

# QST

Prepared relative to Hurricane Fable

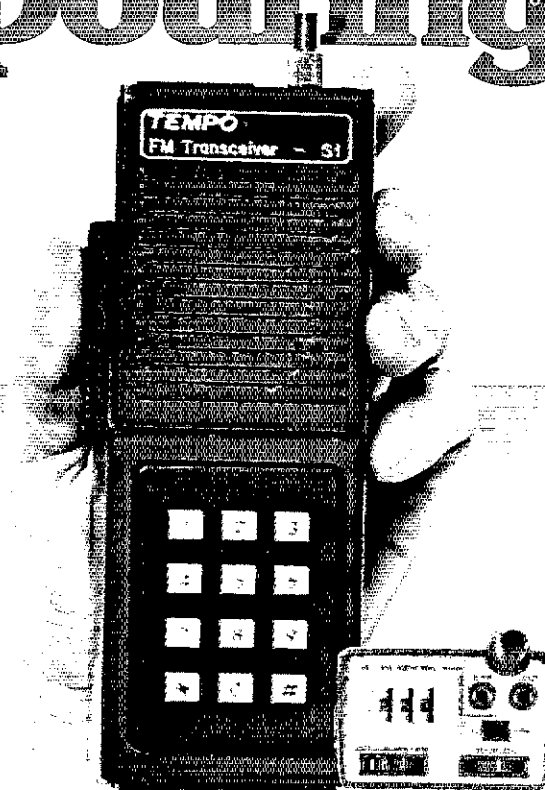


The tornado struck —  
and hams were ready

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# the praise is pouring in



Shown with accessory touch tone pad

Top view

**W**e have never enjoyed such an overwhelming response to a new product. Letters of praise for Tempo's S-1 are coming in daily. Words such as great, fabulous, and fantastic are common. In a few short months the S-1 has taken the Amateur world by storm. In addition to its unique features and its versatility, it has now proven itself to be an extremely rugged and dependable unit...qualities unmatched at any price, but unheard of at the S-1's low price.

This amazing pocket sized radio represents a major breakthrough in 2-meter communications. Other units that are larger, heavier and are similarly priced can offer only 6 channels. The S-1's price includes the battery pack, charger, and a telescoping antenna. But, far more important is its *proven* performance record as a fully synthesized 800 channel hand held transceiver.

The optional touch tone pad adds greatly to its convenience and the addition of a Tempo solid state amplifier adds tremendously to its power.

The Tempo line also features a fine line of extremely compact UHF and VHF pocket receivers. They're low priced, dependable, and available with CTCSS and 2-tone decoders. The Tempo FMT-2 & FMT-42 (UHF) provides excellent mobile communications and features a remote control head for hide-away mounting.

The Tempo FMH-42 (UHF) and the *NEW* FMH-12 and FMH-15 (VHF) micro hand held transceivers provide 6 channel capability, dependability plus many worthwhile features at a low price. FCC type accepted models also available. Please call or write for complete information. Also available from Tempo dealers throughout the U.S. and abroad.

## SPECIFICATIONS

Frequency Coverage: 144 to 148 MHz  
 Channel Spacing: Receive every 5 kHz, transmit Simplex or  $\pm 600$  kHz  
 Power Requirements: 9.6 VDC  
 Current Drain: 17 ma-standby  
 500 ma-transmit  
 Batteries: 8 cell ni-cad pack included  
 Antenna Impedance: 50 ohms  
 Dimensions: 40 mm x 62 mm x 165 mm (1.6" x 2.5" x 6.5")  
 RF Output: Better than 1.5 watts  
 Sensitivity: Better than .5 microvolts

Price... \$349.00 With touch tone pad... \$399.00

## SUPPLIED ACCESSORIES

Telescoping whip antenna, ni-cad battery, pack, charger.

## OPTIONAL ACCESSORIES

Touch tone pad: \$55 • Tone burst generator: \$29.95 • CTCSS sub-audible tone control: \$29.95 • Rubber flex antenna: \$8 • Leather holster: \$16 • Cigarette lighter plug mobile charging unit: \$6 • Matching 30 watt output 13.8 VDC power amplifier (S30): \$89 • Matching 80 watt output power amplifier (S80): \$169

The proven  
**TEMPO S-1**  
 does it all...  
 portable...mobile  
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 and gives you  
**800 channels**  
 in one of the  
**smallest hand helds**

## TEMPO VHF & UHF SOLID STATE POWER AMPLIFIERS

Boost your signal... give it the range and clarity of a high powered base station. VHF (135 to 175 MHz)

Drive Power	Output	Model No.	Price
2W	130W	130A02	\$209
10W	130W	130A10	\$189
30W	130W	130A30	\$199
2W	80W	80A02	\$169
10W	80W	80A10	\$149
30W	80W	80A30	\$159
2W	50W	50A02	\$129
2W	30W	30A02	\$ 89

UHF (400 to 512 MHz) models, lower power and FCC type accepted models also available.

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# Henry Radio

Prices subject to change without notice

# Henry Radio is proud to offer the most important innovation in Amateur Radio since SSB



Historically, Amateur Radio operators have made important contributions to the art and science of communications. Once again Amateur Radio assumes leadership in advanced communications technology. You have the privilege of being one of the first to include a Narrow Band Voice Modulation (NBVM) system in your station. The VBC Model 3000 is the system that you have been hearing about for a year and have read about recently in QST and the 1979 ARRL Handbook. It is the world's first such system.

The VBC Model 3000 provides full audio level compression and expansion... complete intelligibility in only 1300 Hz bandwidth. It permits you to take full advantage of other stations' RF speech clippers and processors... similar to the amplitude compression and expansion used for many years in telephone and satellite communications.

The Model 3000 is for mobile and fixed station use and requires no modifications to your existing equipment. It is completely self contained, including its own audio amplifier. The unit automatically switches into transmit mode when microphone is keyed or voice operation is used. It connects just after the microphone on transmit and just prior to the speaker on receive. In addition to its basic

function of operating in a narrow bandwidth, the Model 3000 also increases the performance of your station in the following ways:

- Reduces adjacent channel interference
- Increases signal to noise ratio
- Increases communications range

Some of its outstanding features include:

- High quality narrow band speech
- Self contained transmit/receive adapter
- Built in audio amplifier
- 5 active filters with a total of 52 poles
- Rugged dependable hybrid IC technology
- Low power consumption

Receive only features, such as sharp voice and CW filtering and amplitude expansion, provide improved reception without requiring a unit at the transmitting station.

For the more advanced experimenter the Model 3000 is available in a circuit board configuration for building into your present transceiver.

Henry Radio is ready to offer technical assistance and advice on the use and servicing of the Model 3000 and will help introduce new owners to others operating NBVM units. Get in on the ground floor... order yours now.

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For more detailed information please call or write. The Model 3000 will be available from most Tempo dealers throughout the U.S. and abroad.

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## Henry Radio

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# The Mobile Marvel Is Back

"Bring back the 225... Bring back the 225," the call was heard and answered. Back by popular demand, and still the economy champ, the IC-225 is again available from your local Authorized Dealer.

Returning as the same "good ol' radio" bought and loved by thousands, the Mobile Marvel is still the friend of the home-brew modifiers. It's so easy to work with, that more user-oriented mods have been made to the IC-225 than to any other ICOM. The synthesizer frequency is controlled by a diode matrix, which is programmed to suit the user's needs and desired channel arrangement. For the new repeater sub-band folks, there is a complete set of step-by-step instructions on how to operate down there (15Khz steps).

For spare parts that are unavailable from your local dealer, phone: ICOM West, Inc., (206) 747-9020; or ICOM East, Inc., (800) 527-7425 (orders only); Texas Residents call (214) 620-2780.

Still an excellent performer in the receiver category, the IC-225 is back with its outstanding balance between sensitivity and IMP, which provides clear, intelligible reception in the modern high-noise environment.

And now the price. Since the IC-225 was introduced, prices on everything have gone up, up, and away. But the amazing 225 returns bearing the same price that it was introduced with years ago!

Economy, versatility, performance and value are all back with the IC-225, the Mobile Marvel.

(Availability may be limited in the Coastal West)

All ICOM radios significantly exceed FCC regulations limiting spurious emissions. Specifications subject to change without notice.

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# QST

August 1979  
Volume LXIII Number 8

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## THE COVER

Phyllis Engleman, WB5YJO, was one of the hundreds of amateurs involved in emergency operations this past spring. Photo by Gary Engleman, K5HGL. Tornado, flood and nuclear accident articles begin on page 53.



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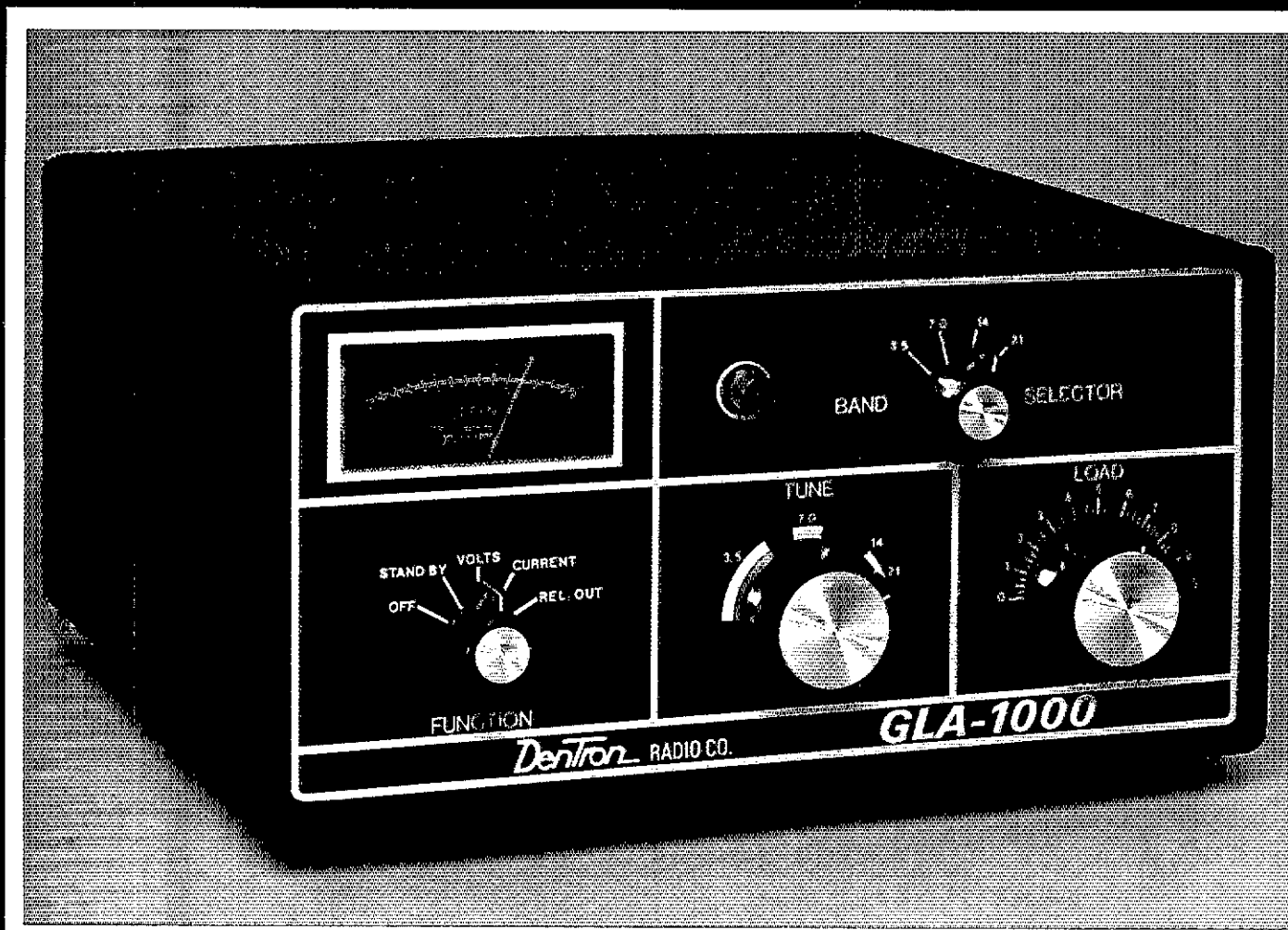
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# ANOTHER FIRST FROM DENTRON more power for less.



In January, 1978, our engineers developed a unique linear amplifier. The GLA-1000 was to be the smallest amateur linear to offer 1200 watts SSB PEP input, and 1000 watts CW input, with a built-in power supply, at the lowest possible price, \$379.50 sugg. retail.

**How would it perform?** Could a unit this small (5½" H x 11" W x 11" D) and economical measure up to high standards set by "professional" amateurs across the country? We decided to let a group of amateurs tell us.

The GLA-1000 was field tested for 1 month by the following amateurs: Robert Allen W8IO, Harold Unger WA2EQN, Robert Schiers N0AN, Jim Turlé WA8RCN, Alan Applegate K0BG, Howard Townsend WA5MLT, Mickey LeBoeuf K5ML, Tom Lutman WB8ZWY, Ed Clegg W3LOY and Andy Calandria K5MVP. The group was instructed to "use the prototype under tough operating conditions, not to baby it in any way."

**What was the response?** Some on the air comments received by W8IO, "Fantastic signal, 12 db over barefoot exciter" (75SSB). "Excellent keying, no change in wave form, 5-9 +30 db in Kentucky" (40CW). From N0AN, "Overall quality excellent and up to the standards DenTron has come to stand for." From K5ML, "Finally a high quality amplifier that everyone can afford."

**Response was unanimously positive.** Build a powerful linear with special features like full metering of essential voltages and currents, a back-lit, black-out meter that even includes a relative, power output function. Keep it small and economical so that it is within the reach of all amateurs, and you've got a winner!

In inflationary times like these, it's important to find ways to do more for less.

We did, and we're proud of it.

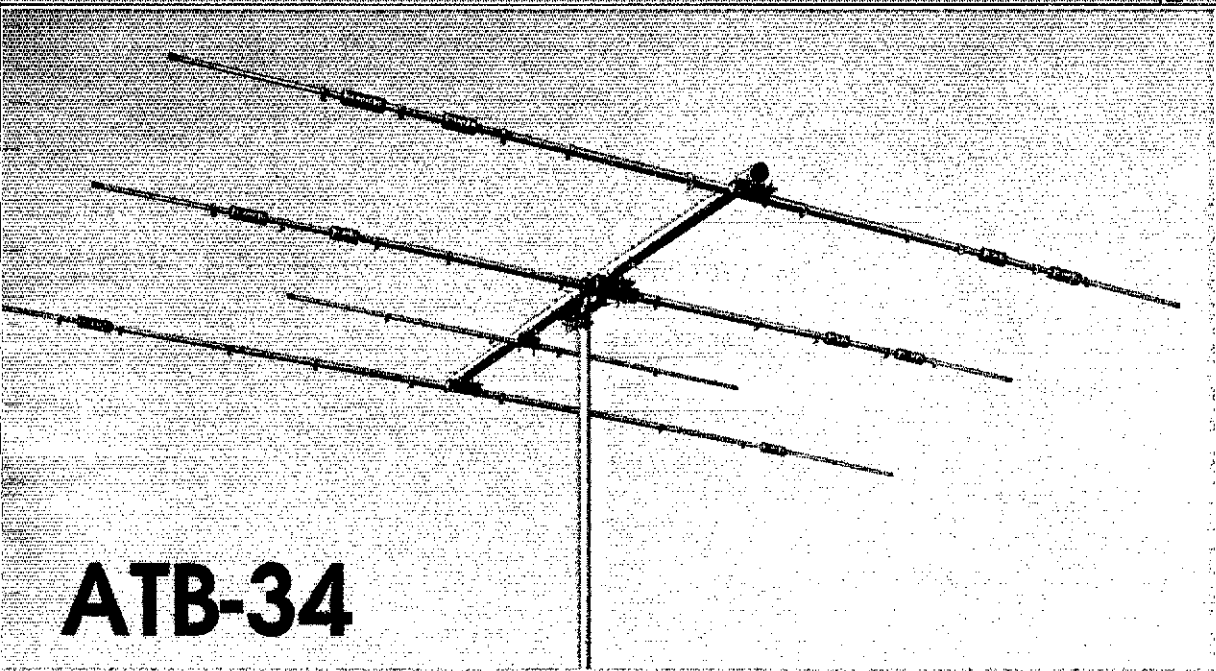
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Punch through the pile-ups with an ATB-34, the only three band beam to give you real full size performance. We invite a full comparison and ask you to check ATB-34 element lengths, check the trap design and construction. Check the spacing and the specially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

### SPECIFICATIONS

Gain	.
F/B Ratio Avg.	.
3dB Beam Width	62°
Nominal Impedance	50 ohms
Power Handling	2000 Watts PEP
Boom Length	18'
Longest Element	32'8"
Turning Radius	18'9"
Wind Area	5.4 Ft. <sup>2</sup>
Weight	42 lbs.
Maximum Mast O.D.	2.25"

\*Antenna gain specifications cannot be published in QST. For complete information on all Cushcraft antennas, see your dealer or write for a free A-9 catalog.

## ATV-5

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

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

ATV-3	ATV-4	ATV-5
10-15-20 Meters	10-15-20-40 Meters	10-15-20-40-80 Meters
Height 13'7" (4.2m.)*	Height 19'2" (5.9m.)*	Height 24'9" (7.4m.)*

ALL MODELS  
Power Handling 2000 Watts, Nominal Impedance 50 ohms, Maximum Mast Size 1 3/4" O.D. Termination: accepts PL-259

\*Nominal height when set for phone operation.

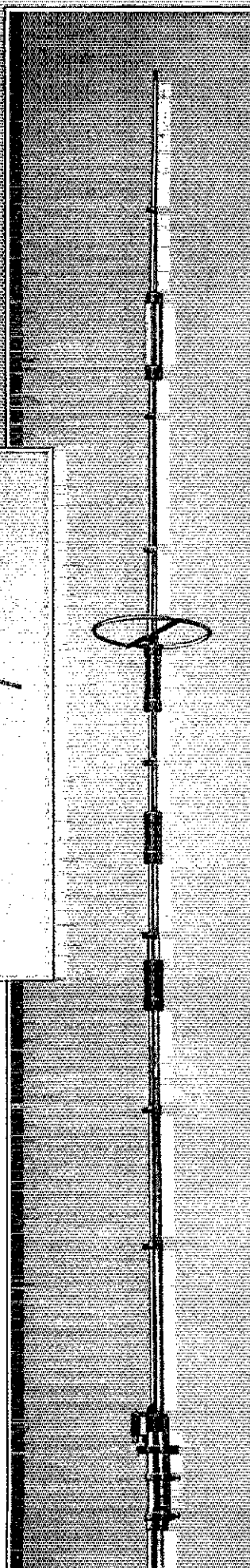
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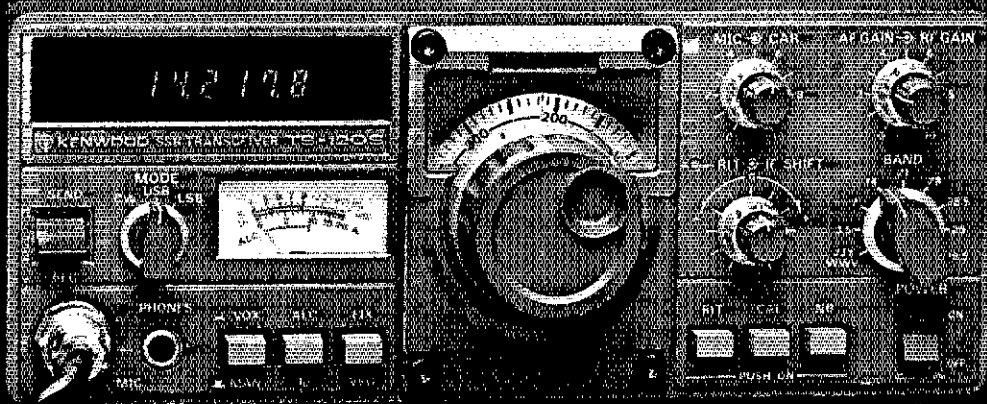
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# TS-120S...A big little rig.



**It's a compact, up to 200 watts PEP input, all solid-state HF transceiver with such standard features as built-in digital readout, IF shift, new PLL technology ...and requires no tuning!**

**Exciting and perfect for car or ham shack use! But, there's more to say about the TS-120S! This unique all solid-state HF, SSB/CW transceiver produces a hefty signal and also offers a lot of other great features in a very attractive, compact package.**

#### **FEATURES:**

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- 200 watts PEP (160 watts DC) input on 80-15 meters, 160 watts PEP (140 watts DC) input on 10 meters. LSB, USB, and CW.
- Digital frequency display (standard).
- 100-Hz resolution. Six digits. Special green fluorescent tubes eliminate viewing fatigue. Analog subdial, too, for backup display.
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- Attractive, compact design. Measures only 3½" high X 9¼" wide X 13½" long, and weighs only 4.9 kg (11.7 lbs.). A perfect size for convenient mobile operation and rugged enough for either

mobile or portable use. Also has all the desired features for optimum ham-shack operation at home.

- Noise blanker. You'll wonder where the ignition noise went.
- Operates with TS-30 base-station power supply, which turns on and off remotely with TS 120S power switch.

See the big little TS-120S rig and matching accessories (VFO-120 remote VFO, SP-120 external speaker, PS-30 AC power supply, MB-100 mobile mounting bracket, AT-120 antenna tuner and YK-88C CW Filter) at your nearest Authorized Kenwood Dealer!



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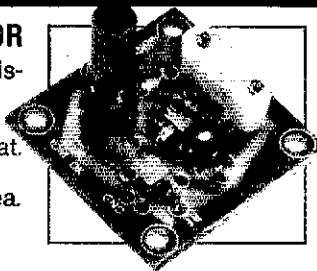
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## OX OSCILLATOR

Crystal controlled transistor type. 3 to 20 MHz, OX-Lo, Cat. No. 035100. 20 to 60 MHz, OX-Hi, Cat. No. 035101.

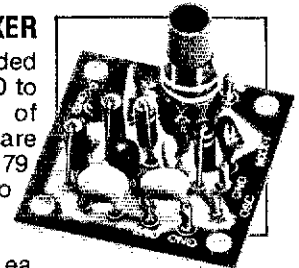
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## MXX-1 TRANSISTOR RF MIXER

A single tuned circuit intended for signal conversion in the 30 to 170 MHz range. Harmonics of the OX or OF-1 oscillator are used for injection in the 60 to 179 MHz range. 3 to 20 MHz, Lo Kit, Cat. No. 035105. 20 to 170 MHz, Hi Kit, Cat. No. 035106.

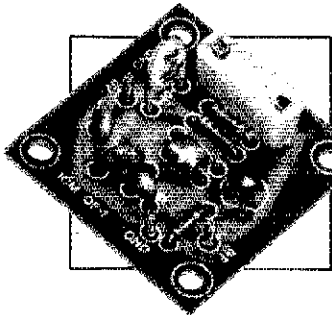
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## OF-1 OSCILLATOR

Resistor/capacitor circuit provides osc over a range of freq with the desired crystal. 2 to 22 MHz, OF-1 LO, Cat. No. 035108, 18 to 60 MHz, OF-1 H Cat. No. 035109.

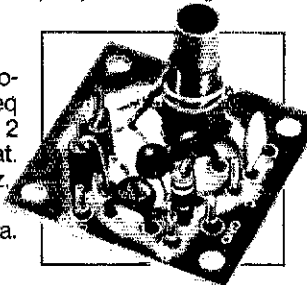
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## PAX-1 TRANSISTOR RF POWER AMP

A single tuned output amplifier designed to follow the OX or OF-1 oscillator. Outputs up to 200 mw, depending on frequency and voltage. Amplifier can be amplitude modulated 3 to 30 MHz, Cat. No. 035104.

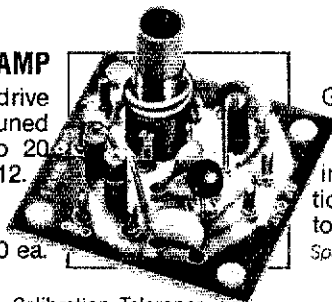
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## SAX-1 TRANSISTOR RF AMP

A small signal amplifier to drive the MXX-1 Mixer, Single tuned input and link output. 3 to 20 MHz, Lo Kit, Cat. No. 03512. 20 to 170 MHz, Hi Kit, Cat. No. 035103.

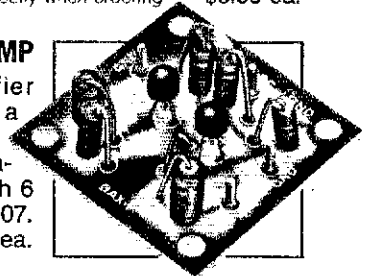
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General purpose amplifier which may be used as a tuned or untuned unit in RF and audio applications. 20 Hz to 150 MHz with 6 to 30 db gain. Cat. No. 035107.

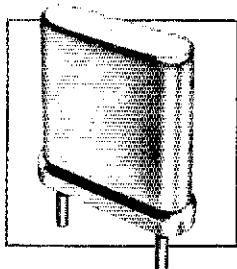
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.02% Calibration Tolerance

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The American Radio Relay League, Inc., is a noncommercial association of radio amateurs, bonded for the promotion of interest in Amateur Radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its board.

“Of, by and for the amateur.” It numbers within its ranks practically every worthwhile amateur in the nation and has a history of glorious achievement as the standard-bearer in amateur affairs.

Inquiries regarding membership are solicited. A bona fide interest in Amateur Radio is the only essential qualification; ownership of a transmitting station and knowledge of the code are not prerequisites, although full voting membership is granted only to licensed amateurs.

All general correspondence should be addressed to the administrative headquarters at Newington, Connecticut 06111.

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## Continued Growth?

Through the 60s and the early 70s, Amateur Radio in the United States didn't sustain much growth. The newcomers just about replaced those who dropped out, and so the total count remained pretty much constant. Then, in the mid-70s, there was an explosion of interest in personal radio. This was first felt in the Citizens Radio Service, where the Federal Communications Commission was soon issuing CB licenses at the rate of some half a million per month. Fired by the resulting equipment demand, a number of electronic companies rode the boom to dizzying sales figures for CB rigs. Aware that many of the CBers were quickly becoming disenchanting with the limitations of the CB bands, the League inaugurated a training program which soon had thousands of students, and graduates. Just as the commercial field expanded its capacity to supply the CB transceiver demand, the League expanded its training facilities and associated supplies to handle the demand. The trials and tribulations of that expansion period are largely over — let's hope the growth is not.

A new fall season will soon be with us, and traditionally it will be time for increased activity on the part of ARRL affiliated clubs to sponsor Novice training programs. There are thousands of prospective radio amateurs out there — we hope they have an opportunity to obtain a Novice license, and we hope they choose to enjoy the advantages of League membership.

If your club has not yet organized a Novice (or other) training course for this fall, please contact our Club and Training Department for guidance. We have in-

structor guides, student material, a new Novice question and answer book (a book small enough so that the student can carry it in purse or pocket), and a wealth of other material.

If you're interested in promoting the general image of Amateur Radio, in calling it to the attention of the general public, you'll be interested in our new film on Amateur Radio. Titled *The World of Amateur Radio*, it runs for 30 minutes and, using such celebrities as Senator Barry Goldwater, Arthur Godfrey, Dick Van Dyke and King Hussein, it dramatizes the fun of Amateur Radio and the public service of Amateur Radio.

Its predecessor, *Ham's Wide World*, was shown to millions of people, both on television and at meetings of local groups and clubs. Both films were produced by Dave Bell, W6AQ, and when you see this latest production, you'll be even more proud of the Amateur Radio Service and of how well Dave Bell has told our story.

*The World of Amateur Radio* is to be previewed at the National Convention in Baton Rouge in July, and will be available for national distribution later this fall. See a forthcoming announcement in "League Lines" on how you can book a copy.

But, great as it is, *The World of Amateur Radio* is only one way to tell the story of Amateur Radio. There are many ways each of us can participate individually. We, collectively, do it every time we render some act of public service and the more of us there are, the better our story will be known.

Will you be helping this fall, in whatever way, to continue the growth of Amateur Radio? — R. L. Baldwin, W1RU



# League Lines...

Amateurs in the Soviet Union may now use 160 meters. Cw is permitted between 1850 and 1950 kHz, ssb between 1875 and 1950 kHz and a-m between 1900 and 1950 kHz. Power is limited to 10 watts. New Soviet "Novice-type" licensees will be permitted to use this band with a 5-watt power limit, and will use an EZ prefix; the remainder of the call will follow the regular system of the U.S.S.R. for individual calls. EZ stations are permitted to contact other EZ stations only.

ARRL is seeking to appoint persons who have expertise in the area of biological effects of non-ionizing radiation as Technical Advisors. To qualify as a TA, you must be a League member in good standing, a licensed amateur, and employed professionally in the specific field of interest or have equivalent credentials in education. Please contact ARRL hq. for further details.

The ARRL Technical Department has career openings available for editors and lab technicians. If you're interested, contact W1FB or K1TD at Headquarters regarding these challenging positions.

League members (and other interested persons) are always welcome during business hours for tours of the ARRL administrative headquarters and the Maxim Memorial Station, W1AW. Visiting hours for both are Monday through Friday from 8 A.M. to 4:30 P.M. (Local Eastern Time). Large groups should make advance arrangements, one week ahead. Give date, time, and number attending. Please call 203-666-1541. W1AW operates until 1 A.M. on week-nights and from 3:30 P.M. to 1 A.M. on Saturdays and Sundays. All facilities will be closed on August 30, September 4, November 23, and December 25.

Do you have a favorite instructor? Well, now is the time to nominate that dedicated soul who helped you up the ladder of Amateur Radio for the Herb S. Brier, W9AD Memorial Award. This award goes to the top Instructor of the Year for 1979 (See February 1979 QST, page 52, for details).

ARRL Hq. has no more Daryl Dragon radio Public Service Announcements left as of mid-June, and we are quickly running out of Joe Rudi spots. If you have any PSAs, please duplicate them and return the originals to Hq. so that we can fulfill other requests. Recycling is the name of the game here!

Club pubs. For clubs that qualify, a complete set of ARRL publications can be purchased from ARRL hq. at a reduced rate to be donated to your local library. Qualifications: The purchaser must be an ARRL affiliated club. Payment of \$55 must accompany a letter from your local library official who has agreed to display and circulate the materials. Sorry, we cannot bill.

More than one ham in your household? The mother, father, sister, brother, wife, husband, son or daughter of a member, living at the same address, can be a Family Member of the League, at \$2 per year, with all privileges of a regular member except receipt of an additional copy of QST.

QST was mailed to all members (except for some new members and late renewals) on the following dates: July issue -- June 14; June -- May 16; May -- April 19; April -- March 20. Since mailing labels are prepared 10 days in advance of mailing, be sure to renew your membership promptly, and allow at least six weeks for an address change to take effect.

● *Basic Amateur Radio*

# Build a Simple "Super" for SSB

Try this stripped-down 75-meter ssb receiver for your next beginner's project. Club members may find this receiver just right for a group effort!

By Doug DeMaw,\* W1FB

One might call this project a "scrounger's special," as most of the parts should be on sale at hamfest flea markets. The notable exceptions are the toroid cores and the i-f filter. Even the panel material can be gleaned inexpensively: It's merely double-clad circuit board!

The writer's objective was to develop a straightforward superheterodyne receiver capable of good performance at modest cost and minimum complexity. Only five transistors and one IC are used to meet the objective. To enhance the appeal of the project for club groups and beginners, a larger-than-necessary main pc board is used. This allows plenty of finger room when assembling the circuit. The added space also serves nicely when larger than typical parts must be substituted. It should be stressed early in this article that *absolute* parts values aren't necessary except for FL1 of Fig. 1: A departure of  $\pm 10$  percent for the remainder of the resistors and capacitors is satisfactory. If 3N211 FETs aren't available, other dual-gate MOSFETs can be substituted, such as the RCA 40673 or Motorola equivalents. In fact, one can even use an MPF102, 2N4416 or similar FETs in place of Q3, Q4 and Q5 because the MOSFETs shown have their gates tied together, resulting in a single-gate configuration. The foregoing illustrates clearly that this circuit does not have rigid constrictions.

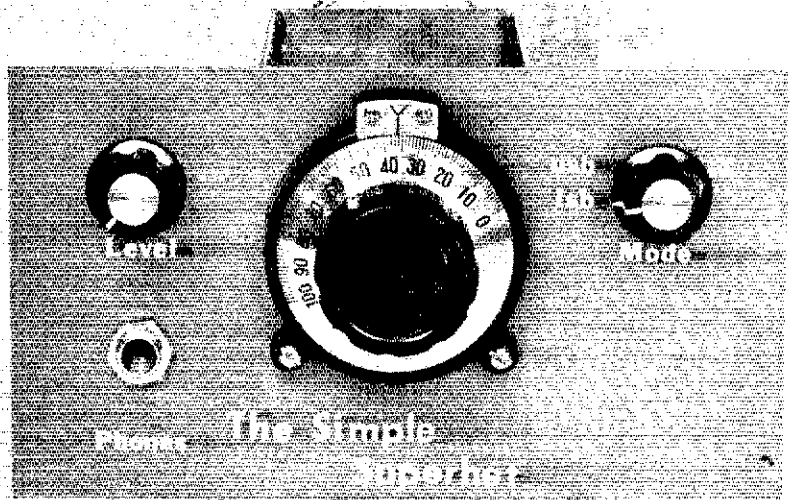
## Circuit Discussion

FL1 of Fig. 1 is a fixed-tuned (once adjusted, that is) Butterworth-response

band-pass filter. It covers 200 kHz of the 75-meter band between the half-power (3-dB) points of the response curve. FL1 eliminates the need to have a front-panel peaking control. To minimize front-end overloading (desensitization and cross modulation), the input signal passes from the filter directly into the mixer, Q1. It is rarely necessary to use an rf amplifier

stage on 160, 80 or 40 meters, because of the fairly high noise level which is picked up by the station antenna. Such noise comes from the atmosphere and man-made causes.

The builder has an option when choosing FL2, the i-f filter. The least expensive approach also provides the best overall receiver gain — employing the circuit of



The front panel of the "Simple Superhet" receiver. Both front and rear panels were fashioned out of double-clad pc-board material.

\*Senior Technical Editor, ARRL

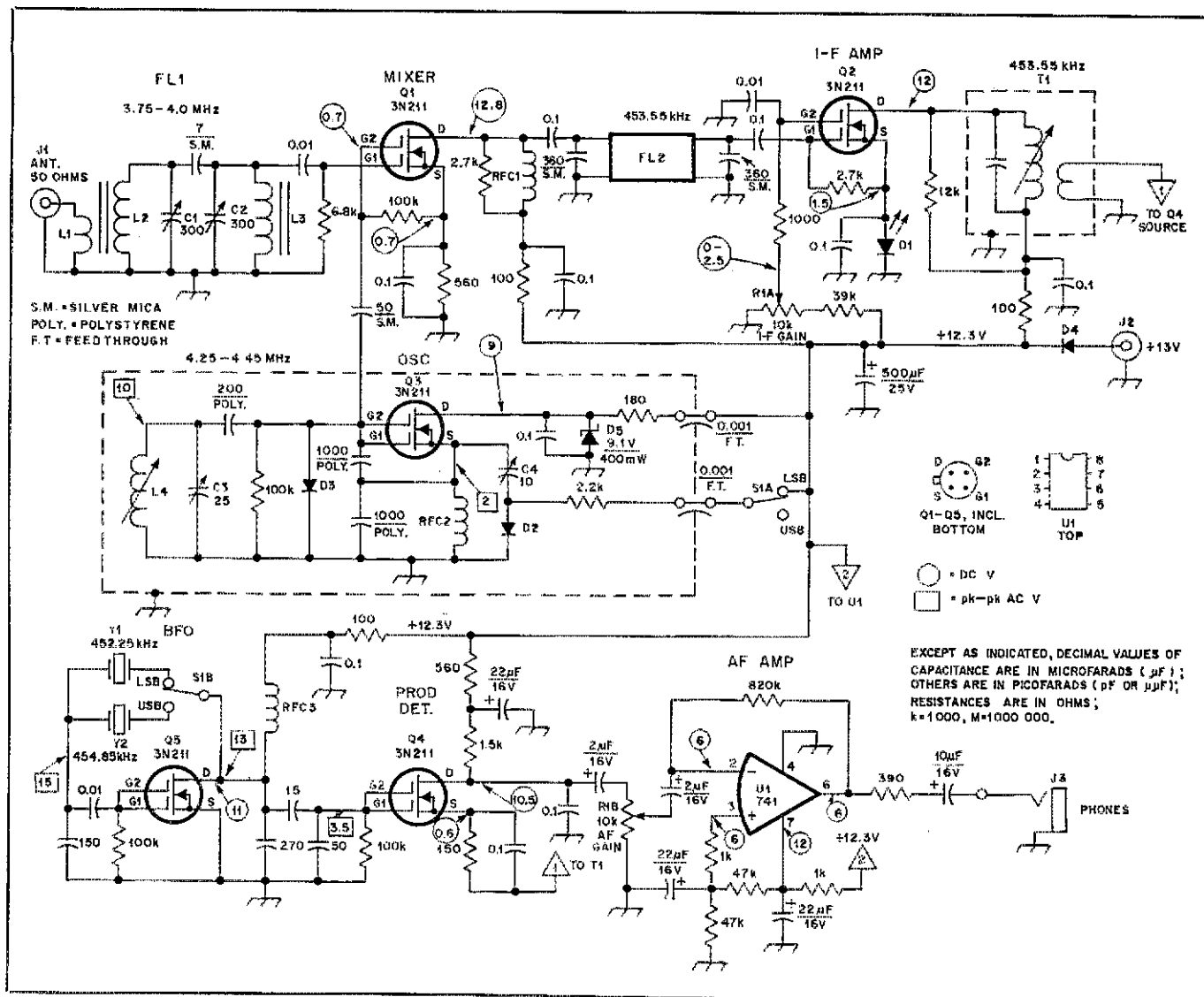


Fig. 1 — Schematic diagram of the receiver. Fixed-value capacitors are disk ceramic unless noted otherwise. Fixed-value resistors are 1/4- or 1/2-watt composition. Polarized capacitors are electrolytic or tantalum. The circuit shown is for a Collins mechanical filter (see Fig. 2 and text).

- C1, C2 — Mica trimmer, 300 pF max., Arco 427 or equivalent.
- C3 — Miniature air variable, 25 pF max., Hammarlund HF-25 or equiv.
- C4 — Subminiature E. F. Johnson pc-mount air trimmer, 10 pF max., Mylar or ceramic trimmer suitable as substitute.
- D1 — Small LED (any color) as 1.5-V reference (see text).
- D2, D3 — Small silicon switching diode, 1N914 or equiv.
- D4 — Power-supply rectifier, 1 A, 50 PRV or greater.
- D5 — Zener diode, 9.1 V, 400 mA.

- FL2 — Rockwell International/Collins 453.55-kHz mechanical filter. See text and Fig. 2 (Collins no. 5269939010).
- J1, J2 — RCA-type phono jack.
- J3 — Two-circuit phone jack.
- L1 — Two turns of no. 24 insulated wire over L2 winding.
- L2, L3 — 41 turns no. 24 enam. wire on T68-6 toroid core (8.7 µH). (See QST ads for toroid-core suppliers.)
- L4 — High-Q slug-tuned inductor, 8.5 µH nominal, J. W. Miller 42A105CBI or equiv.
- Q1-Q5, incl. — Texas Instruments 3N211 or equiv. See text.
- R1 — Dual (not concentric) 10-kΩ audio-taper

- control. See text.
- RFC1, RFC3 — Miniature 10-mH rf choke, J. W. Miller 73F102AF or equiv.
- RFC2 — Miniature 1-mH rf choke, J. W. Miller 73F103AF or equiv.
- S1 — Two-pole, two-position, phenolic or ceramic rotary switch.
- T1 — Miniature 455-kHz transistor i-f transformer, J. W. Miller no. 2067.
- U1 — Operational amplifier, type 741, 8-pin dual in-line pkg.
- Y1, Y2 — 452.25- and 454.85-kHz crystals in HC-6/U style holder. International Crystal Co. type GP, 30-pF load capacitance.

Fig. 2A rather than the FL2 system of Fig. 1. The J. W. Miller 8814 filter/transformer has minimal insertion loss compared to a Collins mechanical filter, thereby enhancing the overall gain. The Miller component is considerably less expensive than a Collins filter, unless the latter is obtained as a flea-market bargain. (Beware of defective filters bought at bargain prices!) The main pc board is laid

out to accommodate a medium-cost Collins CB-band, 453-kHz filter, the circuit for which is given in Fig. 1. Some of the more costly Collins filters have insertion losses as great as 10 dB. If one of them is used, it will be necessary to add a post-filter amplifier of the type shown in Fig. 2B in order to have an acceptable receiver noise figure and adequate overall gain. Furthermore, Collins

filters other than the 5269939010 of Fig. 1 may have different characteristic impedances. If so, they will require different end capacitors for resonating the filter input and output transformers. Therefore, the drain-load resistor of Q1, the gate-source resistor at Q2 and the shunt capacitors at FL2 will have to be changed accordingly. The i-f amplifier, Q2, has no agc

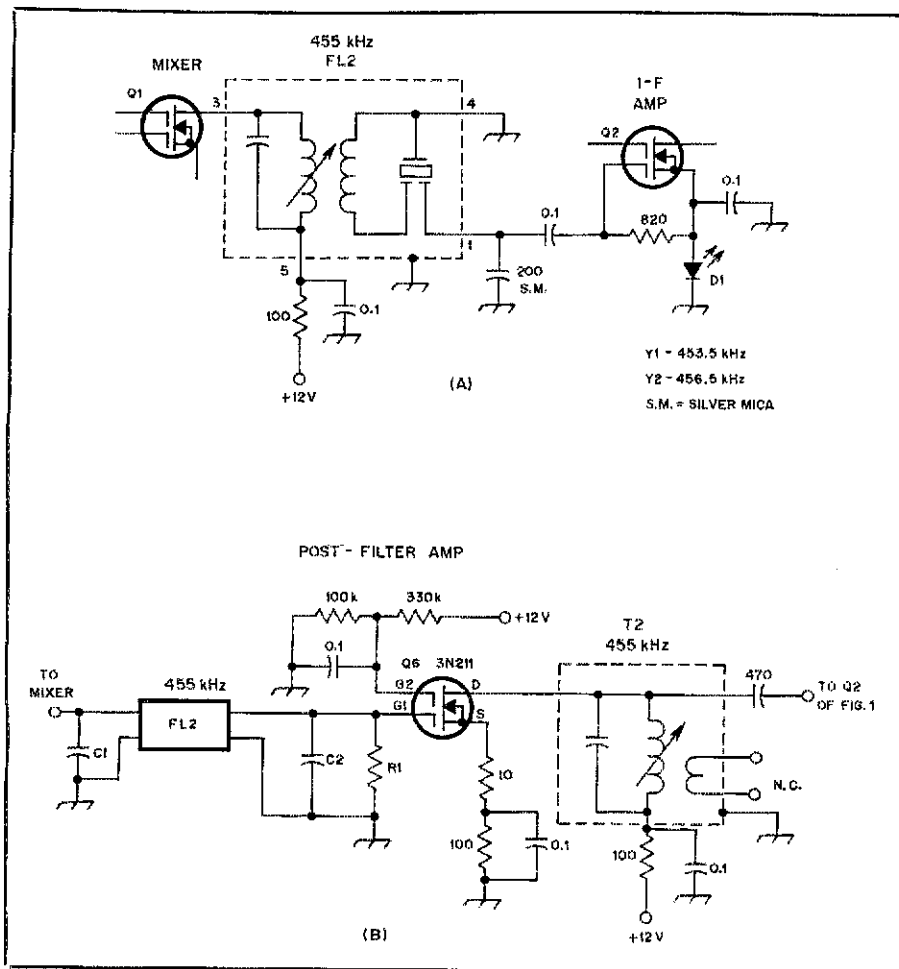


Fig. 2 — The circuit at A shows the modifications required for using a J. W. Miller 8814 low-cost filter at FL2. If this circuit is employed, Y1 and Y2 will be cut for different frequencies than in the circuit of Fig. 1. The new frequencies will be 456.5 and 453.5 kHz. The circuit at B shows how to add a post-filter amplifier to compensate for the insertion loss of some mechanical filters. When filters other than that specified in Fig. 1 are used, C1, C2 and R1 must be chosen in accordance with the manufacturer's specifications which pertain to the filter used. The mixer (Q1 of Fig. 1) will require a different value of resistor in shunt with RFC1 to provide the proper termination for the filter. The resistor will have the same value as that at R1 in example B. T2 at B will be the same type as T1 of Fig. 1.

applied. Instead, manual gain control is effected by means of R1A which is ganged to the audio gain control, R1B. The advantage of using a dual control is that strong signals are attenuated before they reach the product detector (Q4) and the audio amplifier (U1). This prevents the audio to the headphones from being clipped (distorted). Single controls can be used in place of the dual type specified for R1. The cost will be approximately the same.

The LED, D1, serves as a 1.5-volt reference for Q2, thereby permitting gate 2 to be brought effectively down to -1.5 volts when R1A is set for minimum gain. This "bootstrapping" technique ensures a minimum gain point for Q2. Two 1N914 diodes can be used in place of D1 to establish a -1.4 volt minimum level at gate 2. The 12-kΩ resistor across T1 is used to force the impedance ratio from that value to roughly 200 ohms at the source of Q4. The transformer itself does

not have the proper primary-secondary characteristic.

### Local Oscillator

The simplicity guideline is followed also in the local-oscillator section of the receiver. Q3 of Fig. 1 operates as a single-gate FET or JFET. Output to the mixer is taken from the gate of Q3 — a point where the waveform is essentially pure. Only slight pulling (frequency shift) of the oscillator will occur during the initial adjustment of FL1. Polystyrene capacitors are specified in the frequency-determining part of the circuit. They offer excellent stability by having drift characteristics that compensate nicely for those of the core material in L4. Silver-mica capacitors can be substituted if necessary; likewise with ceramic NP0 capacitors. However, the polystyrene units will provide the best long-term stability with this circuit. D3 also aids oscillator stability by functioning as a bias clamp. This diode also reduces

the harmonic currents in the oscillator output by limiting the FET transconductance at the positive peak of the sine-wave excursion. D5 stabilizes the dc voltage to the oscillator at 9.1.

An offset circuit for upper and lower sideband is actuated by means of S1A and D2. C4 is adjusted (S1A closed) to provide the same setting of the main tuning dial for upper and lower sideband. Those interested in receiving only the lower sideband can eliminate C4, D2, Y2 and S1.

### The Remaining Circuit

A Pierce type of oscillator is used as the BFO (Q5). The leads between Y1, Y2 and S1B should be kept as short and direct as possible to prevent unwanted stray radiation of the BFO energy.

Product detector Q4 is source driven by the i-f amplifier, Q2. BFO injection is applied to the parallel gates of Q4. Audio output is taken at the drain of Q4 across a 1500-Ω resistor.

Some 40 dB of audio gain is provided by U1, an op-amp IC. A 390-Ω resistor has been added between pin 6 of U1 and J3. This prevents the op amp from breaking into self-oscillation when headphones of very low impedance (4 to 16 ohms) are used. If phones of 600 ohms or higher are to be used, this resistor can be removed and the pc pads for it jumpered.

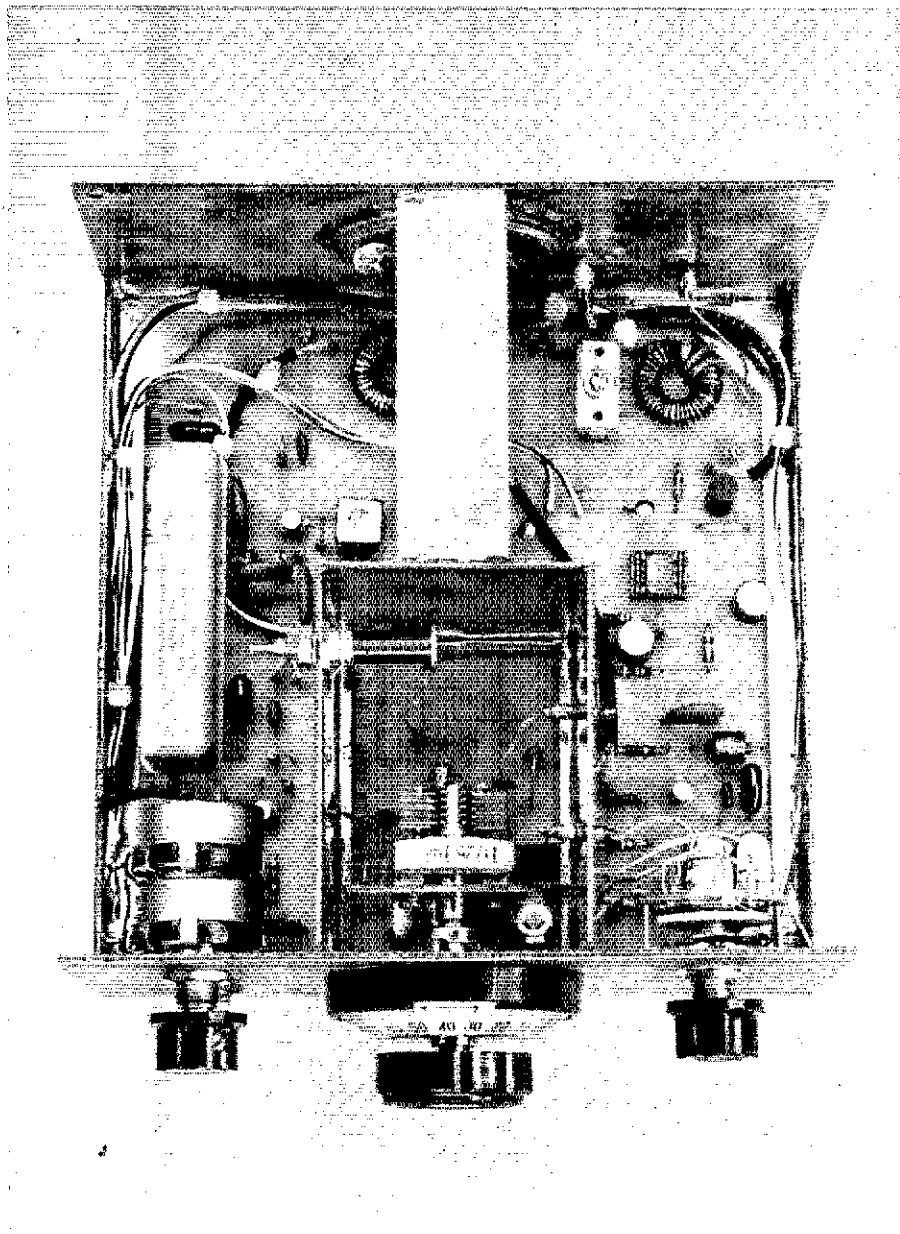
A polarity-guarding diode, D4, is used at J2. This prevents damage to the transistors and IC if the operator mistakenly cross-connects the power supply to the receiver. D4 will cause a voltage drop of approximately 0.7. If the supply leads are reversed, no current will flow through D4.

### Construction Data

The photographs show a kit prototype done by Circuit Board Specialists.<sup>1</sup> The outer edges of the main pc board (top and bottom) have a 1/4-inch (6-mm) strip of unetched copper foil. This enables the builder to solder the front and rear panels to the pc-board chassis above and below the main board. The component side of the main board has a similar copper area (rectangular) for soldering the oscillator compartment in place. The main pc board measures 6 × 5-7/8 inches (152 × 149 mm). The front and rear panels are made from sections of double-clad pc board. The dimensions are 3-3/8 × 6 inches (86 × 152 mm). The main board is elevated above the bottom edges of the panels by 1/4 inch (6 mm).

Double-clad pc board material is used also for the oscillator compartment walls. This rectangular box is 3 inches (76 mm) deep, 2 inches (51 mm) wide and 3 inches

<sup>1</sup>Negatives, circuit boards and parts kits for this receiver are available from Circuit Board Specialists, P. O. Box 969, Pueblo, CO 81002. Parts and pc boards are also available from G. R. Whitehouse, 11 Newbury Dr., Amherst, NH 03031.



Topside view of the prototype receiver. FL1 is at the upper right. FL2 is at the left center. The speaker on the rear panel is not used in this model.

high. The inner corners of the box are soldered the entire length. Solder is used inside and outside the box where it mates with the front panel. A 100-watt soldering iron or 250-watt gun should be used to ensure a smooth flow of solder when joining the various assemblies of the receiver.

A small piece of double-clad pc board is soldered inside the front area of the oscillator enclosure to permit mounting the main-tuning capacitor. This piece is located midway up from the main pc board and roughly 1/2 inch (13 mm) behind the front panel.

A reinforcing strut is soldered between the back wall of the oscillator box and the rear panel. It is fashioned from a 1-inch

(25-mm) wide piece of double-clad pc board. L4 and the two 0.001- $\mu$ F feed-through capacitors are mounted on the walls of the oscillator enclosure. The capacitors are located near the pc-board pads to which they connect.

The Circuit Board Specialists kit version of this receiver contains an adaptor pc board that plugs into the main pc board to allow use of the Miller filter at FL2 in place of the Collins mechanical filter. Those builders designing their own pc boards may wish to modify the pattern to accommodate the Miller filter, thereby eliminating the piggy-back adaptor. An audio amplifier board for driving a speaker is also furnished by Circuit Board

Specialists. The loudspeaker shown in the photograph was installed on the prototype for that purpose.

Miniature 50- $\Omega$  coaxial cable is used to carry rf within the receiver. RG-174/U is suitable, but if none is available it is okay to use short runs of shielded audio cable. Shielded wire helps prevent stray rf from being coupled to critical areas of the circuit.

No top and bottom covers were built for this receiver. Those wishing to provide complete rf shielding and keep dirt from entering the circuit area may fashion covers from aluminum sheeting. It would also be a simple matter to make a cabinet from sections of double-clad pc-board stock.

### Checkout and Tune-up

After you complete the unit, inspect the bottom of the board thoroughly. Look for unwanted solder bridges between pc foils, and for poor solder joints. A magnifying glass or jeweler's loupe are excellent for this.

If all appears to be shipshape, place a length of wire between the antenna connector of a general-coverage receiver and the general area of L4. Set C3 for full mesh, then adjust the slug in L3 for a received signal at 4.253 MHz. With minimum capacitance at C3, a signal should appear at roughly 4.45 MHz.

Next, connect a 50- $\Omega$  antenna (a coax-fed dipole or resonant vertical will suffice) at J1, locate a weak signal in the center of the receiver tuning range, then tweak C1 and C2 for maximum signal response at the earphones. Make certain that R1 is set for maximum gain during alignment of FL1. Finally, adjust the core in T1 for maximum signal. (Details on adjustment of offset trimmer C4 were given earlier in this article.)

If the Miller filter is used at FL2, receiver sensitivity should be ample to plainly hear a 0.5- $\mu$ V signal in the headphones when R1 is set for maximum gain. Slightly less sensitivity may be observed if the mechanical filter is used without an additional i-f amplifier.

### Operation

Excellent results have been obtained at the author's home station with this receiver. Despite WIAW being only two blocks away, no overloading of the front end has been noted when the receiver is tuned 5 kHz or more from the WIAW signal. Oscillator stability is excellent, as is the mechanical stability of the entire receiver.

Unwanted sideband rejection with the Miller filter installed appears to be on the order of 30 dB. It will be substantially better if the Collins filter is used. Remember, however, that different BFO crystals will be required when the Miller filter is used. Fig. 2 provides the frequencies needed.



# Spectrum Analysis — One Picture's Worth a . . .

Ever wonder how those Product Review spectral photos are taken, what they mean and how they might affect you? Here's a short course in the hows and whys of spectrum analysis.

By Jay B. Rusgrove,\* W1VD

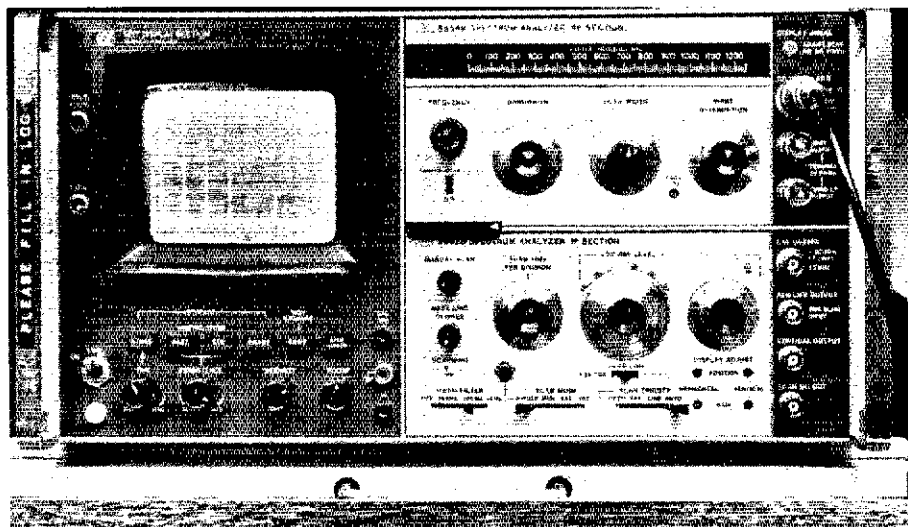
**S**pectrum analyzers play a key role in the design, checkout and alignment of rf equipment. One would be hard pressed to name another single piece of test equipment that can provide as much useful data and perform the variety of tests that can be done with the spectrum analyzer. Although the instrument is not much more difficult to operate than a fancy communications receiver, a certain amount of operating skill is required, at least if meaningful results are to be obtained. Certain test setups and procedures must be followed to guarantee accurate results — more on this later. First, let's see what a spectrum analyzer is and what it can do.

## Oscilloscope Versus Spectrum Analyzer — What's the Difference?

The spectrum analyzer can be likened to an oscilloscope in that both characterize an electrical signal through graphical representation. The oscilloscope is used to observe electrical signals in the *time* domain (amplitude as a function of time). However, not all signals can be properly represented in just the time domain. Amplifiers, mixers, oscillators, detectors, modulators and filters are best characterized in terms of their frequency response. This information is obtained by viewing electrical signals in the frequency domain (amplitude as a function of frequency). One instrument that can display the frequency domain is the spectrum analyzer.

### Time and Frequency Domain

So that we can more easily understand the concepts of time and frequency domain, let's take a look at Fig. 1. The three-dimensional coordinates show time



The spectrum analyzer used in the ARRL laboratory, a Hewlett-Packard model 8554B.

(as the line sloping toward the bottom/right), frequency (as the line rising toward the top/right) and amplitude (as the vertical axis). The two discrete frequencies shown are harmonically related so we'll refer to them as  $f_1$  and  $2f_1$ .

In the representation of time domain at Fig. 1B, all frequency components of a signal are summed together. In fact, if the two discrete frequencies shown were applied to the input of an oscilloscope we would see the solid line (which corresponds to  $f_1 + 2f_1$ ) on the display.

In the frequency domain, complex signals (signals composed of more than one frequency) are separated into their individual frequency components. Additionally, a measurement is made as to the power level at each discrete frequency. The display depicted at Fig. 1C is typical of that obtained with a spectrum analyzer.

The frequency domain can contain in-

formation not found in the time domain and therefore the spectrum analyzer offers advantages over the oscilloscope for certain measurements. As might be expected, there are some measurements that require data gathering to be done in the time domain, and in these cases the oscilloscope is an invaluable instrument.

### Spectrum Analyzer Basics

There are several different types of spectrum analyzers. However, we'll confine our study to that of the most widely used and most popular type — the swept superheterodyne. A simplified block diagram of such an analyzer is shown in Fig. 2.

The analyzer is basically a narrow-band receiver which is electronically tuned in frequency. This tuning is accomplished by applying a linear-ramp voltage to the frequency-controlling element of a

\*Senior Assistant Technical Editor, ARRL

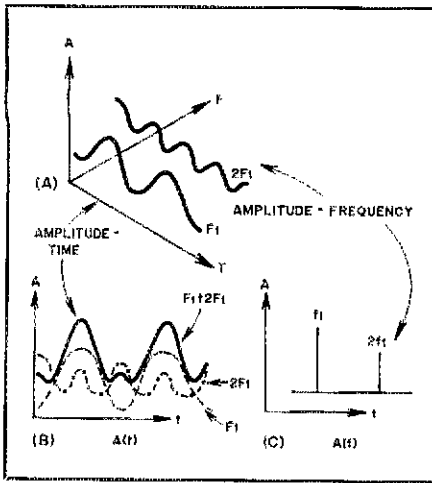


Fig. 1 — Here are several ways in which a complex signal may be characterized. At A is a three-dimensional display of amplitude, time and frequency. At B, this information is shown only in the time domain as would be seen on an oscilloscope. At C the same information is shown in the frequency domain as it would be viewed on a spectrum analyzer.

voltage-tuned local oscillator (VTO). This same ramp voltage is simultaneously applied to the horizontal deflection plates of the cathode ray tube (CRT). The output from the receiver is synchronously applied to the vertical deflection plates of the CRT and an amplitude-versus-frequency display results.

So that this idea will be easier to understand, let's plug a few actual numbers into the system. Assume that we are using an analyzer that is designed to cover the range from 0-110 MHz. Also, assume that the i-f is 200 MHz. In order to convert the input rf signals in the 0- to 110-MHz range up to the i-f, we need a local oscillator that can be swept from 200-310 MHz. For an rf signal input at 0 MHz, the lowest end of the tuning range, and an i-f of 200 MHz, the local oscillator must be tuned to 200 MHz ( $200 - 0 = 200$  MHz). This is a special case since the local-oscillator signal is precisely on the same frequency as the

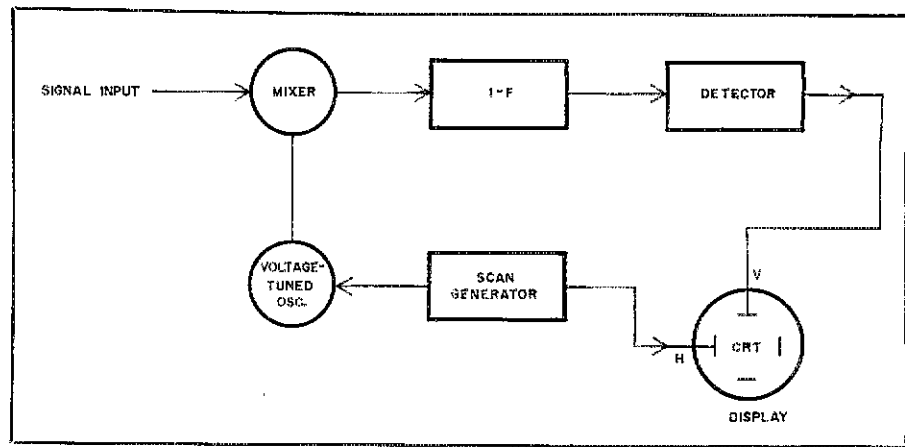


Fig. 2 — A simple block diagram showing how a spectrum analyzer functions.

i-f. For an rf signal input at 110 MHz, the high end of the range, and again, the i-f of 200 MHz, the local oscillator must be tuned to 310 MHz ( $310 - 110 = 200$  MHz). An input signal at 50 MHz would require an LO signal at 250 MHz to produce the desired i-f ( $250 - 50 = 200$  MHz).

If the LO is swept across the range 200-310 MHz in conjunction with the CRT beam from left to right, the display presented on the CRT will represent 0 MHz at the left-hand extreme of the screen and 110 MHz at the right. As mentioned earlier, there is a special case where the LO is at the same frequency as the i-f (200 MHz). This produces a response on the analyzer screen at the far left which corresponds to 0 MHz. Quite simply, the LO signal is fed directly through to the i-f. This limits the ability of the analyzer in viewing signals that are located very near 0 MHz since a response is produced at this frequency. The "blip" at 0 MHz is handy though, as it serves as a frequency marker at one end of the range.

Shown in Fig. 3 is a somewhat more complex block diagram of the spectrum analyzer. This diagram resembles that of a communications receiver in a number of ways. As shown, the input signal is first

routed through a step attenuator (adjustable in 10-dB increments). In addition to providing an adjustable amount of attenuation, it also presents a wide-band 50-ohm load to the device under test. This is very important if meaningful measurements are to be made. Output from the attenuator is fed to a low-pass filter which is responsible for eliminating, or greatly reducing, the analyzer image response, which in this case would be in the 400- to 510-MHz range. For an analyzer covering the frequency range from 0-100 MHz, the low-pass filter would have a cutoff frequency in the area of 150 MHz. This filter will also help reduce feedthrough at the i-f, 200 MHz, should there be any such signal component at the input.

The signal is now passed on to the mixer where it is converted to the i-f as outlined earlier. At the i-f, the signal encounters an i-f filter, the bandwidth of which is adjustable with a front-panel control. This filter determines the ability of the analyzer to resolve signals. Resolution of a signal means, simply, the ability to distinguish it from its nearest neighbors. The narrower the filter, the better will be the resolution. Typical bandwidths range from 300 kHz down to 10 Hz for rf analyzers.

The filtered signal is applied to an

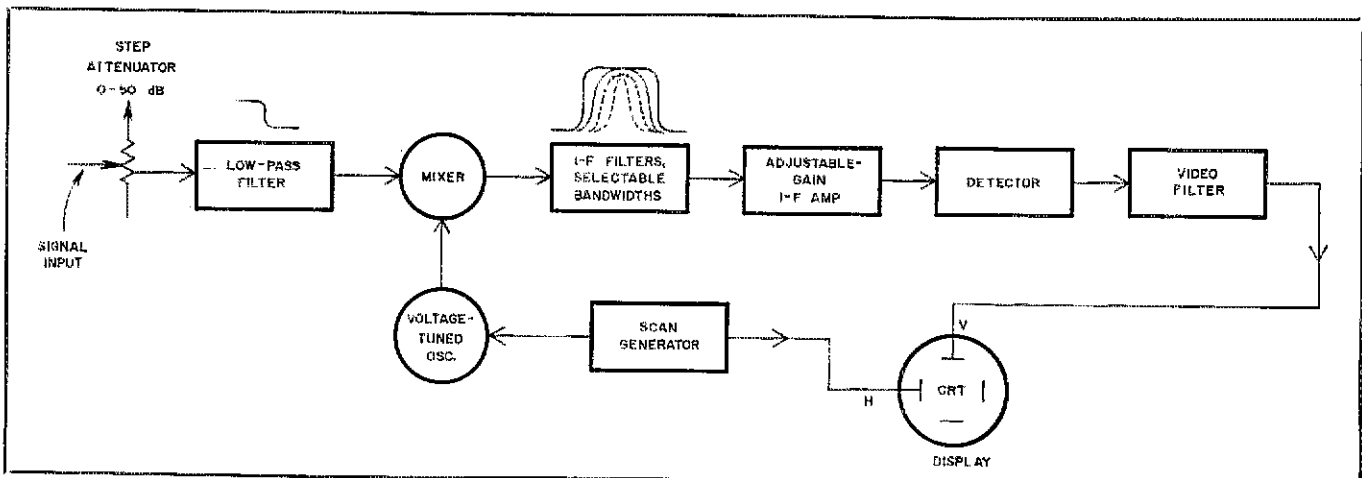
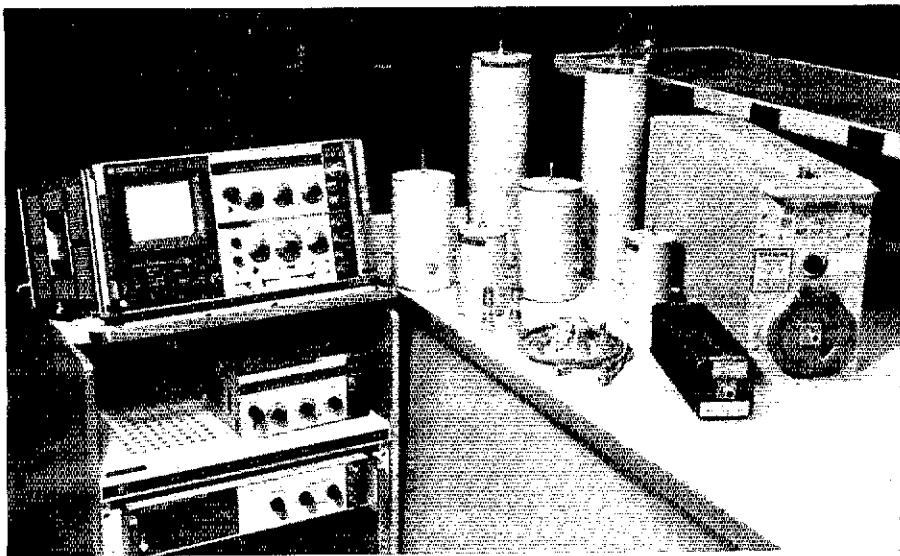


Fig. 3 — A more detailed block diagram of a spectrum analyzer. See text for a discussion of the operation.



Here is a photograph of the equipment used for spectral analysis. The "finned" objects at the right are power attenuators and the cylindrical items to the left are the cavities used for notching the fundamental signal when testing vhf and uhf equipment.

adjustable-gain i-f amplifier. The input attenuator and i-f amplifier gain control perform exactly the same function on the spectrum analyzer as they would on a communications receiver. Rf attenuation is added to protect the receiver from overload and the i-f control is adjusted to make up for signal loss in the rf attenuator. Output from the i-f amplifier is detected and applied to the vertical plates of the CRT. The stronger the input signal, the greater the deflection will be. A video filter is shown in the drawing between the detector and the CRT. This video filter is a post-detection, low-pass filter which averages the internal noise of the analyzer.

The addition of this filter is particularly useful when trying to view signals near the level of the internally generated analyzer noise.

Spectrum analyzers are calibrated in both frequency and amplitude for relative and absolute measurements. Frequency calibration is set by the tuning and scale-factor controls. On most analyzers there are three different modes in which the scale can be scanned — full, per division, and zero scan. Full scan is normally used to locate signals because the widest frequency range is displayed in this mode. The per-division mode is used to "zoom in on" a particular signal or portion of the

spectrum. For this mode, the frequency range displayed on the screen is controlled by the scan-width control, which is calibrated in Hz, kHz or MHz per division. Each horizontal division on the screen, for example, might correspond to 10 MHz, 1 MHz, 10 kHz, or whatever. The frequency displayed at the center of the screen is adjusted by the tuning control — analogous to the VFO control of a communications receiver. In the zero-scan mode, the analyzer acts as a fixed-tuned receiver with selectable bandwidths for recovering modulating signals or real-time monitoring of a single signal.

The vertical axis of the display is calibrated for amplitude in either a decibel/division (power) or volt/division (voltage) manner. Common calibrations for the amplitude axis are 10 dB and 2 dB per division. When the analyzer is used to measure voltage, the calibration would be 100 mV, 1 mV, 2  $\mu$ V per division, or whatever the i-f gain control (sensitivity) is set for.

### Transmitter Measurements Using the Spectrum Analyzer

There are many practical uses for the spectrum analyzer. However, there is at least one use for which it is ideally suited — that of checking the output from a transmitter or amplifier for spectral purity (or lack thereof!). This is the area of spectrum analysis that we will concentrate on in the remainder of this article.

All amateur transmitters, transceivers and power amplifiers are subject to FCC rules and regulations regarding spectral purity. Part 97.73 of the rules and "regs" deals with these requirements and reads as follows:

"97.73 Purity of Emissions.

"(a) Except for a transmitter or transceiver built before April 15, 1977 or first marketed before January 1, 1978, the mean power of any spurious emission or radiation from an amateur transmitter, transceiver, or external radio frequency power amplifier being operated with a carrier frequency below 30 MHz shall be at least 40 decibels below the mean power of the fundamental without exceeding the power of 50 milliwatts. For equipment of mean power less than five watts, the attenuation shall be at least 30 decibels.

"(b) Except for a transmitter or transceiver built before April 15, 1977 or first marketed before January 1, 1978, the mean power of any spurious emission or radiation from an amateur transmitter, transceiver, or external radio frequency power amplifier being operated with a carrier frequency above 30 MHz but below 235 MHz shall be at least 60 decibels below the mean power of the fundamental. For a transmitter having a mean power of 25 watts or less, the mean power of any spurious radiation supplied to the antenna transmission line shall be at least 40 decibels below the mean power of the fundamental without exceeding the power of 25 microwatts, but need not be reduced below the power of 10 microwatts.

"(c) Paragraphs (a) and (b) of this section notwithstanding, all spurious emissions or radiation from an amateur transmitter, transceiver, or external radio frequency power amplifier shall be reduced or eliminated in accordance with good engineering practice.

"(d) If any spurious radiation, including chassis or power line radiation, causes harmful interference to the reception of another radio station, the licensee may be required to take steps to eliminate the interference in accordance with good engineering practice.

"Note: For the purposes of this section, a spurious emission or radiation means any emission or radiation

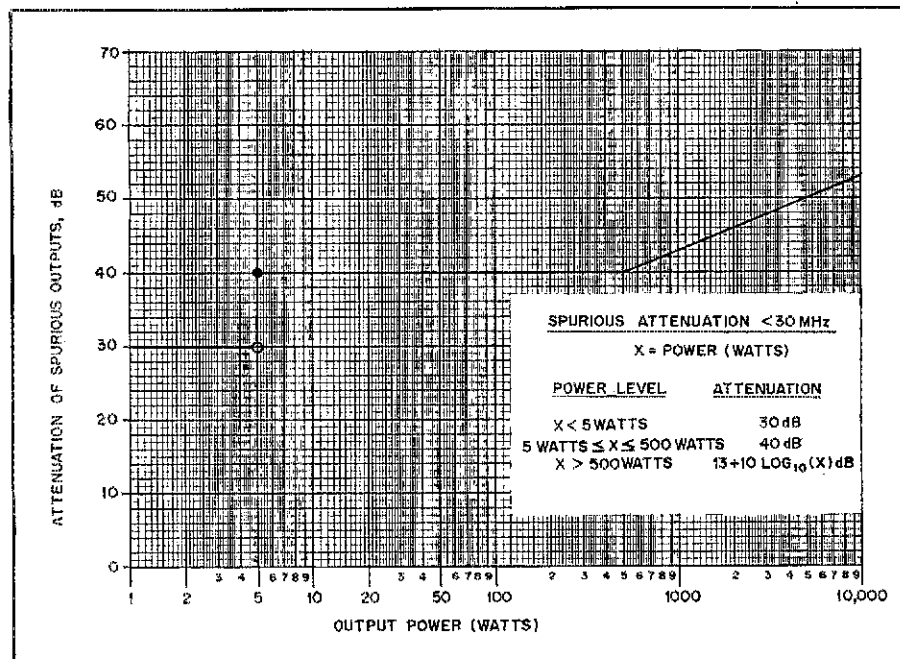


Fig. 4 — The FCC specifies that spurious signals generated by transmitting equipment must be reduced well below the level of the fundamental. This graph illustrates exactly how far the spurious components must be reduced. This applies to amateur transmitters operating below 30 MHz.

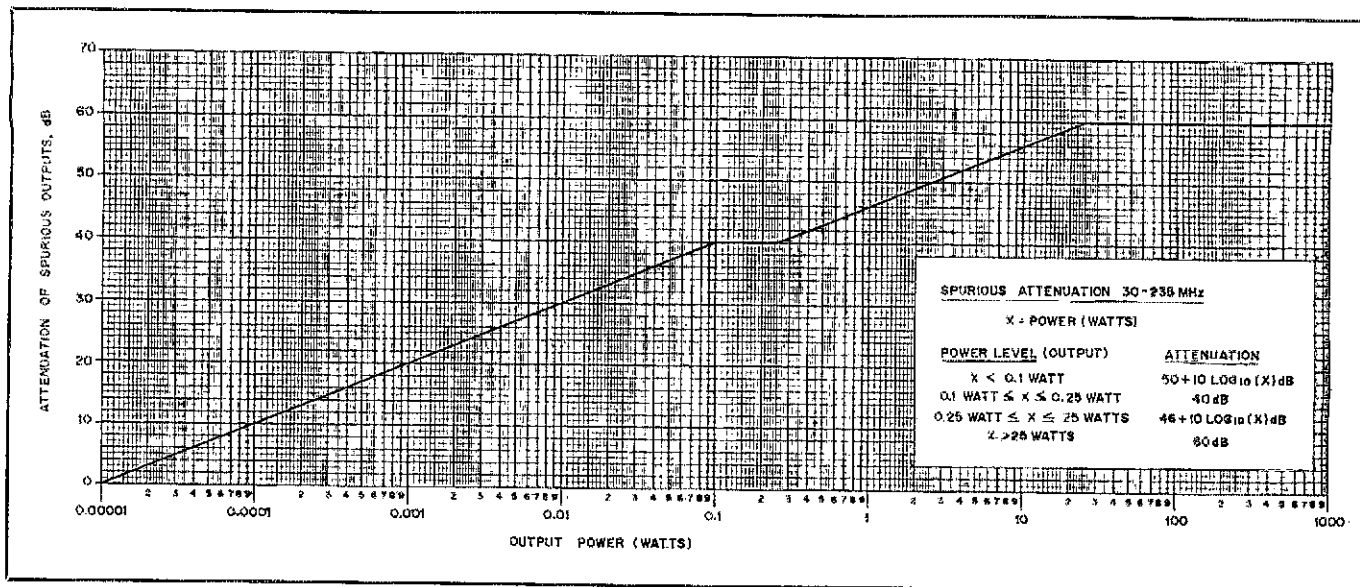


Fig. 5 — This graph illustrates to what level spurious-output energy must be reduced for equipment designed to operate in the 30- to 235-MHz range.

from a transmitter, transceiver, or external radio frequency power amplifier which is outside of the authorized Amateur Radio Service frequency band being used."

Paragraph "a" relates to equipment that operates in the frequency range below 30 MHz. For equipment running less than 5 watts of power, the spurious output must be reduced to a level of at least 30 dB below the mean power of the fundamental. At the 5-watt power level or above, the spurious output must be reduced to a level of at least 40 dB below the mean power of the fundamental, but not to exceed 50 milliwatts. This "not to exceed 50 milliwatt" stipulation modifies the amount of attenuation required above the power level of 500 watts. This is illustrated graphically and mathematically in Fig. 4. As an example, let's assume we're operating a 2000-watt-PEP-input amplifier which is producing 1200 watts PEP output. Under these conditions, the spurious output from the amplifier must be reduced to a level at least 43.8 dB below the mean power of the fundamental.

Paragraph "b" deals with equipment for use in the 30- to 235-MHz range. The requirements here are a bit more difficult to figure. After a lot of head scratching and a worn-out index finger (from pressing calculator keys) a graphical and mathematical solution was devised and is shown in Fig. 5. This information will allow easy computation of the required spurious attenuation at any power level in this frequency range. As another example, let's assume we're operating a 2-meter fm rig that puts out 10 watts of power. According to the information in Fig. 5 the spurious output from the rig must be reduced to a level at least 56 dB below the mean power of the fundamental.

Equipment designed for operation above 235 MHz is exempt from the foregoing requirements; however, it is bound by good engineering practice. Ex-

actly what is good engineering practice? Ask a dozen engineers and you'll probably get a dozen different answers! One outcome of WARC 1979 will probably be that of rules and regulations regarding spectral purity of transmitting equipment operating through 960 MHz. The International Radio Consultative Committee (CCIR) has prepared a proposal which includes the information below for the 235- to 960-MHz range:

"For a transmitter, transceiver or radio frequency amplifier being operated in the range of 235-960 MHz the mean power of any spurious emission shall be at least 60 decibels below the mean power of the fundamental without exceeding the power of 20 milliwatts. For equipment of mean power of 25 watts or less, the mean power of any spurious emission shall be at least 40 decibels below the mean power of the fundamental without exceeding the power of 25 microwatts."

People closely involved with WARC

preparation feel that it is extremely likely that these or similar rules will go into effect.

#### Test Setup for HF Measurements

Shown in Fig. 6 are two test setups that are generally used to examine the output of a transmitter or amplifier on a spectrum analyzer. Since the spectrum analyzer is basically a small-signal receiver, a large portion of the transmitter or amplifier power must be dissipated and only a small amount fed to the analyzer.

The system shown at A uses a line sampler to "pick off" a small amount of transmitted power for viewing on the analyzer. The bulk of the transmitter or amplifier power is dissipated in the dummy load. This system is best suited for relatively narrow band measurements

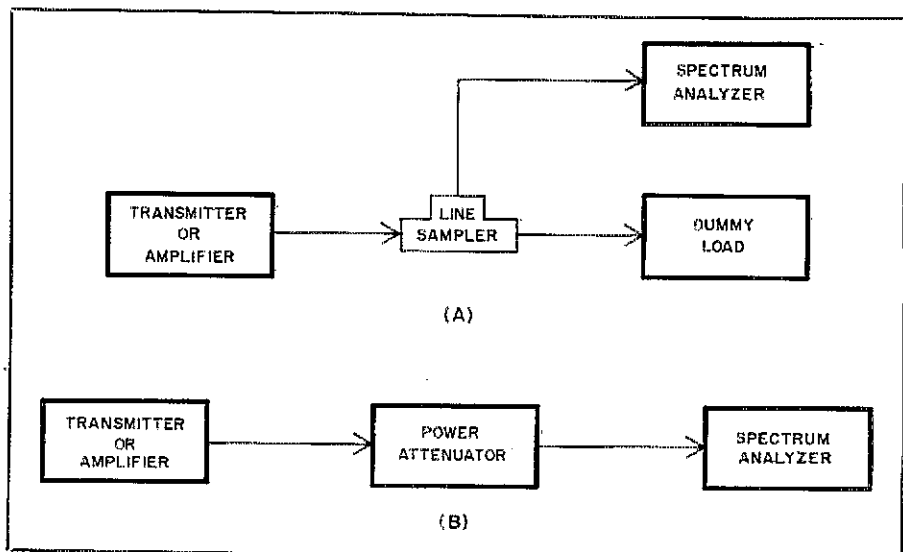


Fig. 6 — Here are two setups that are commonly used to observe the output of a transmitter or amplifier on a spectrum analyzer. The system at A uses a line sampler to "pick off" a small amount of the transmitter or amplifier power. At B, the majority of the transmitter power is dissipated in the power attenuator. See text for a comparison of the two systems.

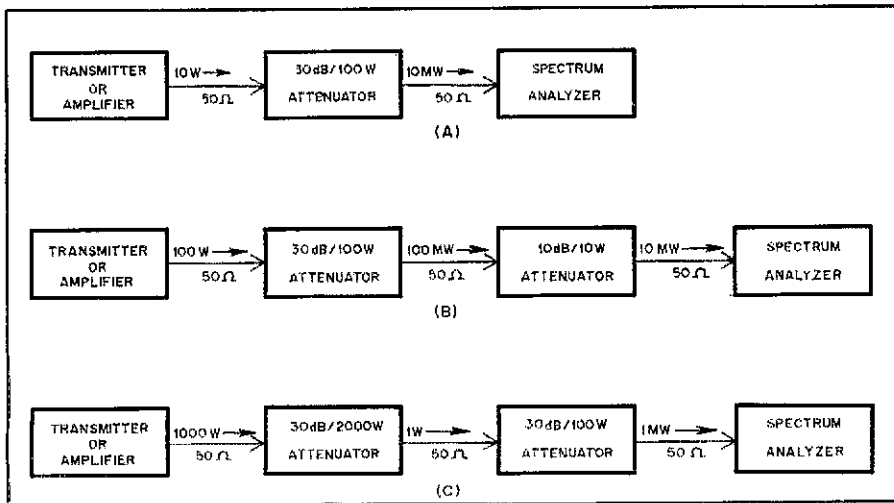


Fig. 7 — ARRL laboratory test setup for several different power level transmitters or amplifiers.

since most line-sampling devices do not exhibit a constant-amplitude output over a broad frequency range. A typical line sampler may offer 50 dB of isolation between the main line and the sample output at 30 MHz, but only 40 dB of isolation at 210 MHz. Since the coupling is not constant across a broad-frequency spectrum, it is difficult to measure the exact level of a spurious output from a transmitter or amplifier. Consider a 30-MHz fundamental signal with a seventh harmonic (210 MHz) that is known to be 40 dB below the fundamental. When this transmitter is tested on the setup just described, the seventh harmonic would register only 30 dB below the fundamental — 10 dB worse than it really is!

A better and more accurate (at least for wide-band measurements) approach is shown in Fig. 6B. The output from the transmitter or amplifier is fed through a broadband power attenuator to the spectrum analyzer. One or more power attenuators connected in series may be required to reduce the output from the transmitter or amplifier to a level suitable for the analyzer. Many power attenuators offer constant attenuation across a very wide spectrum — dc to 2 GHz for example. Variance from the rated attenuation is specified at considerably less than 1 dB, which means very accurate measurements can be made of the level of spurious output.

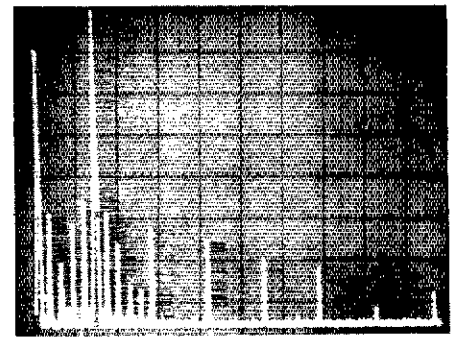
Power attenuators differ from dummy loads in that they have two ports instead of one — an input and an output. Rather than all the power that is supplied to the attenuator being dissipated (as is the case of the dummy load), a specific ratio exists as to the amount of power passed from the input to the output terminal. This may be 10, 20, 30 dB, or virtually any specific value. Attenuators are designed to be used in a certain impedance system. For rf work, these are usually 50 or 75 ohms. The resistance as seen at the input to the

attenuator should equal the characteristic impedance of the system when terminated in that resistance.

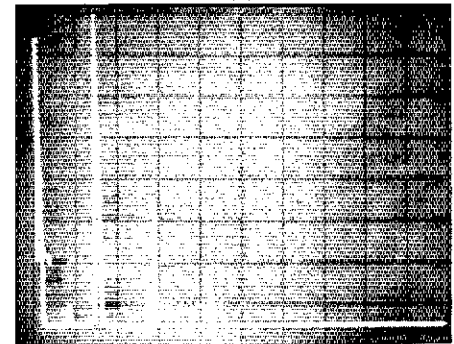
The test setup used in the ARRL laboratory for measuring an hf transmitter or amplifier is shown in Fig. 7. As can be seen, different power levels dictate different amounts of attenuation between the transmitter or amplifier and the spectrum analyzer.

#### Understanding the Photos

Displayed at Fig. 8A is the output from a transmitter operating "key down" on the low end of 40 meters. The horizontal scale is set for 5 MHz per division and the vertical scale is 10 dB per division. The "pip" at the far left-hand edge of the display is generated within the spectrum analyzer, being the i-f feedthrough mentioned earlier. This signal corresponds to "zero" frequency and is used to mark this spot on the analyzer display. Moving to the right at 5 MHz per each division, the next tall "pip" may be seen at roughly 7 MHz. This signal is the fundamental frequency. The rf and i-f gain controls of the analyzer are adjusted so that this signal touches the top (reference) line of the



(A)



(B)

Fig. 8 — Spectrum-analyzer photographs of two different pieces of equipment operating on the 40-meter band. Each horizontal division represents 5 MHz and each vertical division is 10 dB. The photograph at A represents a "clean" transmitted signal and that at B is not. Both transmitters are legal, though, according to the FCC rules and regulations.

display. Since the vertical scale is adjusted for 10 dB per division, all other signals (spurious outputs from the transmitter) can be accurately referenced to the mean power of the fundamental. Moving further to the right, the next signal can be seen at roughly 14 MHz — the second harmonic of the fundamental. The level of this signal is 46 dB below the fundamental. Moving even further to the right, another signal can be seen — the third harmonic of the fundamental. This signal is down 67 dB from the level of the fundamental. Backtracking to the left, another signal is visible at about 4 MHz. This is most likely a spurious mixing product or oscillator leakage through to the

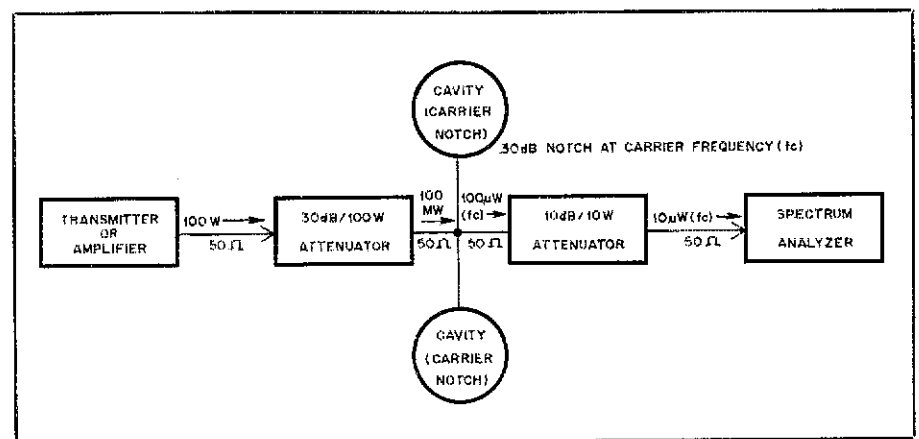
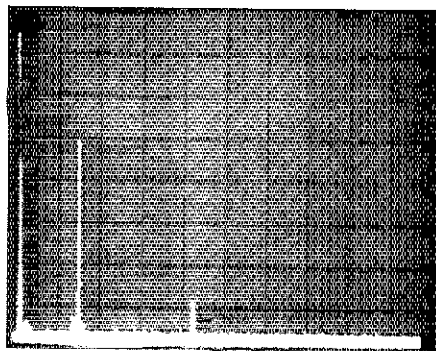
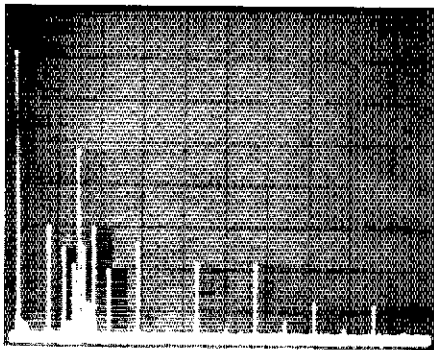


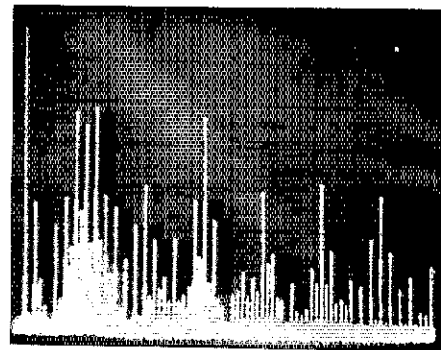
Fig. 9 — The test setup used in the ARRL laboratory to check vhf and uhf transmitting equipment.



(A)



(B)



(C)

Fig. 10 — Spectrum analyzer photographs of three different 2-meter rigs. Each horizontal division represents 100 MHz and each vertical division is 10 dB. These shots show the output of the transmitter notched to a level of approximately 30 dB below the top line to avoid analyzer overload. The shot at A is that of an extremely clean transmitted signal, with only the third harmonic visible at roughly 68 dB below the mean power of the fundamental. At B, a not-so-clean transmitter which does not meet today's FCC specifications regarding spectral purity. C — no comment! [The rigs producing the outputs shown at B and C were withdrawn from the market shortly after the current FCC rule went into effect. — Ed.]

final amplifier. The level of this signal is quite low, some 70 dB below that of the fundamental. This photograph is typical of the output of a well-designed multi-hand rig.

The photograph shown at Fig. 8B is that of a not-so-well-designed rig. The horizontal and vertical calibration for this photograph is identical to that shown at A. In addition to the higher order harmonics, a number of mixing products are seen above and below the fundamental. Generally speaking, the chances of causing interference to other services is greater with the transmitter output shown at B than that depicted at A.

#### Test Setup for VHF Measurements

The general setup for testing equipment that operates above 30 MHz is shown in Fig. 9. Since a different analyzer rf section, one having a lower dynamic range, is required to examine this part of the spectrum, a method of preventing analyzer overload is needed. The two notch cavities provide this protection. These are *tunable* notch cavities, tuned to attenuate *only* the fundamental signal (by roughly 30 dB — the exact amount isn't critical). Notching of only the fundamental signal has the effect of increasing the system dynamic range because the fundamental signal is reduced to a level that should prevent overload. Using this system without the notch cavities can yield gross errors in measurement of the levels of spurious output.

Attenuators are used between the transmitter or amplifier and the analyzer, as with the hf setup. At least one attenuator is located on each side of the tunable cavities to mask the effects of any impedance mismatch between the cavities and the spectrum-analyzer line. The amount of attenuation used depends on the power output of the transmitter or amplifier under test. The test setup shown is the one used in the ARRL laboratory

for transmitters or amplifiers up to the 100-watt level.

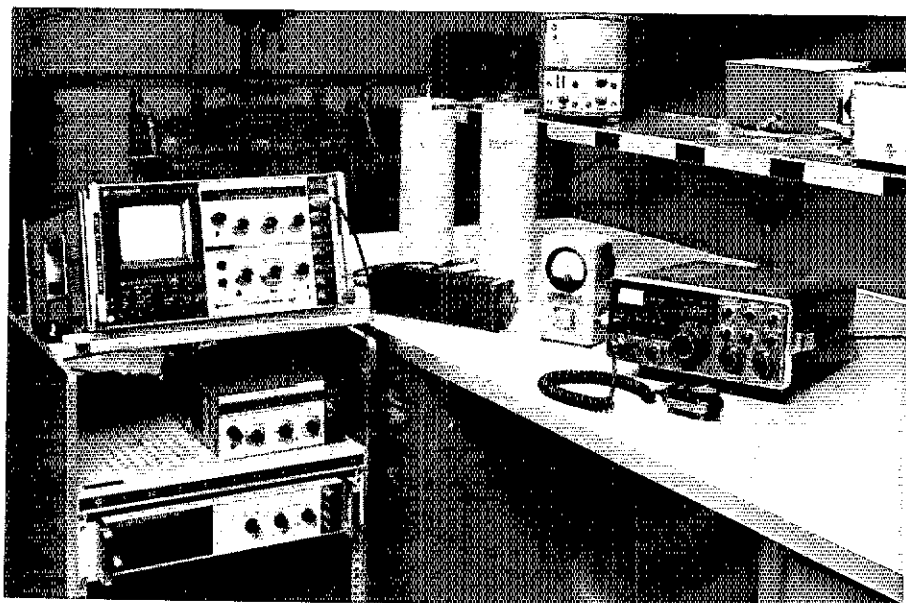
#### Examining the Photos

Displayed at Fig. 10A is the output from a 2-meter multimode transceiver. The horizontal scale is set for 100 MHz per division and the vertical scale is 10 dB per division. As with the other photographs, the "pip" at the far left is the i-f feedthrough within the analyzer and represents "0" frequency. The next tall "pip" to the right is the fundamental signal which has been notched 30 dB with respect to all other signals shown on the display. The system is initially adjusted without the notch cavities in the line so that the fundamental signal just touches the top line of the display. Then the cavities are inserted in the line and tuned to the fundamental. As shown, the fundamental then drops to a value 30 dB

below the top line. All other signals on the display are now referenced to the top line (not the -30-dB line). Note again, *only the fundamental* has been notched.

Moving to the right on the display, a signal can be seen at roughly 430 MHz. This is the third harmonic of the fundamental and is 68 dB below the mean power of the fundamental. Remember, all signals are still referenced to the top line of the graph. This display represents one of the cleaner transmitters that we have tested with all spurious output energy, other than the third harmonic, below the level of the "grass" (analyzer noise floor), which is 76 dB below the mean power of the fundamental. (The in-band signals, near the fundamental, are not considered as spurious by FCC definition.)

The photograph at Fig. 10B shows the output of an older 2-meter fm transceiver. The horizontal and vertical calibration for



This is a shot of the test setup used to inspect 2-meter transmitting equipment. A detailed explanation of this test is given in the text.

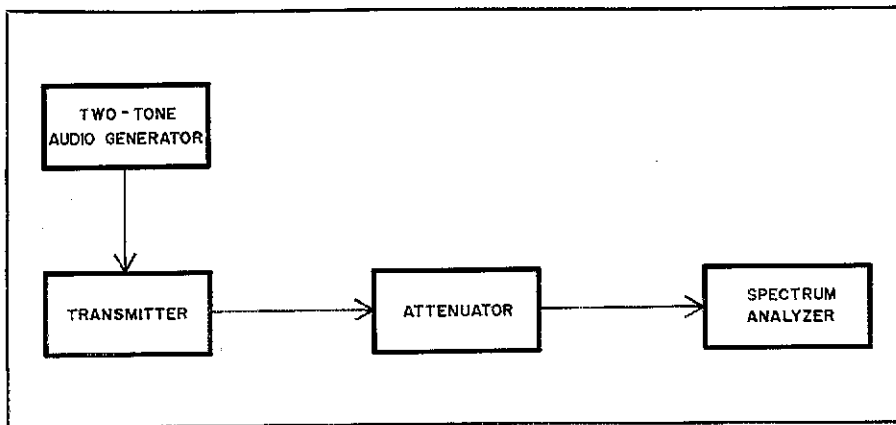


Fig. 11 — This is the test setup used in the ARRL laboratory for measuring the IMD performance of transmitters and amplifiers.

this photograph is identical to that of Fig. 10A. This transceiver puts out approximately 20 watts. Current regulations require the spurious output to be at least 59 dB below the mean power of the fundamental. As shown in the photograph, it is not. The worst-case spurious level is only 50 dB below the fundamental. If introduced to the market today, this rig would not comply with FCC rules and regulations.

Just how bad can a piece of equipment be? Pretty bad, as Fig. 10C shows. The fundamental of another older transmitter (144 MHz) has been notched and is located between the two tallest pips at the left. Here the worst-case spurious level is only 22 dB below the mean power of the fundamental. Illegal? You bet — at least by current FCC regulations!

### Transmitter IMD Measurements

Another area of concern in the realm of transmitter spectral purity has to do with the intermodulation distortion (IMD) levels associated with ssb transmitters and amplifiers. IMD occurs within an amplifier stage when it is supplied with more than one input tone (frequency). These tones combine in such a manner as to produce additional amplifier output signals which were not present at the input. In the strictest sense, these are spurious (undesired) signals. Since human speech is made up of a conglomeration of different frequencies, a high-level rf amplifier stage amplifying an ssb signal will produce a certain amount of IMD. Measurement of the IMD produced in a transmitter or amplifier gives an idea of how linear or "clean" the transmitter or amplifier signal will be. The cleaner your signal, the less "splatter" you're going to sling across the band!

A detailed discussion of IMD can be found in the 1979 edition of *The Radio Amateur's Handbook*. One convenient method of measuring IMD from a transmitter or amplifier is to inject two equal-

amplitude tones (at different frequencies) into the microphone jack of the test transmitter and view the output signal on a spectrum analyzer. This is called a two-tone IMD test. The general test setup is shown in Fig. 11. Two equal-amplitude but not harmonically related tones are fed into the transmitter (in the ARRL laboratory we use 700 and 1900 Hz). The output of the transmitter is fed through one or more power attenuators and from there into the spectrum analyzer.

The photograph shown in Fig. 12 is typical of the two-tone test results obtained from an ssb transmitter or amplifier. Each horizontal division represents 1 kHz and each vertical division represents 10 dB. This photograph is of the output of a 200-watt PEP transmitter operating on the 40-meter band. The spectrum-analyzer display is initially adjusted so that a single tone fed into the microphone jack drives the transmitter or amplifier to its rated PEP output (or input). The single tone is replaced with the two equal-amplitude tones; the output of the two-tone generator and the microphone-level control on the transmitter are adjusted for "best" IMD performance while maintaining each tone at a level 6 dB below the top line (PEP output). Responses other than the two individual tones near the center are distortion products; third-order products are down 30 dB, fifth-order products are down 37 dB and seventh-order products are down 44 dB from the PEP output. This represents acceptable, but not ideal, performance. Many of the newer pieces of equipment on the market have third-order products down 40 dB, fifth-order products down 50 dB and seventh down 58 dB!

The individual tones of the two-tone signal are down by 6 dB from the PEP output. This is so because the tones are displayed as two discrete frequencies. At the instant when the voltages of the individual tones are in phase, they add to

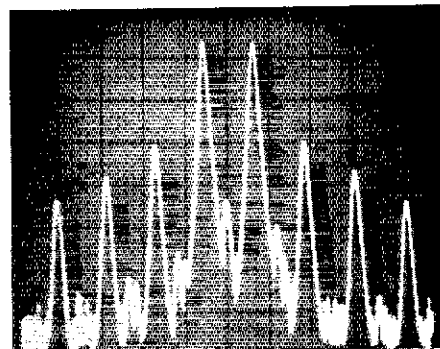


Fig. 12 — Here is a spectrum analyzer photograph showing the result of a two-tone test of an ssb transmitter. Each horizontal division is equal to 1 kHz and each vertical division is 10 dB. The third-order products can be seen at 30 dB below the PEP (top line), the fifth-order products down 37 dB and seventh-order products down 44 dB. This represents acceptable, but not ideal, performance. See text for a detailed discussion of the tone levels involved.

produce a peak in the envelope-waveform pattern which is twice the voltage amplitude of a single tone alone. The power at the peaks of the envelope (PEP) is therefore four times that of a single tone — a 4:1 power ratio being equivalent to 6 dB. (The power ratio is four because doubling the applied voltage will double the current, assuming the load resistance is constant.)

### So, What Does It All Mean?

Spectrum analysis plays a very important part in the analysis of a piece of transmitting equipment. Without a spectrum analyzer to check the output from a transmitter, one could be operating an illegal transmitter or amplifier and not even know it. One of the functions of the ARRL Technical Department is to perform this spectrum analysis on pieces of transmitting equipment that companies wish to advertise in *QST*, not to mention the check out of transmitter projects carried in *QST* or *The Radio Amateur's Handbook*. This is a job that we don't take lightly. We will (and have on many occasions) refuse to accept advertising on pieces of equipment that do not meet FCC specifications and/or manufacturer's specifications. In many cases we work with the manufacturer to help him clean up his product so that it meets FCC specifications. Then, and only then, can he advertise in *QST*.

Likewise, if you're building a transmitter or amplifier project from plans in *QST* or the *Handbook*, you can be sure that the equipment has been tested on the spectrum analyzer. We feel that this is important. TVI and interference to other radio services caused by poorly designed Amateur Radio equipment could certainly tarnish our image. This is something that you and I certainly don't want to let happen!

# Anatomy of a Product Review

What's involved in producing the popular "Product Review" column each month? Here's the inside story!

By Jim Bartlett,\* K1TX

Editorial treatment of commercially available amateur gear has been a regular feature of *QST* since the 1950s. The "Recent Equipment" column began on a regular basis in mid-1954, and the "New Apparatus" column was added in mid-1957. These were both replaced with a single, more comprehensive column with the change to the new format in 1976. This column is the one still being published today, the popular "Product Review" column. Letters from many ARRL members indicate that perhaps a full explanation of how a product write-up gets into the column, and how it is prepared, might be of interest. Here are some typical questions from members, with answers.

*Q. How does a product get into the "Product Review" column?*

A. As new products are introduced by Amateur Radio manufacturers, the Product Review editor arranges for the evaluation of those that appear to be of the most interest to members. He contacts the manufacturers and informs them of ARRL interest in publishing a technical review of their products. Usually, equipment manufacturers are very interested in the chance to have their equipment highlighted in the journal, and shipment of the review samples (from production, not prototypes) follows shortly. (Review equipment is loaned by the manufacturer or distributor, and is not purchased for the express purpose of writing a review.) When review items arrive at Hq., they are assigned to a staff member with the necessary technical expertise to do the performance analysis and lab tests, and complete the write-up.

*Q. What happens next? How are the tests performed?*

A. Laboratory tests are scheduled next. These vary from item to item, but may include such things as receiver performance tests (noise floor, signal-to-noise ratio, blocking dynamic range, and IMD dynamic range); audio selectivity tests; power output of transmitters and amplifiers; regulation, current capability, duty cycle of power supplies; SWR bandwidth of antennas; port isolation and insertion loss for power dividers, couplers, coaxial switches, etc.; noise figure of vhf/uhf receivers; oscillator drift/frequency stability of receivers; and pass-band of low- and high-pass filters.

One particularly important set of tests conducted on transmitters and amplifiers is that performed with the spectrum analyzer. Transmitter spectral purity and two-tone IMD are measured, and photographs are taken of the spectrum analyzer display. These photographs, as the saying goes, are each worth a thousand words. That's why they are published in reviews of all transmitters and amplifiers that fall under FCC jurisdiction with regard to spectral purity. (For a description of how these spectrum analysis tests are performed, see the preceding article.)

*Q. But what about performance under real operating conditions?*

A. In addition to all of the laboratory tests that are performed on a given review item, the equipment is evaluated for actual performance in the reviewer's home station (without compensation) for a one- to two-month period before the write-up is prepared.

*Q. Do review samples that you receive ever "poop out" on you? If so, what do you do then?*

A. Once in a while, problems occur with the equipment during the review. When this happens, the Product Review editor and reviewer get in touch with the manufacturer or supplier of the review item, and explain the problem. Sometimes the review unit is sent back, and other times the manufacturer is able to help clear up the difficulty over the phone. Whatever the outcome of such problems, the result is summarized in the review. If a transmitter is returned to the factory for modifications during the review period, and these modifications clear up a spurious output problem or other anomaly, the manufacturer may be asked to provide the serial or model number of the first unit or series of the item that will contain all of the required modifications. All of this information is included in the Product Review report, when applicable.

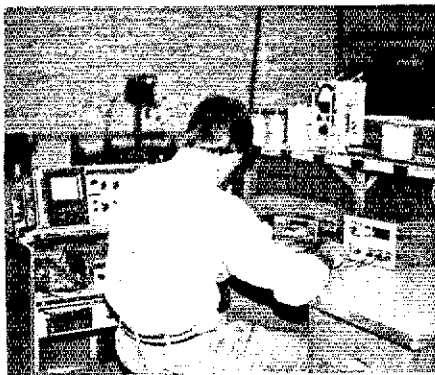
*Q. It seems like QST reviews take quite a while to complete. What else is involved in getting the review finished and into QST?*

A. When all testing is completed and the review item has survived a thorough "in-use" performance test at the reviewer's station, then the review report is written up by the reviewer. While this is being done, professional photographs are taken, if desired, and any other necessary graphic material is prepared, such as SWR curves, or schematic and block diagrams.

When the manuscript is completed and edited, it is then prepared for the printer. Under normal conditions, readying manuscript material for the printer takes about three months. When added to the three months necessary for evaluation and write-up of an item, this makes for a considerable delay between the time an item arrives and the time its review appears in *QST*. Actually, it would be terrific if all products could be turned around in this

\*Product Review Editor, *QST*





This photograph shows a 2-meter rig being tested on the spectrum analyzer.

amount of time. At present, our average, or mean, "turn around" time is about eight months. Contributing to this longer average are the necessary returns of faulty equipment, staff turnover, three-month *QST* lead time, and uncooperative New England weather, just to name a few things.

*Q. Several months after I saw some ads on a new hf rig, I wrote to Hq. to find out if QST was going to review it. I was informed that the review unit had not arrived yet. Why don't you guys get your samples earlier so the reviews can be published sooner?*

A. What really seems to bother some ARRL members (and rightly so) is that advertisements for some products appear in all the leading ham magazines up to a year or more before a review appears in *QST*. How does this happen? Well, in many cases there is a reluctance on the part of manufacturers or suppliers to send samples of new products to *QST* for review. A variety of reasons are given. Some say that they can't spare a unit because they are all promised to dealers. Others say that they don't want a review so early because they haven't yet built up a reserve stock — the review might create a flood of orders they can't handle. Some manufacturers say frankly that they want a little more time to "work out the bugs" before subjecting their equipment to "scrutiny under the magnifying glass." If the manufacturer does not advertise in *QST*, there is little we can do in such a situation. (Yes, we do review products made by firms who don't advertise in the journal.) But *QST* does reserve the right to call in any product carried in its ads for examination. We wouldn't do a Product Review against the manufacturer's wishes, but we would require him to correct any deficiencies or we would discontinue his *QST* ads on that product. Adding to this type of delay is the fact that some companies start advertising their products when just a few production units are actually available. This marketing strategy causes an even longer time lag between product



Output-power levels are checked with two calibrated wattmeters, while the rig is powered at the manufacturer's stated operating voltage. Power consumption is also recorded.

"introduction" and review publication.

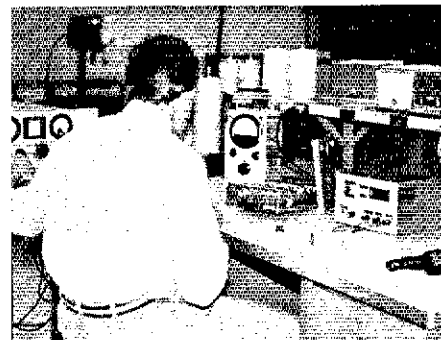
*Q. What do you do with all the equipment when you're finished with the testing and the review has been published?*

A. After the product is reviewed and the report is published in the journal, the item is returned to the Product Review editor for disposition. Most items are simply shipped back to the suppliers, although sometimes, if the manufacturer is interested in selling, items are purchased by the reviewer or other members of the Hq. staff. Except for kits requiring construction and write-up at home by the reviewer (on personal time), individual reviewers or any other member of the Hq. staff are not allowed to keep review items unless purchased. Some items are donated to the ARRL lab or to WIAW by the manufacturer after the review has been published.

*Q. Can I write to Hq. about the "Product Review" column? Can I find out when a review of a specific rig is scheduled to appear?*

A. We at Hq. welcome suggestions from members on possible Product Review items for future issues, although when a member writes suggesting that we review a new rig, many times that rig has been requested or may have been here several months with the write-up already nearing completion. It is at these times that members often press for early information, or a "summary" of the review. We treat prepublished information as "proprietary," and do not divulge information pertaining to the performance of a Product Review item until a review has appeared in *QST*.

Even the manufacturer doesn't obtain a preview of what will be contained in a review until he receives a "tear sheet" of the Product Review section a few days before *QST* starts arriving in members' mailboxes. It is not until this time that manufacturers are informed of the specific month in which the review will appear. This policy is necessary because sometimes an item that is scheduled for a given month gets "bumped" into a subse-




Here a vhf signal generator is connected to the transceiver antenna input and an audio ac voltmeter to the speaker output. This test provides an indication of receiver sensitivity.

quent issue because of space limitations. The exact content of the column each month isn't firm until late in the production process — shortly before the journal is sent to the printer.

*Q. Why don't you publish the product reviews in the same format used by Consumer Reports, with comparison charts so we can compare and contrast various pieces of gear?*

A. That's a good question, and one that has been posed by a number of ARRL members. These members suggest, for example, that *QST* run tests on all hf transceivers one month, then review all hf antennas the next, and so on. This idea has been discussed by the board of directors several times, and the decision each time was not to implement such a program. Why? Because, although the concept has merit, it would be impractical if not impossible to implement. First of all, such a review format would prevent *QST* from reviewing new equipment as it is now possible, because of the fact that different manufacturers introduce new rigs at different times — not simultaneously. Second, the *Consumer Reports* format would be out of place in *QST*, a journal that carries advertising (*Consumer Reports* does not). Last but not least, this type of review preparation would require a much greater number of worker hours to complete each month — more than is possible with the current Technical Department staff size; reviewers already devote their personal time to a portion of every review. A suitable size staff would cost League members considerable money, which many would be unwilling to sanction. Apart from the foregoing, we try to rule out subjectivity in our product reviews. A *Consumer Reports* format would, necessarily, contain some subjectivity.

We hope that this information has helped you, a member, to more fully understand what goes on behind the scenes in preparation of the "Product Review" column for *QST* each month. We at Hq. are constantly striving to improve the quality of the analyses provided in your "Product Review" column! 

# Propagation — Past and Prospects

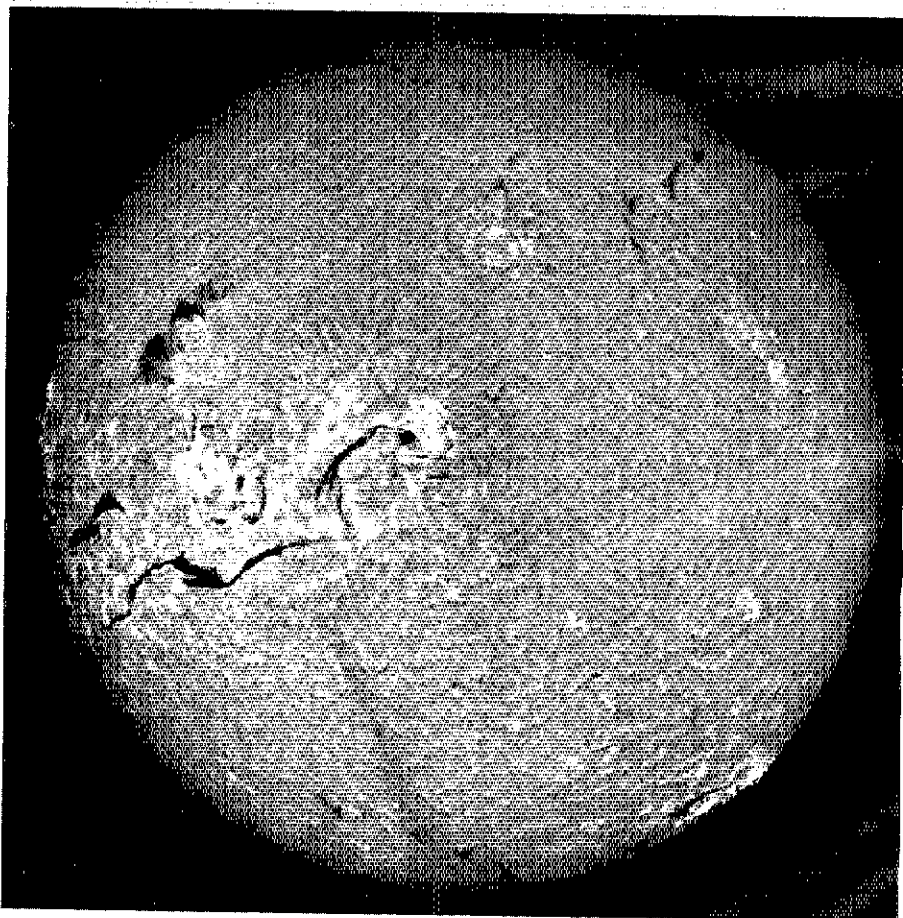
Solar Cycle 21 reached age three — an exciting age for sunspot cycles — in July. Already surpassing the immediate predecessor, it moves into what could be the best fall season since 1960.

By Edward P. Tilton,\* W1HDQ

In discussing the sun we try to keep things simple despite the obvious fact that the sun and its ways are far from simple or even consistent. The long-term record of solar activity is kept in "smoothed" sunspot numbers. In graph form, this makes a series of graceful but slightly asymmetrical ups and downs, none exactly like the predecessor. Such a graph is useful for statistical purposes, but it reveals almost nothing of what the sun was really up to in the period under consideration.

Even daily unsmoothed sunspot numbers (not readily available anyway) are none too good for radio propagation study. Sunspots are visible evidence of something happening on the sun that affects radio propagation. They do not tell us all we need to know. To confound the problem, our view of the sun through the diffusing medium of the earth's atmosphere is less than ideal. Thus, it is not surprising that we have tended to think of the whole low period between sunspot activity peaks as "bad" and the peak years as "good."

Thanks to new and better ways to observe the sun, and to more consistent amateur activity on the higher bands during the middle-70s solar minimum, we now recognize that "bad/good" is a gross oversimplification and that propagation watching can be a fascinating game anytime. What makes this so is more apparent if we chart solar activity since 1975 in a form that shows something of the incredible ups and downs the sun goes



Much more than sunspots can be seen when the sun is viewed through selective optical filters. This photo was taken through a hydrogen-alpha filter that passes a narrow light segment at 6562 angstroms. The bright patches are active areas around and often between sunspots. Dark irregular lines are filaments of activity having no central core. Faint magnetic field lines are visible around a large sunspot group near the disk center. (photo courtesy of Sacramento Peak Observatory, Sunspot, NM)

\*Contributing Editor, QST

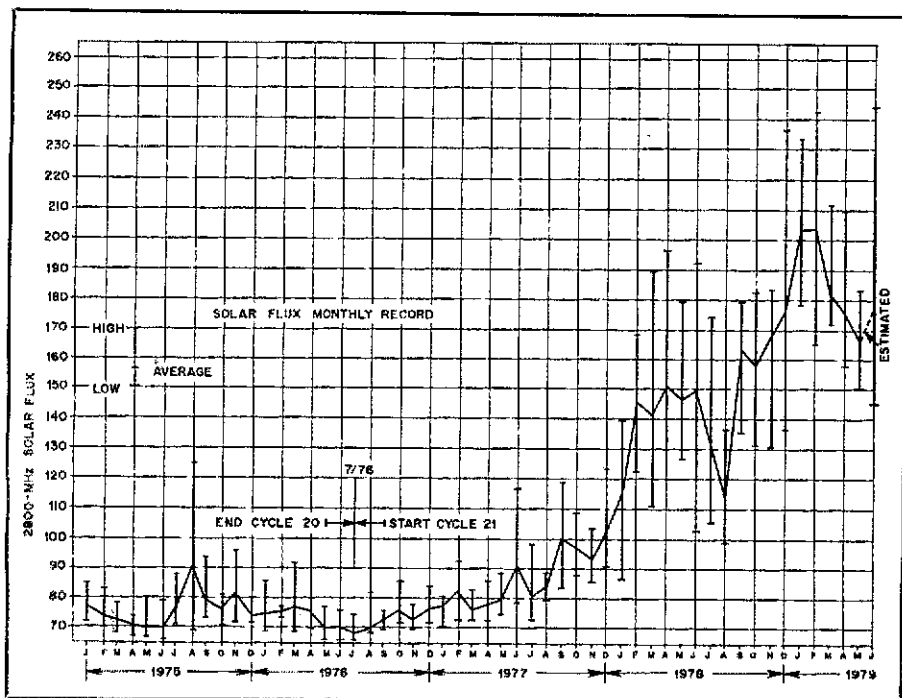
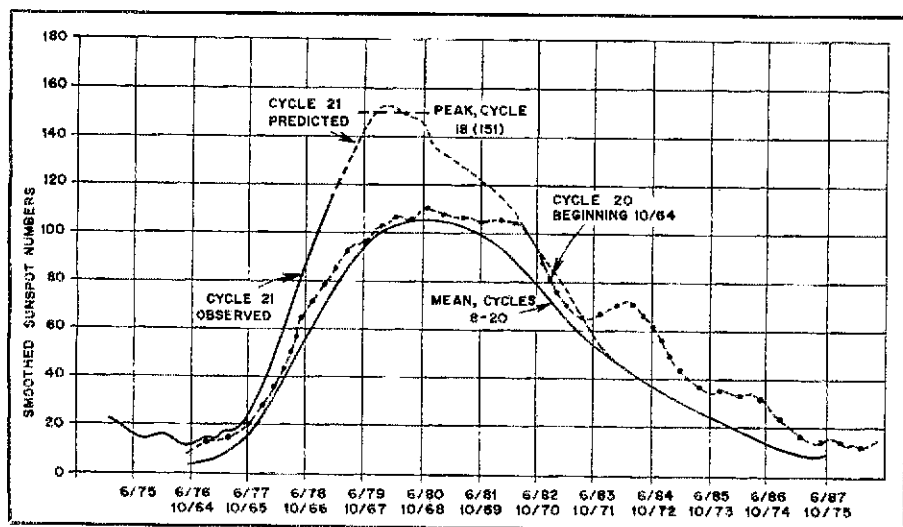


Fig. 1 — Monthly solar flux record since 1975. The curve shows monthly averages. Vertical lines show the high and low values for each month. Note that the last year of Cycle 20 looks very much like the first year of Cycle 21, except for the reversal of trend in July 1976. Even in the lowest years there is much more range of solar activity than is apparent from the smoothed sunspot-number curves of Fig. 2.

Fig. 2 — Smoothed sunspot-number curves are useful for long-term comparisons. The mean of Cycles 8 through 20 is shown by the lowest curve. Next above it is the record of Cycle 20, which shows more of the erratic nature of a typical cycle. The top curve is the observed and predicted sunspot numbers for Cycle 21. It is likely that the falloff of this curve will be much more irregular than shown, probably with a wider and more flat-topped peak. If Cycle 19 had been included, it would have gone through the top of the chart by a substantial margin.



through, even in the low years.

### Sunspot Numbers and the Solar Flux

Solar records prior to 1947 were in sunspot numbers only. Since 1947 there has been something much better for our purposes, though we have begun to use it only in the last five years. This is the *solar flux*, a measure of radiation from the sun which in this case is observed at 2800 MHz. The solar flux has been recorded on several frequencies, from 245 to 15,400

MHz, in various locations. The virtue of the 2800-MHz record, for radio propagation uses, is the almost linear relationship with the ionization density of the F layer — the ionospheric region most responsible for long-distance propagation on the hf amateur bands.

Daily monitoring of the sun at 2800 MHz, an offshoot of the World War II radar program in Canada, was begun early in 1947 by what is now the National Research Council of Canada. A prime

mover in this work was Arthur E. Covington, ex-VE5CC, now retired from the Herzberg Institute of Astrophysics, NRCC, Ottawa. The solar-flux information transmitted hourly by WWV is obtained from this source. Propagation-minded amateurs know it as one of the best aids we have in understanding and predicting radio communication conditions.

One of the most-used works in the writer's library is Covington's *Working Collection of Daily 2800-MHz Solar-Flux Values, 1946-1976*. This volume and our daily record of WWV propagation bulletin information since 1975 have been used in an extensive reexamination of W1HDQ logs, old correspondence records and *QST* vhf columns since 1946. More on this later. First, let's look at Fig. 1, a graph of the solar-flux record from 1975 through as much of 1979 as was available at our production deadline for this article.

It can be seen that the zigzag line showing monthly solar flux averages bears some resemblance to rising portions of the smoothed sunspot number curves of Fig. 2. The vertical lines in Fig. 1 show monthly highs and lows of the solar flux. This information is much more directly related to the real world of radio propagation than is Fig. 2. A daily flux record would be much better still, but ours is compiled month by month, so it is not reproducible in the limited space available here.

The 2800-MHz solar-flux value for a quiet sun is about 66. Readings as low as 64 have been recorded, but they are rare. There were many 66 days in 1975-76, mostly in the Northern Hemisphere summer months when the earth and the sun are farthest apart. There are also some surprising highs. Note the August 1975 high of 125 — a pretty fair number for a good DX day if it had come in November or February. The 21 and 28-MHz bands did come alive well in November 1975, still closer to the end of Cycle 20, on a flux rise to 96. The high bands don't just go dead for three years, as the smoothed number curves of Fig. 2 would seem to indicate.

### Cycle 21 Peak Near?

What we've been calling "the new cycle," for perhaps too long, began in July 1976. How did we know? Not by sunspot numbers or solar-flux readings, but rather by the area of the sun in which spots appeared. In the late years of a solar cycle, spots are concentrated near the equator of the sun. Spots of a new cycle appear first in the latitudes mostly 25 to 30 degrees north or south of the equator. There may be an overlapping period of as much as two years, but eventually the equatorial region clears and all new activity is well removed from it.

Early spots of the new cycle and the last of the old are mostly small and widely separated in their time of appearance. A 10-day period in June 1975, with no visible

spots, had a solar flux range of 65.5 to 66.5. It looked like the end of Cycle 20, but when the spots came back they were still in the equatorial belt, indicative of the old cycle. High-latitude spots had been seen before this, but they were small, short-lived and of little importance in the propagation picture until June 1976. They became dominant in July. Even now, well into 1979, most sunspot activity is still 15 degrees or more away from the equator, but the migration toward the equator is on.

The course of the curve in Fig. 1, before and after July 1976, is very similar either way, except for the decline on one side and the rise on the other. A casual operator would have observed little difference in the DX bands over this period, except for seasonal variations. The first major change associated with the rise of Cycle 21 came in September 1977 when the monthly solar-flux average went above 100 for the first time since September 1973. The 21- and 28-MHz bands began to sound like old times and it was obvious that Cycle 21 was "off and running" at last.

With a flux average above 100 or so, 21 and 28 MHz are in fine shape from September through April. The lower bands also perform well most of the time. As the flux goes higher, the "open" hours increase. At an average around 150, 14 MHz seems to be open to somewhere all the time and 21 MHz is good many hours daily. The 10-meter band is active on a dawn-to-dusk basis. You could work DX on 10 with a converted CB rig in a car in the first four months of 1978 and in the cool months since. The band approached round-the-clock usefulness when the flux began to hit the 200 level.

Something less attractive was also happening at this time. Major solar flares became more common and there were occasional total or near-total hf blackouts. Did you wonder about your receiver or antennas the first time you tuned across a DX band with no signals to be found? In March and April 1978 and 1979 a good many amateurs had their first experience with this sort of thing. Even those of us who have been around for many years tend to get that gnawing doubt when we can't even hear noise. The writer particularly remembers the morning of April 11, last year. There was no

WWV to be found on any of their frequencies. Quick checks across the DX bands showed WIAW to be the only thing readable. Occasional testing by locals also was heard along with the inevitable "There's got to be something wrong . . ." conversations. Indeed there was something wrong, but nothing could be done except to wait for the ionosphere to come back!

It does come back usually within a half hour or so, but flares may not be isolated events. So the absorption may hang on for some time, or come and go. Solar flares and blackouts can happen anytime, but they are much more frequent and severe in the years of rising solar activity. There is no all-good or all-bad ride on the solar roller coaster. If the overall activity of the sun is to rise, there have to be new eruptive areas on the sun. These rarely develop slowly and benignly. Anytime you see the solar flux rise from 155 to 180 in a single day (such as April 11, 1978), something cataclysmic has happened on the sun. You know when it happens because the blackout is practically simultaneous with the eruption on the sun. (Light and surge of paralyzing radiation travel at the same speed.) The solar-flux information you get later in the day from WWV may show a large rise and flares may be mentioned in the bulletin if they were of real importance.

There is another result of such an event. It marks the beginning of a large increase in emission of charged particles from the sun. These have mass, so travel more slowly than the electromagnetic rays. From one to four days after the event, they may enter the magnetic field of the earth and react with it. This ionizes the D region, increasing absorption of signal energy and making the ionosphere a sponge rather than a reflector. The effect is worst on paths that enter or graze the auroral zone, dropping off quite rapidly with decreasing latitude.

The picture changes markedly with frequency. At the worst, there is no ionospheric propagation at all. More often the higher frequencies are severely affected. A common condition on 21 and 28 MHz is loss of east-west and far-north communication, but with north-south and transequatorial paths still working well, or even enhanced. The latter condition is usually associated with a visible aurora, especially in

latitudes above about 40 degrees north and in regions near the Northern Hemisphere auroral zone. Auroras commonly begin in the late afternoon or early evening, so the most notable propagation effects are nighttime events. Auroral propagation on the frequencies above 50 MHz are in this category. They occur throughout the solar cycle, but are more frequent and intense in the high-activity years.

Some spectacular nighttime 10-meter openings are associated with auroral conditions. These also are more frequent under solar conditions like those currently experienced. Exceptional propagation to New Zealand, Australia and Tasmania is typical for New England, but all transequatorial paths can be affected. The best such events may begin after the band has gone quiet. A session with ZLs and/or VKs beginning before midnight, local time, is not unusual. Enhanced propagation to the Falkland Islands or Antarctica is not uncommon in the daylight hours of disturbed periods and it may come even in low-activity years.

These effects may be quite frequency-selective. Some splendid openings to VK and ZL, particularly, were observed in February and March 1979 on 7 or 14 MHz but with 21 MHz almost dead and 28 MHz completely quiet. This condition has been caught in early morning hours, local time, dissipating around local sunrise. Long-path 28-MHz openings to Japan and Australia have been early morning surprises in the Northeast.

### Prospects for 50-MHz DX

Many present occupants of the 50-MHz band came into ham radio in the last few years. They've heard about worldwide DX on 6 meters from greybeards who were active during both Cycles 18 and 19, but they're now just beginning to experience it or perhaps they're still waiting. What does it take in the way of solar activity to bring F-layer DX to that band?

Here, certainly, was a job for Covington's solar-flux tabulations mentioned earlier, since they cover almost the whole history of 50-MHz DX. We've not finished the job yet, but a check has been made on all 50-MHz DX reported in QST vhf columns of the 1940s and 1950s in addition to the early DX openings of Cycle 21. With a few exceptions, high-

**Table 1**  
Statistical Comparisons of Cycles 18 through 21.

Cycle	Start	First Day 200+	Peak Day	First to Last Day 200+	First to Last Month 200+ Mean	Max. Monthly Mean
18	2/44	11/23/46 (33 mo.)	4/7/47 (457) <sup>1</sup>	2/20/50 (39 mo.)	2/47 2/49 (24 mo.)	264 (4/47)
19	8/54	2/15/56 (18 mo.)	12/23/57 (383)	11/10/60 (58 mo.)	9/56 11/60 (41 mo.)	286 (12/57)
20	10/84	12/17/67 (38 mo.)	2/1/68 (262)	11/15/70 (35 mo.)	None	189 (1/68)
21	7/76	12/9/78 (29 mo.)	2/19/79 (243) <sup>2</sup>	Note 2	Note 2	204.3 <sup>2</sup> (2/79)

<sup>1</sup>Four-day disturbance. Present methods might have yielded lower values.

<sup>2</sup>Cycle 21 records only through April 1979.

latitude 50-MHz DX has been worked only on days when the solar flux was above 200. Only VE1s have made it at lower flux values. They are probably the best situated for both transatlantic and transcontinental work.

The first east-west high-latitude 50-MHz DX of this cycle came on December 12, 1978, when the solar flux was riding a peak of 237. WB2RLK/VE1 worked into Washington and Oregon on that day. The solar flux went above 200 for the first time in Cycle 21 on December 9 with a 208-211-219-237-230-202 record in six days.

Two months later the North Atlantic was bridged on 50 MHz for the first time since 1960. G3COJ heard WB2RLK/VE1 February 8 and 9 (solar flux 216-204). G3FXB heard his first signal of Cycle 21, WIHDQ, on the 9th. The first crossband QSOs were made the next day with WB2RLK/VE1, W2IDZ and G3COJ worked on the 11th, as did G3FXB and WB8IWI/4 (solar flux 210). Several other Gs joined the ranks in the following days and stations in Sweden, Germany, Poland and Spain were also worked crossband. The Europeans listen on 50 and reply on 28, mostly around 28.45 MHz. ZB2BL, operator of the 50-MHz beacon, ZB2VHF, has been worked two-way on 50 MHz. So far he is the only European holder of an active 50-MHz authorization. EI2W may possibly join the fray this fall, we hear.

The last known North Atlantic opening reported by WB2RLK/VE1, March 2, is the sole exception to the over-200 rule. The last known 50-MHz work with U.S. stations was done February 17 with a flux of 215. We except work with ZB2BL here and also reports on his beacon because of the lower latitude of Gibraltar.

A high solar flux is not the sole requirement. The earth's magnetic field must be quiet or nearly so. The solar flux high at this writing, 243 on February 18, came in a period of rising geomagnetic activity and resultant poor high-latitude propagation.

The solar flux need not be particularly high for 50-MHz DX in the lower latitudes and on transequatorial paths. Unlike the North Atlantic path, some geomagnetic activity seems to be a requirement for north-south DX. This is far from a new idea, having been recognized in early 50-MHz work between North and South America. See documentation in "The World Above 50 Mc.," May 1950 QST. The idea was known even years before that from work more than 40 years ago on 10 meters.

Unless long-path propagation is counted, the maximum DX that can be worked on earth is 12,500 miles. This distance, or close to it, has been worked numerous times between Japan and South America. The record shows this path open with solar-flux values below 150, but always with appreciable geomagnetic ac-



"Closeup" effects in this hydrogen-alpha view were obtained with a higher-power telescope aimed at the limb of the sun. The "craters" in the upper portion mark the locations of sunspots not yet visible. Several sunspots are barely visible as dark patches in the brilliant hydrogen-alpha display in the lower portion of the picture. (photo courtesy of Sacramento Peak Solar Observatory)

tivity (WWV K indices of 3 or higher and A indices above 20 or so). A similar distance and path was covered on 50 MHz for the first time ever on April 16, 1979, when ZS6LN worked four KH6s on 50 MHz. The period was 0645 to 0815 UTC. Solar flux that day: 175.

Some of the writer's best South American 50-MHz QSOs of years ago were made when the solar flux was around 130. We didn't have A and K figures then, but we did know that "ionospheric storms" were in progress.

Much 50-MHz DX on transequatorial paths in early 1979 has yet to be analyzed. G3COJ reports work with ZS6PW and ZS6LN on March 3. Other Gs report March 6 as good for this path (WWV K indices: 4 on the 3rd and 6 on the 6th). ZLs and VKs have been worked many times from the southern part of the United States but we do not have full details as to times and dates at this writing. All openings to South and Central America from the Northeast thus far in Cycle 21 have come when the WWV K index was 3 or higher.

### Cycle 21 Prospects

No solar cycle was ever studied as closely or predicted in such detail as Cycle 21. Some early guesses have already been proved wrong, but perhaps a better estimate can be made, now that we've

seen the cycle through the first three years. Comparison with previous cycles, back as far as accurate solar-flux data are available, seemed a good approach, so significant milestones in Cycles 18 through 20 were determined from the Covington compilation. These and related figures from Cycle 21 are compared in Table 1.

If there is a single statistical detail that sets a solar cycle apart from the rest, it is the magic number 200. All cycles since solar-flux observation began have had over-200 days, but old sunspot number records indicate that some cycles never made it or reached this level perhaps only a few times. So we reasoned that how soon the cycle reached the first 200 day, the spread between the first and last such days and the spread between the first and last monthly means over 200 would be significant. The maximum values and highest monthly means were also worth looking for.

Statistics seldom make bold headlines. Therefore, we invite attention to some significant numbers in Table 1. Cycle 18, rated second in all cycles for which data are available, took 33 months to reach the 200 figure. Cycle 19, undisputed record holder, did it in 18 months. Cycle 20, certainly no weakling, took 38 months. Staying power? Cycle 18 spread some 200-plus days over a 39-month period. Cycle 19, the champion, stayed in the big leagues for 58 months! The spread of Cycle 20 was 35 months, 10 percent less than that of Cycle 18.

Monthly means over 200 are perhaps more revealing, since they show how consistently the cycle stood up across the high years. Again we find Cycle 19 far out in front. Note that Cycle 20 never made it in this category, having reached only 189 in the monthly-mean sweepstakes. Cycle 21 has already had two over-200 months — January and February of 1979. More are almost certainly coming, if not already recorded by the time this appears in print.

What this all boils down to is that Cycle 21 is given a good chance to surpass Cycle 18, perhaps by a wider margin than indicated in Fig. 2. It is deemed unlikely to take over the Number 1 position of Cycle 19. The rise time of a cycle is less than the decay time and the peak usually spans several years at a level that should sustain good DX conditions up through 28 MHz. It would seem that the best is yet to come, at least on 50 MHz. This fall, and very likely both spring and fall of 1980, should do well by 50-MHz enthusiasts. Cycle 18 showed signs of 50-MHz DX from the fall of 1946 through spring of 1950. And remember, the first over-200 day of Cycle 21 came four months sooner than did that of Cycle 18. If the last over-200 day of this cycle comes only as far from the first as happened with Cycle 18, we could be working 50-MHz DX via the F layer through March 1981!

# Improving the SB-104A/SB-644A

WØMYN provides four modifications for this combo. These include the addition of RIT and the defeat of a few gremlins along the way.

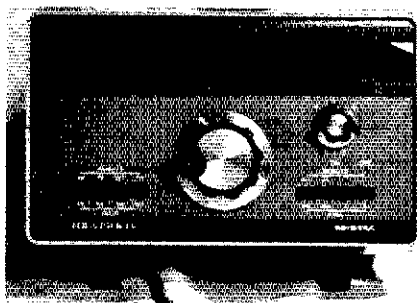
By Harlan Bercovici,\* WØMYN

In 1978 the author assembled a Heathkit SB-104A transceiver and an SB-644A remote VFO. The flexibility offered by having two VFOs with push-button selection was great. However, after some use of this equipment, a problem became apparent — the idle VFO produced an unwanted signal in the output of the transceiver. For instance, if the main VFO in the transceiver was set at 14.210 MHz for transceiving and the remote VFO (not being used at the time) was set to 14.185 MHz, the main signal would be at 14.210 MHz. Unfortunately, there would be an unwanted signal, down some 45 dB, at 14.185 MHz. Or if split-frequency operation was the mode selected, the weaker transmitted signal would be found in the listening frequency. Regardless of which VFO was employed for transmitting or receiving, this was the case.

When the transceiver is operated barefoot, the problem is minor. But when a linear amplifier is added to boost the output, the unwanted signal has the potential of stirring up a hornet's nest of interference for other amateurs, not to mention the possibility of getting an FCC out-of-band citation. I also discovered that the difficulty turned up in the receive mode if the selected VFO happened to be tuned to a somewhat weak signal at the same time the unselected VFO was set on the frequency of a strong signal.

## What to Do?

Investigation disclosed that one of the causes of the unwanted signal was coupling through the +11-V line. To reduce the coupling, an additional power supply for the SB-644A VFO was tried, lowering the unwanted signal some 8 dB. An improvement, yes, but it was not a complete cure. The problem continued to appear when the remote VFO was placed in the transceiver or transmit modes with the main VFO being assigned for receiving or remaining idle. A close look at the cir-



The modification of the panel of the author's SB-644A is shown in this photograph. Just above the REMOTE/XTAL push buttons at the right is the added RIT control with a Heathkit knob. Lettering is done with white dry transfers, used to identify the vertical index mark just above the knob, the + and - indicators, RIT and ON and OFF.

cuitry for switching the two VFOs seemed in order.

The signal from the main VFO of the transceiver is fed to the collector of Q1256 in the SB-644A, by way of a cable and capacitor C1264. A positive voltage at the base of this transistor (derived from either Q1251 or Q1252 and passed through SW1276A) turns the transistor on, coupling the main VFO signal through the transistor and filter network in the emitter circuit back to the mixers of the transceiver. If Q1256 is on, Q1257 is off, and vice versa. This allows the signal from only one of the VFOs to get back to the transceiver. Q1257 performs a function for the SB-644A VFO similar to that of Q1256 for the SB-104A transceiver VFO. The only catch here is that the off-junction capacitance of either Q1256 or Q1257, plus the VFO rf signal fed through the +11-V line, does allow some of the "inactive" VFO signal to slip back into the mixer and produce an unwanted signal in the rf output.

## Switching the +11-V Lines

The search for a complete cure led to the disconnection of the +11-V line to the idle VFO as a means of preventing this cir-

cuit from oscillating. See Fig. 1. Switching of the lines to the VFOs is accomplished with the aid of a DIP-style spdt relay, K1, in conjunction with the switching performed by Q1256 and Q1257. The contacts on the relay can handle up to 250 mA with an expected life of over 1,000,000 cycles. Because the VFO current does not exceed 50 mA, there is no reason to feel concerned about surpassing the relay contact ratings.

Components for the circuit in Fig. 1 are mounted with flea clips (push-in terminals). These are assembled on a piece of perforated board. Because the switching signals are derived from the remote VFO, and are not available in the transceiver, the switching circuit board must be placed in the remote VFO unit.

Once the modification of my equipment had been completed, tests disclosed that the unwanted signals had been eliminated. Admittedly, I had some concern that the VFO would shift frequency during the sequence of power being applied, removed and reapplied. The small amount of shift that occurred, 10 Hz or less, would not be detectable in normal operation.

## Making the Modification

The circuit revision involves changing the source of the +11 V for the main VFO from the transceiver to the remote VFO. Inasmuch as the remote VFO is powered by the +11 V from the transceiver, there will be no change in the operation of the main VFO, except that the +11 V will be switched off whenever the transceiver is being operated with the remote VFO.

To modify the SB-104A, perform these changes. (S and a number in parentheses indicate to solder the given number of wires.)

1) Remove the screw in the lateral shield that is above and just to the right of the VFO assembly. Install the mounting foot of a 1-lug terminal strip under this screw and reinsert the screw.

2) Remove the red wire from the VFO connector at pin 3 of the front section of

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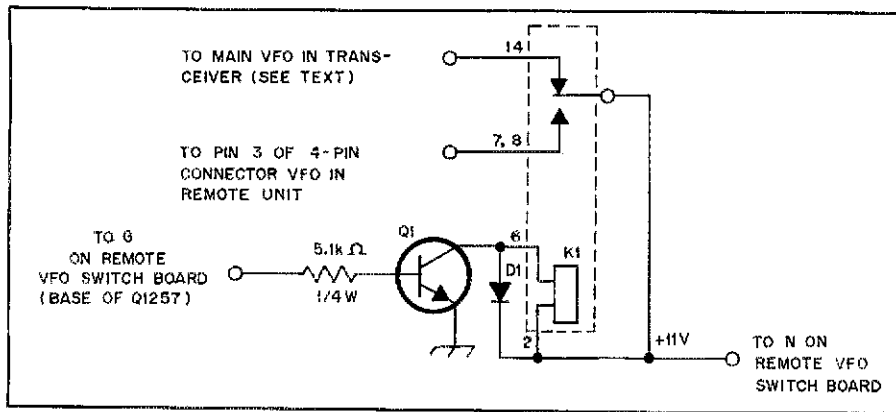


Fig. 1 — The SB-644A remote unit VFO may be modified as shown in this diagram to eliminate unwanted VFO signals that could appear in the rf output. The parts shown here may be mounted on a small piece of perfboard and added to the VFO circuitry.

D1 — Silicon rectifier, type 1N4002.  
K1 — 12-V DIP relay, Magnecraft no. W172DIP-3.

Q1 — Npn silicon transistor, type 2N2222 or MPSA05 (Heath no. 417-864) or MPSA20 (Heath no. 417-801).

the band switch. Reconnect this wire to the 1-lug terminal strip installed in step 1. Do not solder.

3) Insert a wire from the 1-lug terminal strip, installed in step 1 above (S-2), through the front chassis cutout along the main wire harness, up through grommet BC and connect to pin 4 of the accessory socket CY (S-1). Pin 4 of this socket is presently unused.

4) Connect a wire from pin 4 of the accessory *plug* and extend it along the cable to the remote VFO, terminating the wire on the unused position 4 of the 6-pin power connector at the rear of the SB-644A. An additional male and female pin is required for this.

Note: If you incorporate the RIT modification, discussed later in this article, you will not need the VFO shift function. So instead of performing step 4, do the following. Move the white wire on pin 1 of the accessory *plug* to pin 4 of that *plug*.

5) If you wish to use the transceiver for mobile operation, or without the SB-644A remote VFO, you must connect a jumper between pins 4 and 7 of the accessory *plug*. This jumper is installed in the same manner that pins 2 and 5 are presently jumpered. This puts +11 V on the VFO circuit when the remote unit is disconnected.

### Changing the SB-644A

Follow these instructions for modifying the SB-644A remote unit.

1) The circuit in Fig. 1 may be built on perforated board and mounted under the chassis. Flea clips support the components and provide terminals for wiring to the SB-644A circuitry. A standard 14-pin DIP socket serves for mounting the relay, a recommended procedure in the event a relay ever has to be replaced. Insulating material, such as the fish paper mentioned in the Heath manual, is placed on the chassis directly under the circuit board to prevent possible short circuits.

2) Connect a wire from the 5.1 kΩ resistor on the relay board (Fig. 1), to G on the switchboard. An orange wire terminates on this pad where the new wire is tack soldered.

3) Identify the red wire from the VFO assembly (small sleeving coming through grommet A to pin 3 of the 6-pin Molex connector on the chassis rear wall). Cut this wire approximately 2 inches (51 mm) from the 6-pin connector. Splice a piece of wire to the VFO end of this cut red wire and connect the other end to either pin 7 or pin 8 of the relay. Protect both the splice and the remaining cut red wire by insulating with tape or shrink tubing.

4) Connect a wire from relay pins 1 and 2 to switchboard pad N. Tack solder the wire to the pad.

5) Install a new pin and wire at location 4 (presently unused) of the 6-pin Molex connector and extend this wire to relay pin 14.

Note: If you install the RIT circuit to be explained next, do the following instead of step 5 above. Cut the white wire from pin 1 of the 6-pin connector 2 inches (51 mm) from the connector. On the connector side of the cut, splice a wire with the other end attached to relay pin 14. This splice should be protected with tape or shrink tubing.

These changes eliminate any vestige of an unwanted signal on the nonselected VFO frequency while either transmitting or receiving. This procedure does not sacrifice the stability of the circuit and retains all the operational features of the equipment. May I caution, however, that the VFO output levels must be properly set according to the procedure explained on pages 2 through 9 of the Heath manual.

### Receive Incremental Tuning

When the author completed his SB-104A, operation of the unit was indeed satisfactory with the exception that it lacked receiver incremental tuning (RIT).

A discussion with the technical people at the Heath Co. led to a scheme for adding this feature.

By referring to the SB-104A manual you will observe that two separate oscillators are employed to generate the upper and lower sidebands, respectively. Accordingly the VFO must shift 2.8 kHz. A positive dc voltage is applied to the lsb shift line when operating in the lsb mode. This causes D1201 in the VFO to conduct, effectively connecting C1209 (fixed) and C1211 (variable) across the tuned circuit that determines the VFO frequency. If C1211 is properly adjusted, the VFO frequency will be lowered by 2.8 kHz, thus ensuring that the dial indicates the same in both usb and lsb.

If the shift is properly adjusted at mid-band, it will be off slightly at either end. This is the result of different L/C ratios as the VFO is tuned. The digital frequency readout in the SB-104A will be correct even if the lsb shift isn't utilized. When going from usb to lsb, the display will shift by 2.8 kHz but it will be correct.

### Adding the RIT Circuit

To incorporate the RIT circuit, first assemble the components indicated in Fig. 2, including a circuit board.

Although the RIT board may be placed in either the transceiver or the remote VFO, the author chose to install it in the remote unit where there is more available front-panel space for the potentiometer and knob. Furthermore, the remote unit has unused contacts on the XTAL 1 push-button switch that can be employed. Additionally, if you wish to remove the circuit for resale purposes, installing a new panel on that unit is easier than on the transceiver.

If a noise blanker has been added to the SB-104A, as in the author's case, the only spare switch contacts on that unit are in service. In that case, placing the RIT circuit in the SB-644 avoids the addition of another switch on the SB-104A.

The wiring to pin 2 of the VFO connector should be revised as shown in Fig. 2 to carry the RIT signal into the VFO. The idea is to eliminate the lsb shift signal in one of the two VFOs, namely the one in the remote VFO. The lsb shift will still operate normally in the unmodified VFO in the transceiver.

### Modifying the VFO and Building the Circuit

To modify the VFO assembly, remove the VFO from the chassis, pull off the covers and extract the circuit boards. Remove C1209 and the small trimmer, C1211. (See Fig. 3.) Next lift the cathode end of D1201 and add another diode of the same type (Heath no. 56-24 or a 1N458) in series with D1201. Pigtail the cathode end of D1201 with the anode end of the new diode. Place the cathode end of the new diode in the same hole in the

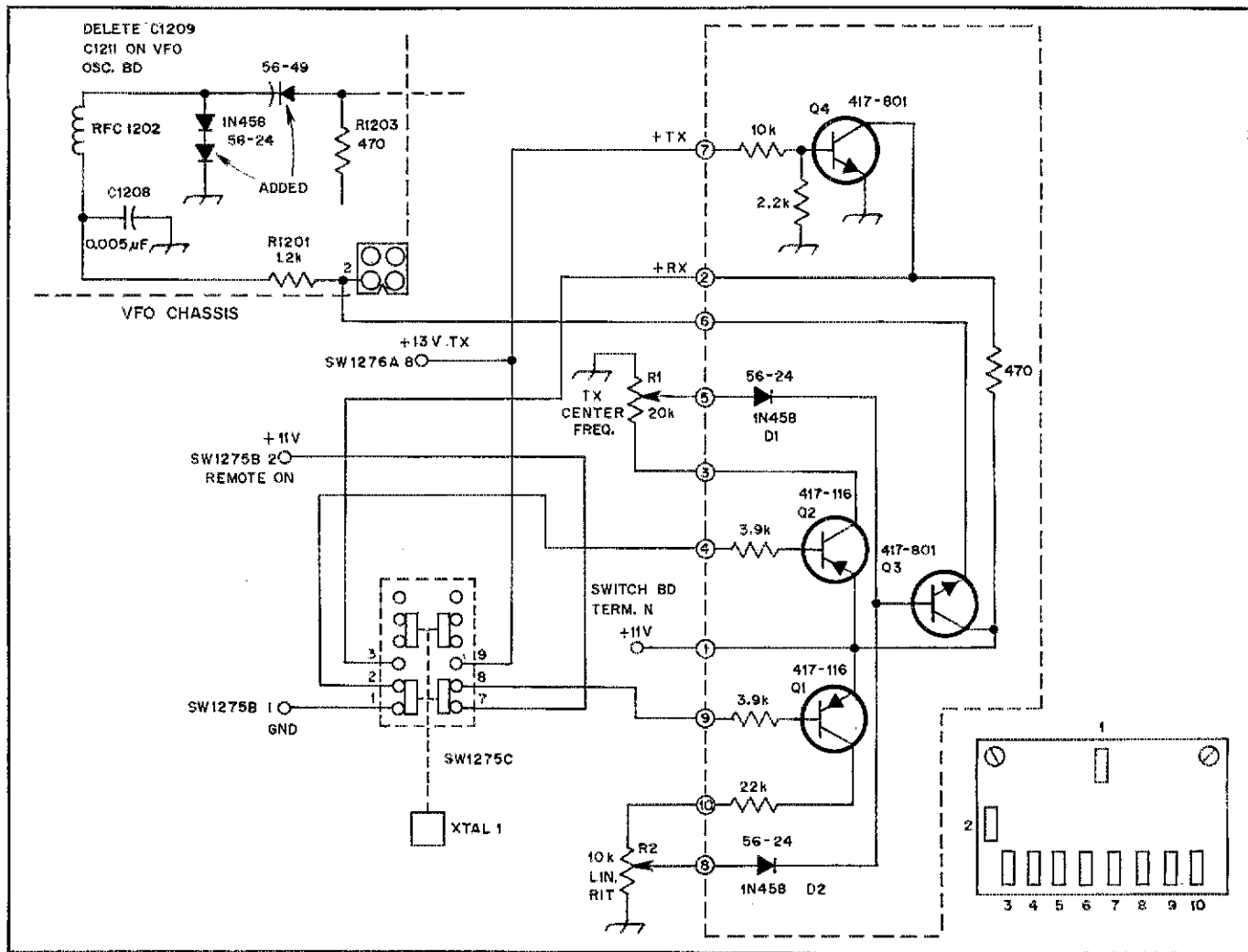


Fig. 2 — An RIT circuit for use with the SB-104A/SB-644A combination. Heath part numbers for solid-state devices are shown. Resistances are 1/4 watt with values indicated in ohms.

board from which you took the cathode of the original D1201. Install a Heath capacitive diode (no. 56-49) in place of C1209. Now reassemble the VFO in the chassis.

Proceed to build the circuit shown in Fig. 2. Mount the components on a small perforated board, supporting them with flea clips, which will also provide terminals for wires to switches, potentiometers and the switchboard. All additional components, with the exception of the two potentiometers, can be mounted on this board. When installing this board, use a piece of fish paper or other suitable insulation to prevent shorts to other parts of the VFO.

The transmit center-frequency potentiometer is mounted on the chassis at any convenient spot. A front-panel location can be found for the RIT potentiometer. Mine is just above SW1275 (containing the XTAL-select buttons) and beneath the right-side pilot lamp. The XTAL-select switch contacts are used for turning the RIT on or off besides serving as a means of selecting either desired crystal. The pins of this switch, shown in Fig. 2, are unused

prior to modification.

### Circuit Operation

When the XTAL ON button is depressed, the collectors of the two switch transistors are grounded. This disables any VFO signals from feeding through this part of the circuit. Operation of the RIT circuit in this case is immaterial. However, if both the REMOTE ON button and the XTAL 2 button are depressed (XTAL 1 button is out), the resulting effect is to disconnect the RIT potentiometer from the circuit. The two diodes, D1 and D2, keep R1 and R2, the transmit center frequency and RIT potentiometers, from interacting. Thus, if REMOTE ON is depressed and XTAL 1 isn't depressed, the RIT circuit has no effect. Whether the equipment is in the transmit or receive mode, the transmit center-frequency potentiometer sets the operating point for the capacitive diode, and thus the frequency in conjunction with the VFO.

The "+13 TX KEY" voltage from the transceiver (see Heath SB-644A VFO diagram) is brought through pin 5 of the 6-pin power connector. This signal

voltage is taken from SW1276, pin A8, and applied to both pin 9 of the XTAL 1 switch and to the base of Q4 through the divider resistors, as shown in Fig. 2. Q4 is an inverter. Therefore, the signal at the collector is "+RX." (If the transceiver isn't in the transmit mode, then it must be in the receive mode.) The output from the collector of Q4 is then connected to pin 3 of the XTAL 1 switch. With the XTAL 1 switch depressed and the transceiver in the transmit mode, there will be a positive voltage at the base of Q1, turning it off and isolating the RIT pot. There will be, at this time, a positive voltage at the base of Q4, turning it on and pulling the collector voltage down close to ground potential. This signal is then applied through pins 3 and 2 of the switch to the base of Q2, turning it on and applying voltage to the transmit center-frequency potentiometer and the capacitive diode. The action is exactly the same as when the XTAL 1 switch is not depressed.

Whenever the transceiver is in the receive mode, the +13 key line goes to ground potential, which is applied to the base of Q1 through pins 8 and 9 of the



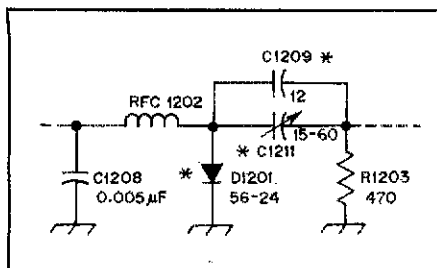


Fig. 3 — Modification of the Heath SB-644A oscillator circuit board. A capacitive diode replaces C1209 and C1211. See text. Resistance values are in ohms. Capacitances are in picofarads except as shown.

switch. Q1 is turned on, providing a voltage at the RIT potentiometer. The setting of the potentiometer will determine the voltage furnished to the capacitive diode. At this time Q4 inverts the ground applied at its base. The positive voltage of the Q4 collector is applied to the base of Q2, turning it off and isolating the transmit center frequency potentiometer, which will then have no effect.

Thus, with the REMOTE ON and the XTAL 1 buttons depressed and the transceiver in the transmit mode, the chassis-mounted transmit center-frequency potentiometer determines the frequency. With the transceiver going to receive, the RIT potentiometer determines the frequency. The receive frequency can be varied approximately  $\pm 1.5$  kHz about the transmit frequency.

#### Operation and Adjustment

When the crystals are being used, if you depress the XTAL ON button and either the XTAL 1 or the XTAL 2 switch, operation will occur just as it did before the modification. No effect will be observed from the RIT circuit. With the REMOTE ON and the XTAL 2 buttons depressed, the SB-104A will be in the transceiving mode but the RIT circuit will be inoperative. However, if the REMOTE ON and the XTAL 1 buttons are both depressed, you will be able to vary the receive frequency  $\pm 1.5$  kHz around the transmit frequency with the RIT control. To adjust, set the RIT control at midrange (center mark), depress the REMOTE ON, XTAL 1 and REMOTE T/R buttons. The transceiver is then in the receive mode. Tune the signal for maximum clarity. Note the exact frequency on the digital readout. Depress the XTAL 2 button and set the transmit center-frequency potentiometer for exactly the same reading (with same voice sound that you had in receive.)

#### Curing Talk Back

There are two more modifications suggested by Heath technical consultants. The SB-104A sometimes has a characteristic of "talking back." This occurs when the operator is using the ssb mode during transmission with the result that

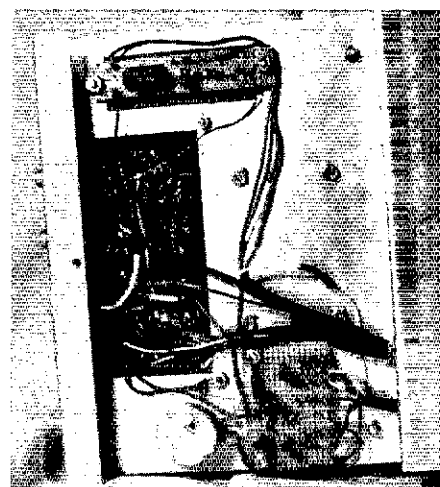
the operator's voice can be heard through the loudspeaker or the phones. The cause of this condition is rf that appears on the 13.8-V line feeding the driver and final circuit boards in addition to the audio-output amplifier located on the receiver i-f and audio board (F). The rf comes into pin 19 of board F, is rectified by Q515, then amplified by Q516 and Q518, the audio output stage.

Completely bypassing the rf on the 13.8-V line is not easily accomplished. Furthermore the ground returns for the driver and final boards are carried through the chassis. With all the mechanical connections involved, made by sheet-metal screws, there is an impedance between the board grounds and the power socket on the rear panel. Therefore, the next change is to provide a direct ground path from the power socket to the ground connections on the driver and power-amplifier circuit-board connectors.

Wire either a piece of shield braid taken from RG-58/U cable, or a piece of no. 14 copper wire, from pins 7, 8, 9 and 10 of power plug CX down through the grommet to the ground lug which has bare wires connected to pins 2 and 4 of the power amplifier board. Install another piece of braid or no. 14 wire to pin 3 of the driver board. Be sure to tape the braid to prevent possible contact with the chassis. (An alternative would be to bond each piece of sheet metal together with braid.)

Another factory-recommended modification is to remove the 13.8 volts from the audio board during transmission. If you do have the talk-back problem and the addition of the grounds mentioned above doesn't correct it, this change certainly will! However, simply removing the 13.8 volts during transmissions isn't the entire picture, since this will also disable the sidetone during cw transmissions. By means of the change described here, the 13.8 volts for the audio board is obtained during receive from an unused contact on the T-R relay while disabling the voltage during transmission. In the cw mode, the voltage is obtained from the cw mode switch. Since both poles of the cw switch are used, one to switch the 11 volts and the other to switch 5 volts to the counter preset, the technique used is to remove all wires from the cw mode switch S3C (the section that switches the 5 volts to the counter preset). After modification the 5 volts is derived from the 11-V section of this switch. A dropping resistor is used to present the correct voltage to the counter board. The modification is accomplished as follows:

- 1) Disconnect the gray wire from lug 2 of the CW switch and reconnect it to lug 3 of the TUNE switch.
- 2) Disconnect the jumper from lug 3 of the TUNE switch and reconnect it to lug 2 of the CW switch.



The underside of the 644A. The long, narrow perforated board mounted at the top, above the Heath circuit board, contains the relay and the driver. The larger board next to the potentiometer has the circuitry for the RIT function.

3) Disconnect the white-violet wire from lug 4 of the CW switch and reconnect this wire to lug 6 of the HIGH switch.

4) Disconnect the jumper from lug 6 of the CW switch to lug 6 of the LSB switch.

5) Disconnect the gray wire from lug 6 of the CW switch and reconnect it to lug 6 of the LSB switch.

6) Install a 100-ohm, 1/2-watt resistor from lug 6 of the HIGH switch to lug 3 of the CW switch.


7) The orange wire between pin F-19 and pin 11 of the relay is to be disconnected at relay pin 11 and reconnected to relay pin 3.

8) Connect another large orange wire from pin F-19 to lug 4 of the CW switch.

9) Connect a third orange wire from lug 6 of the CW switch to pin 3 of the K board.

10) Install a 560-ohm, 1/2-watt resistor from pin 19 of the F board to ground.

This change completely eliminates the talk-back problem for the high-power ssb mode while leaving the sidetone intact during cw operation. It does not affect the talk-back problem in low-power operation because the relay isn't used. However, the added ground wire should alleviate, if not completely eliminate, the problem when the low-power mode is used.

The cost of the two modifications for eliminating the talk-back problem is about 50 cents, and the time involved is about one hour. Considering the results, this time is well spent. The modifications for eliminating the inactive VFO signals and adding RIT can be implemented for less than \$10 each. The RIT modification will make operating more pleasant for you. The added relay for the VFO voltage control will make your operating more pleasant for your fellow amateurs. 

# An Audible Digital Voltmeter

Combine a 6800-based microcomputer and a simple interface circuit to make this unique "beeping" digital voltmeter. Its resolution is 0.1 volt.

By William S. Wagner,\* AA4WW

**D**it dit (pause) dit dit dit dit dit (longer pause). Dit dit (pause) dit dit dit dit. That's the sound this audible voltmeter makes when it is indicating a measured potential of 2.5 volts. A 0.3-volt signal is indicated by dah (pause) dit dit dit repeatedly, and 4.0 volts by dit dit dit dit (pause) dah. From this you can probably tell that a long sound represents a zero, and a short sound represents an incremental one. Nine dits in succession represent a nine. The brief pause between the two digits represents a decimal point.

The application of a device such as this for visually handicapped persons is obvious. There are numerous other applications as well, such as the remote monitoring of circuit voltages. With appropriate control the instrument could be used at a repeater site, for example, perhaps to indicate received signal strengths.

A 6800-based microcomputer and the interface circuit are shown in Fig. 1. The interface circuit and the software program (Table 1) provide for measurement of a 0- to 5-volt dc signal with a resolution of 0.1 volt.

## Circuit Operation

When initiated, the M6800 software program first establishes which are the input and output sections of U1, a peripheral interface adaptor (PIA). Six binary outputs from the PIA are fed in parallel to U2, a digital-to-analog (D/A) converter. The digital-voltmeter portion of the software program causes these six binary outputs to change in a sequence to create a current staircase at the output of U2, pin 4. U3 is used as a current-to-voltage converter. The voltage arriving at pin 2 of U4 is a staircase, stepping up from 0 in 0.1-V steps. As the voltage is be-

ing stepped up, the voltage value is tracked in BCD form in accumulator A of the 6800 microprocessor.

A 741 op amp, U4, is used as a voltage comparator. The potential being measured is applied to its noninverting input, pin 3. When the staircase input voltage at pin 2 steps to exceed that at pin 3, the 741 output voltage switches. This signals the microcomputer to halt its staircase function at that point and go to the audio portion of the program. The BCD

information contained in accumulator A is then converted into an audio output by the remainder of the program in conjunction with U5B, which is a buffer, and the loudspeaker. The frequency and length of the individual tones, the time interval between digits, and the sampling rate of the dc signal are all software controlled.

## Calibration and Use

Construction details of the audible voltmeter are left to the builder. Calibra-

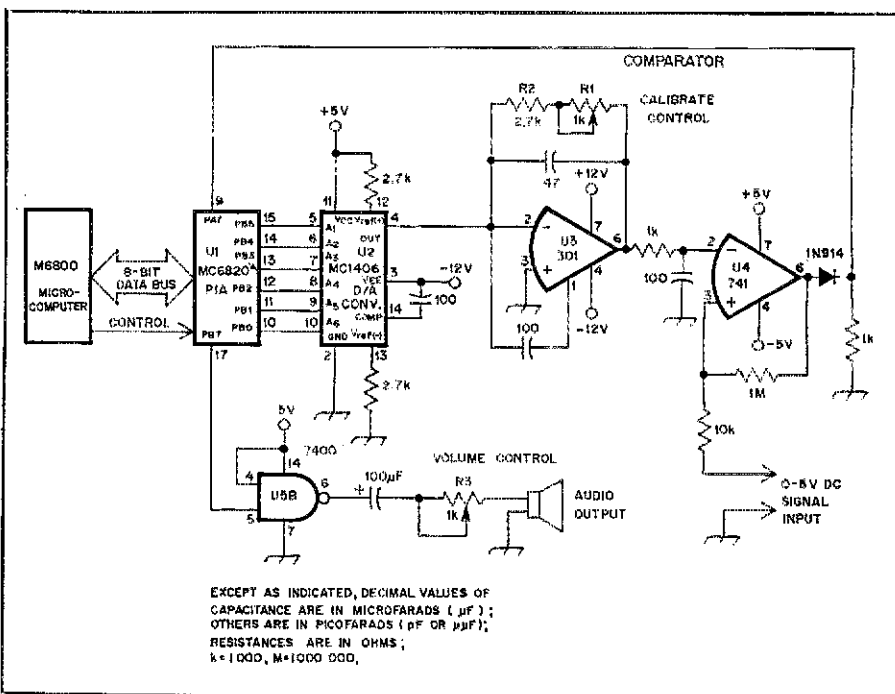


Fig. 1 — Schematic diagram of the interface circuit for the Audible Digital Voltmeter. An M6800 system manual should be consulted for detailed information on the microcomputer, including connections not shown explicitly for U1. Pin connections indicated for U3 and U4 are for the 8-lead mini-DIP versions.

R1, R2 — For text reference.

R3 — Audio taper

U1 — Peripheral interface adaptor IC, Motorola MC6820 or equiv.

U2 — 6-bit multiplying digital-to-analog converter, Motorola MC1406 or equiv.

U3 — General-purpose operational amplifier, Fairchild  $\mu$ A301A or equiv.

U4 — Frequency-compensated operational amplifier, type 741.

U5 — TTL quad 2-input NAND gate, type 7400 (3 sections unused).

\*Dept. of Physical Sciences, Northern Kentucky University, Highland Heights, KY 41076

Table 1

## Program Listing for the M6800 Audible Voltmeter

Address	Op Code	Label	Mnemonic/ Operand	Comment	Address	Op Code	Label	Mnemonic/ Operand	Comment
0000	CE 0004	INITIALIZE	LDX #0004	A SIDE OF PIA IS INPUT	0086	20 E6		BRA BIT1	
0003	FF 8000		STX \$8000		0088	86 02	DDIT(2)	LDAA #02	PRODUCE A DIT(2)
0006	CE FF04		LDX #FF04	B SIDE OF PIA IS OUTPUT	008A	BD 0100		JSR DITONE	
0009	FF 8002		STX \$8002		008D	20 E4		BRA BIT0	
<b>DIGITAL VOLTMETER PROGRAM</b>					008F	86 01	DDIT(1)	LDAA #01	PRODUCE A DIT(1)
000C	C8 FF	VOLTMTR	LDAB #0FF	MAKES OUTPUT OF DAC EQUAL ZERO WHEN STORED TO OUTPUT	0091	BD 0100		JSR DITONE	
000E	4F		CLRA		0094	86 02	DELAY3	LDAA #02	TIME INTERVAL BETWEEN READINGS
000F	F7 8002	LOOP1	STAB \$8002		0096	CE FFFF	LOOP4	LDX #FFFF	
0012	CE 0055		LDX #0055	DELAY TO ALLOW INTERFACE CIRCUIT TIME TO CHANGE	0099	09	LOOP5	DEX	
0015	09	DELAY1	DEX		009A	26 FD		BNE LOOP5	
0016	26 FD		BNE DELAY1		009C	4A		DECA	
0018	7D 8000		TST \$8000	IF COMPARATOR MATCH OCCURS GO TO AUDIO PROGRAM	009D	26 F7		BNE LOOP4	
001B	2A 06		BPL AUDIO		009F	32		PULA	
001D	5A		DECB		00A0	7E 000C		JMP VOLTMTR	GO BACK TO DIGITAL VOLTMETER
001E	8B 01		ADDA #01		00A3	7E 0140	STEP	JMP DAH(2)	GO TO SECOND DAH TONE
0020	19		DAA		<b>SUBROUTINE FOR DIT TONE</b>				
0021	20 EC		SRA LOOP1	CONVERT A TO BCD FORMAT	0100	36	DITONE	PSHA	SAVE NO. OF BITS TO BE PLAYED
<b>AUDIO PROGRAM</b>					0101	CE 00FF		LDX #00FF	DETERMINES LENGTH OF TONE
0023	8E 00B0	AUDIO	LDS #00B0		0104	CA 7F	OUT1	ORAB #07F	MAKE PB7 THE OUTPUT
0026	36		PSHA		0106	F7 8002		STAB \$8002	
0027	84 70		ANDA #070	CHECK FOR FIRST DECIMAL ZERO	0109	86 25		LDAA #025	DETERMINES FREQUENCY OF TONE
0029	2E 03		SGT BIT6	IF NOT ZERO, CONTINUE	010B	4A	LOOP6	DECA	
002B	7E 0120		JMP DAH(1)	GO TO FIRST DAH TONE	010C	26 FD		BNE LOOP6	
002E	32	BIT6	PULA	EXAMINE 2 <sup>6</sup> BIT	010E	09		DEX	
002F	48		ASLA		010F	27 03		BEQ DELAY4	BRANCH IF TONE DURATION ENDED
0030	48		ASLA		0111	53		COMB	TOGGLES PB7 WHEN STORED TO OUTPUT
0031	36		PSHA		0112	20 F0		BRA OUT1	
0032	25 0C		BCS DIT(4)	BRANCH IF IT EQUALS 1	0114	CE 1FFF	DELAY4	LDX #1FFF	TIME INTERVAL BETWEEN DITS
0034	32	BIT5	PULA	EXAMINE 2 <sup>5</sup> BIT	0117	09	LOOP7	DEX	
0035	48		ASLA		0118	26 FD		BNE LOOP7	
0036	36		PSHA		011A	4A		PULA	IS THERE ANOTHER DIT?
0037	25 0E		BCS DIT(2)	BRANCH IF IT EQUALS 1	011B	32		DECA	
0039	32	BIT4	PULA	EXAMINE 2 <sup>4</sup> BIT	011C	26 E2		BNE DITONE	GO BACK FOR NEXT DIT
003A	48		ASLA		011E	39		RTS	GO BACK TO MAIN PROGRAM
003B	36		PSHA		<b>SUBROUTINE FOR DAH TONE AS FIRST DECIMAL ZERO</b>				
003C	25 10		BCS DIT(1)	BRANCH IF IT EQUALS 1	0120	CE 03FF	DAH(1)	LDX #03FF	DETERMINES LENGTH OF TONE
003E	20 13		BRA DELAY2		0123	CA 7F	OUT2	ORAB #07F	MAKE PB7 THE OUTPUT
0040	86 04	DIT(4)	LDAA #04	PRODUCE A DIT(4)	0125	F7 8002		STAB \$8002	
0042	BD 0100		JSR DITONE		0128	86 25		LDAA #025	DETERMINES FREQUENCY OF TONE
0045	20 ED		BRA BIT5		012A	4A	LOOP8	DECA	
0047	86 02	DIT(2)	LDAA #02	PRODUCE A DIT(2)	012B	26 FD		BNE LOOP8	
0049	BD 0100		JSR DITONE		012D	09		DEX	
004C	20 EB		BRA BIT4		012E	27 03		BEQ LSHIFT1	BRANCH IF TONE DURATION ENDED
004E	86 01	DIT(1)	LDAA #01	PRODUCE A DIT(1)	0130	53		COMB	TOGGLES PB7 WHEN STORED TO OUTPUT
0050	BD 0100		JSR DITONE		0131	20 F0		BRA OUT2	
0053	86 01	DELAY2	LDAA #01	TIME INTERVAL BETWEEN DECIMAL DIGITS	0133	32	LSHIFT1	PULA	
0055	CE FFFF	LOOP2	LDX #FFFF		0134	48		ASLA	MOVE CONTENTS OF A FOUR PLACES TO THE LEFT
0058	09	LOOP3	DEX		0135	48		ASLA	
0059	26 FD		BNE LOOP3		0136	48		ASLA	
005B	4A		DECA		0137	48		ASLA	
005C	26 F7		BNE LOOP2		0138	36		PSHA	SAVE A
005E	32		PULA	CHECK FOR SECOND DECIMAL ZERO	0139	7E 0053		JMP DELAY2	GO BACK TO TIME INTERVAL BETWEEN DECIMAL DIGITS
005F	36		PSHA		<b>SUBROUTINE FOR DAH TONE AS SECOND DECIMAL ZERO</b>				
0060	84 F0		ANDA #0F0		0140	CE 03FF	DAH(2)	LDX #03FF	DETERMINES LENGTH OF TONE
0062	27 3F		BEQ STEP	IF ZERO, MAKE 2ND DAH TONE	0143	CA 7F	OUT3	ORAB #07F	MAKE PB7 THE OUTPUT
0064	32	BIT3	PULA	EXAMINE 2 <sup>3</sup> BIT	0145	F7 8002		STAB \$8002	
0065	48		ASLA		0148	86 25		LDAA #025	DETERMINES FREQUENCY OF TONE
0066	36		PSHA		014A	4A	LOOP9	DECA	
0067	25 11		BCS DDIT(8)	BRANCH IF IT EQUALS 1	014B	26 FD		BNE LOOP9	
0069	32	BIT2	PULA	EXAMINE 2 <sup>2</sup> BIT	014D	09		DEX	
006A	48		ASLA		014E	27 03		BEQ LSHIFT2	BRANCH IF TONE DURATION ENDED
006B	36		PSHA		0150	53		COMB	TOGGLES PB7 WHEN STORED TO OUTPUT
006C	25 13		BCS DDIT(4)	BRANCH IF IT EQUALS 1	0151	20 F0		BRA OUT3	
006E	32	BIT1	PULA	EXAMINE 2 <sup>1</sup> BIT	0153	32	LSHIFT2	PULA	
006F	48		ASLA		0154	48		ASLA	
0070	36		PSHA		0155	48		ASLA	
0071	25 15		BCS DDIT(2)	BRANCH IF IT EQUALS 1	0156	48		ASLA	
0073	32	BIT0	PULA	EXAMINE 2 <sup>0</sup> BIT	0157	48		ASLA	
0074	48		ASLA		0158	36		PSHA	SAVE A
0075	36		PSHA		0159	7E 0094		JMP DELAY3	GO BACK TO TIME INTERVAL BETWEEN READINGS
0076	25 17		BCS DDIT(1)	BRANCH IF IT EQUALS 1					
0078	20 1A		BRA DELAY 3						
007A	86 08	DDIT(8)	LDAA #08	PRODUCE A DIT(8)					
007C	BD 0100		JSR DITONE						
007F	20 E8		BRA BIT2						
0081	86 04	DDIT(4)	LDAA #04	PRODUCE A DIT(4)					
0083	BD 0100		JSR DITONE						

tion of the instrument consists only of setting R1 while a known voltage at approximate midrange is being "measured." Move the control very slowly, as just a small amount of rotation may change the audio-indicated output by several tenths of a volt. Depending on the individual IC used at U3, it may be necessary to change the value of the fixed resistor, R2, in order to get a proper calibration. Values such as 3.0 or 3.3 kΩ may be appropriate.

For the most precise calibration, it would be best to check at two potentials straddling the midvoltage value of 2.5, because the instrument is limited by its 0.1-V resolution. Too, the output of the D/A converter may be not quite linear, although any error here should be masked by the resolution limitation when the in-

strument is calibrated properly.

If the builder works primarily with TTL, the maximum range of 5.0 V will be adequate. It is in the interface circuit where this limitation arises. If a sufficiently high voltage is applied to the measurement terminals, the voltage-comparator circuit will reach saturation before a switching crossover occurs in U4. This will place the microcomputer in an endless loop (endless until the overvoltage is removed), and no audio output will result. If one wishes to measure potentials higher than 5 V, a simple voltage-divider circuit may be added at the input. If necessary, the software can be modified so the BCD information in accumulator A tracks the voltage range ahead of the divider.

Note that the proper voltage polarity

must be observed at the signal-measuring input. If the polarity is inadvertently reversed, the voltmeter will emit "dah dah" (0.0), no matter what the potential.

As mentioned earlier, the speed of the audio information is software controlled. The absolute rate will be a function of programmed values and the clock frequency used in the microcomputer. The timing for the individual digits can be altered to one's own liking by changing the delay times in the program. These are identified in the "Comments" column of Table 1. The user may find, as I did, that a faster speed is desirable after one gains familiarity with the instrument. Now with my voltmeter it's no longer dit dit (pause) dit dit dit dit dit but instead, didit diditdidit. □

## Additional Notes on the Audible Digital Voltmeter

By Jerry Hall,\* K1TD

The foregoing article presents a very interesting and yet affordable approach to a "talking" voltmeter... the device actually tells you, with its audio output, what voltage potential is being measured. Wagner's software approach was directed fundamentally at visually handicapped persons who may not necessarily know

Morse code. For some amateur applications it may be desirable to have the voltmeter talk in Morse code, rather than dahs and incrementing dits. This can be done simply by replacing the audio portion of Wagner's software program.

A suitable Morse code subprogram is given in the table accompanying this article. This information is presented with highest regard for the work Wagner has done in designing this unique instrument,

and is intended only to supplement that data. As a user, you should choose the audio subprogram of your liking.

With this subprogram the code speed will be a function of the clock frequency of your microcomputer, as well as the delays created at addresses 0031-32, 005B-5C, 006E-6F, and 0077-78. The program values presented in the table are for a code speed of 20 wpm with a clock frequency of 614.4 kHz. For other code

\*Technical Editor, QST

### Audio Subprogram for Sending Numbers by Morse Code.

The beginning of the program presented in Table 1 of the preceding article, memory addresses 0000 through 0022, is to be used in conjunction with the program information given here.

Address	Op Code	Label	Mnemonic/ Operand	Comment	Address	Op Code	Label	Mnemonic/ Operand	Comment
0023	8E 01F0	AUDIO	LDS #01F0	DEFINE STACK	0057	36		PSHA	SAVE REMAINING ELEMENTS
0026	16		TAB	SPLIT VALUE INTO TWO DIGITS	0058	25 1C		BCS DAH	BRANCH IF DAH
0027	C4 0F		ANDB #0F		005A	CE 0096	DIT	LDX #0096	DIT DURATION
0029	44		LSRA	MOVE HIGH NIBBLE TO LOW NIBBLE	005D	CA 7F	TONE	ORAB #07F	MAKE PB7 THE OUTPUT
002A	44		LSRA		005F	F7 8002		STAB #8002	
002B	44		LSRA		0062	86 25		LDA #25	DETERMINES FREQUENCY OF TONE
002C	44		LSRA		0064	4A	LOOP6	DECA	
002D	37		PSHB	SAVE SECOND DIGIT	0065	26 FD		BNE LOOP6	
002E	8D 16		BSR CODE	SEND CODE FOR FIRST DIGIT	0067	09		DEX	
0030	CE 23F4	DELAY 2	LDX #23F4	TIME INTERVAL BETWEEN DIGITS	0068	27 03		BEQ DELAY4	BRANCH IF TONE DURATION ENDED
0033	09	LOOP2	DEX		006A	53		COMB	TOGGLES PB7 WHEN STORED TO OUTPUT
0034	26 FD		BNE LOOP2		006B	20 F0		BRA TONE	
0036	32		PULA	GET SECOND DIGIT	006D	CE 11FB	DELAY4	LDX #11FB	TIME BETWEEN ELEMENTS
0037	8D 0D		BSR CODE	SEND CODE FOR SECOND DIGIT	0070	09	LOOP7	DEX	
0039	86 02	DELAY3	LDA #02	TIME INTERVAL BETWEEN READINGS	0071	26 FD		BNE LOOP7	
003B	CE FFFF	LOOP3	LDX #FFFF		0073	32		PULA	GET REMAINING ELEMENTS
003E	09	LOOP4	DEX		0074	20 DC		BRA ELEMENT	GO BACK TO COMPLETE CHARACTER
003F	26 FD		BNE LOOP4		0076	CE 01C3	DAH	LDX #01C3	DAH DURATION
0041	4A		DECA		0079	20 E2		BRA TONE	
0042	26 F7		BNE LOOP3		007B	39	OUT	RTS	RETURN TO MAIN PROGRAM
0044	20 C6		BRA VOLTMTR	GO BACK FOR ANOTHER READING					
<b>SUBROUTINE TO SEND MORSE CODE</b>					<b>LOOK-UP TABLE *** BIT PATTERNS FOR MORSE CODE</b>				
0046	CE 0000	CODE	LDX #0000	LOOK UP MORSE CODE PATTERN	0080	FC	0		A 1 BIT IS USED FOR A DAH
0049	4D	LOOP5	TSTA	FOUND YET?	0081	7C	1		A 0 BIT IS USED FOR A DIT
004A	27 04		BEQ DIDAH	IF YES, BRANCH	0082	3C	2		A 1 BIT IS ADDED AT THE END
004C	4A		DECA	NO, KEEP LOOKING	0083	1C	3		OF EACH BIT PATTERN TO INDICATE
004D	08		INX		0084	0C	4		END OF CHARACTER
004E	20 F9		BRA LOOP5		0085	04	5		AFTER LEFTSHIFT
0050	A6 00	DIDAH	LDA #0X	GET PATTERN IN A	0086	84	6		
0052	81 00	ELEMENT	CMPA #00	CHARACTER COMPLETED?	0087	C4	7		
0054	27 25		BEQ OUT	IF YES, EXIT SUBROUTINE	0088	E4	8		
0056	48		ASLA	PREPARE FOR NEXT CODE ELEMENT	0089	F4	9		

speeds and clock frequencies, you can either try different delays experimentally until the code sounds good to your ear, or you can take the more sophisticated approach of figuring out the hexadecimal values from the equations of the appendix. With the correct delays, the code has a "perfect, machine-sent" characteristic, even though there are various minor differences in loop lengths from character to character, such as in finding the correct bit pattern in the look-up table.

The bit patterns in the look-up table generate "pure" code characters — five dahs for a zero, dahdahdahdahdit for a nine. If you prefer the shorthand zero (a single dah), load a hexadecimal C0 at program address 0080. For a shorthand nine (the letter N), load hex A0 at 0089. (The basic concept used here in generating the code permits the sending of any character up to seven elements in length, as outlined in the "Comments" column of the look-up table.) Now you can let your voltmeter *really* do the talking, in a language known by amateurs throughout the world.

#### Appendix

Many readers will know that "perfect"

code has a 1-3-7 relationship, where the duration of a dit tone is the fundamental unit. The dah tone should be exactly three times as long. The interval of time between the elements of a code character should equal a dit in duration. The time between two characters (letter space) should equal three times that of a dit, and between code groups (word space) equal to seven times that of a dit. The following equations, based on these time relationships, will allow you to adjust the program values to whatever code speed you desire, whatever your clock frequency.

$$N = \frac{1.2 \times CF}{wpm} \quad (\text{Eq. 1})$$

where

N is a constant used in the equations

below;

wpm is the desired code speed in words per minute; and

CF is the clock frequency of your microcomputer in *hertz*.

$$\text{Value at } 005B-5C = \frac{N - 13}{245} \quad (\text{Eq. 2})$$

$$\text{Value at } 006E-6F = \frac{N - 37}{8} \quad (\text{Eq. 3})$$

$$\text{Value at } 0077-78 = \frac{3N - 13}{245} \quad (\text{Eq. 4})$$

$$\text{Value at } 0031-32 = \frac{3N - 138}{8} - P \quad (\text{Eq. 5})$$

where

P is the whole-number value obtained from Eq. 3 (see below).

Note that the constants in the above equations are *decimal* values, not hexadecimal. Unless you're an expert in performing calculations with hexadecimal numbers, I suggest working with decimal values and then converting the answers to hexadecimal form for use in the program. Most likely your answers will come out with a decimal fraction. The values should be rounded to the nearest whole number before converting to hexadecimal form. [E5]

# Strays



## CALL FOR TECHNICAL PAPERS

□ The 25th National ARRL Convention, in recognition of the League's continuing commitment and contribution to Amateur Radio since 1914, will be held from July 25 to 27, 1980, in Seattle, WA. Technical seminars covering all aspects of Amateur Radio will be part of the convention activities. Because of the broad scope covering technical, operational and service interests, it is anticipated that the seminars will result in concurrent sessions. Papers are solicited for this convention which emphasize recent advances in theoretical and empirical techniques; design and construction practices; operational procedures, traffic, service, contests, public relations and emergency operations for experienced, new or prospective hams; Cycle 21 propagation status and forecasts; interference and tower liabilities, legislation and/or litigations; and WARC-79 update.

Prospective authors are invited to submit three copies of an abstract of 500 to 1000 words by November 1, 1979, to the Technical Sessions Chairman, P. O. Box 68534, Seattle, WA 98168. Authors will be notified of acceptance by December 1, 1979, and will be expected to submit a

short abstract of no more than 75 words for the convention brochure by March 1, 1980. Final full manuscripts (three copies) will be due no later than April 15, 1980. The language for the conference, abstracts and manuscripts will be English. International participants are welcome. The chairman of the sessions will allocate the time for the presentations according to content of the papers.

All abstracts submitted must include the following information: complete title; author's name, call, mailing address and League affiliation; a concise statement of the content of the paper (and possibly its genesis) or the objective covered; an indication of the scope of the paper coupled with a statement of what is considered to be the contribution or interesting application of the specific subject and to the general Amateur Radio community; and free-hand sketches of major figures, tables, graphs, circuit diagrams, drawings or photographs to be used in the final paper.

Authors of accepted papers will be expected to meet all schedule deadlines. All program participants and authors will be charged the regular registration fee at the meeting. — *William W. Bingham, WA7VEH*

## VHF AWARD AVAILABLE

□ The Mt. Airy VHF Radio Club, W3CCX, has announced sponsorship of the Sam Harris Memorial VHF Activity Award. The trophy will be presented to the top scoring multioperator, *portable* station in the September ARRL VHF QSO Party. For more information, send s.a.s.e. to Harry Brown, W3IIT, 3012 Potshop Rd., Norristown, PA 19403.

## SPARE PARTS NEEDED

□ Attention New Hampshire and eastern New York amateurs. Do you have some usable spare parts in your junk box you'd like to see put to good use by new amateurs in the developing countries of Africa and Asia? Carl E. Wolfe, W2IQK, has generously volunteered to serve as a collection agent in your area. If you can conveniently get the parts to him, he will see that they are delivered to ARRL hq. for immediate shipment overseas. Carl's address is Mt. Orange Rd., Box 16F, Slate Hill, NY 10973, tel. 914-355-1596 or 603-756-4300. Carl also can be reached most days on the EASTCARS net, 7255 kHz. — *Bruce Johnson, WA6IDN*

# The Carpenter's Delight

This low-cost directional array will appeal to the occasional 6-meter operator. Wood, PVC pipe and wire are used in the construction of this two-element quad.

By Paul H. Bock, Jr.,\* K4MSG

The Carpenter's Delight is a simple, low-cost 50-MHz antenna that represents a good compromise between cost and gain. If built with all new materials, the total investment (excluding feed line) should not exceed \$20.

Most amateurs new to vhf think in terms of a Yagi array for directional applications. However, from the standpoint of simplicity, low cost, and ease of assembly and adjustment, a vhf quad is hard to beat. This is especially true when you consider that many common materials, such as lumber and PVC pipe, may be used in construction of the antenna.

The design details of this two-element, 6-meter quad are shown in Figs. 1 and 2. The quad boom and end plates are wooden, and the quad loop spreaders are 1-1/2-inch (38-mm) diameter PVC pipe. If the end plates are made larger than shown in Fig. 1, sufficient spread can be obtained using wooden dowels or fiberglass rods, normally available in 36-inch (914-mm) lengths. Dowels will make the structure more rigid, although somewhat heavier.

The element spreaders are cut from 10-foot (3-m) lengths of PVC pipe, available in most hardware stores. Small holes are drilled in the ends of the spreaders to support the 16-gauge stranded copper wire elements.

The design shown has a feed-point impedance of 75 ohms, and was chosen to allow utilization of spare coax I had on

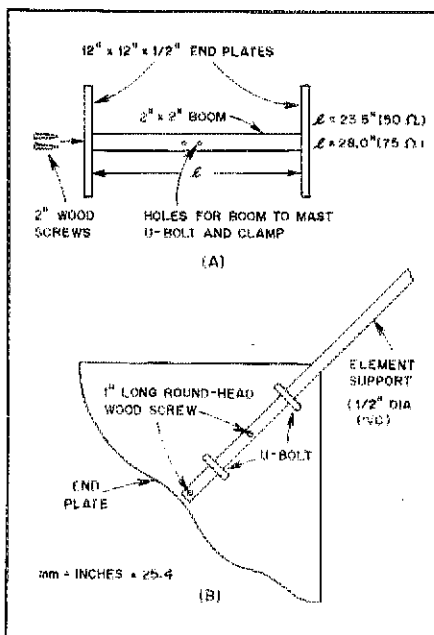


Fig. 1 — Boom and end-plate construction is shown in the drawing at A; element support attachment to end plate at B.

hand. However, by changing the spacing between the driven element and reflector, you can obtain a 50-ohm feed-point impedance, if that is desired. The correct spacing for 50 ohms is 23.5 inches (597 mm), as opposed to 28 inches (711 mm) for 75 ohms. The decoupling sleeve (see Fig. 3) is 40 inches (1016 mm) in either case. Since the sleeve length is a function of wavelength and the velocity factor of the *outer* insulation, it will remain essentially the same for any of the common

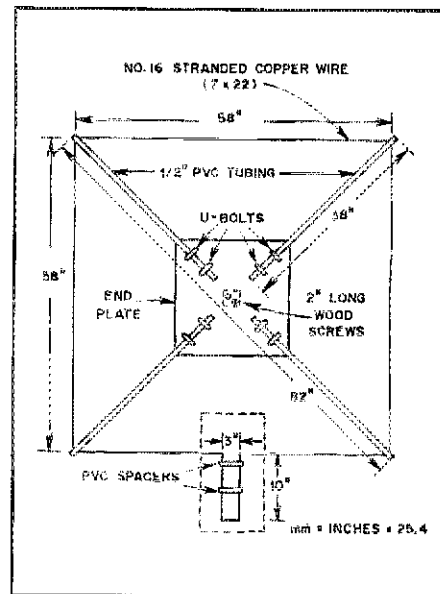


Fig. 2 — Pictorial drawing of the reflector element for the two-element quad. The driven element is identical except that the stub (shown here inside a broken line) is replaced with the feed-point terminals.

varieties of coax (RG-8, -11, -58, and -59/U), because they all have the same type of outer jacket. The sleeve itself is made of coax braid, smoothed over the feed line and soldered to the feed-line shield as shown in Fig. 3.

As with any wood structure that is used outdoors, a liberal application of varnish is vital. Sealing the connections to the driven element and wrapping the sleeve balun tightly with electrical tape will ensure a waterproof system that won't

\*204 S. Harrison Rd., Sterling, VA 22170

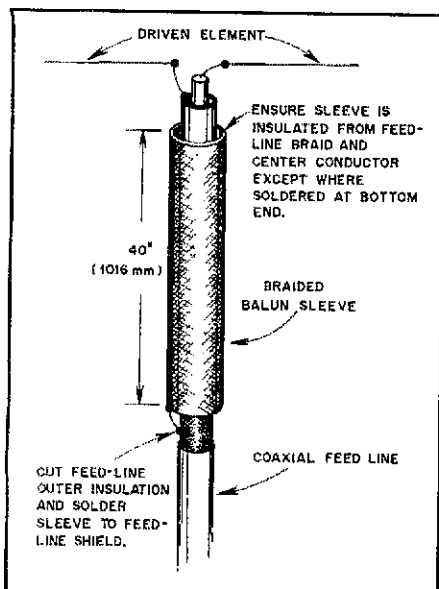


Fig. 3 — Details of the sleeve balun used with the 6-meter quad.

corrode and cause problems prematurely.

Testing is rather straightforward and easy to accomplish. Tune up and check

the VSWR, which should be around 1.5 or less at the design frequency (50.150 MHz using the dimensions shown). If the VSWR is unusually high, check the element spacing and the balun connection. If the VSWR is normal, check the front-to-back ratio using a field strength meter; 20 to 25 dB is a good figure. If the front-to-back ratio is significantly less than 20 dB, shorten the reflector stub a small amount and check again. Continue this process until the front-to-back ratio has been optimized. Generally, if the element dimensions are correct, the frequency of maximum forward gain will coincide with the frequency of optimum front-to-back ratio.

Operation on 6 meters with the quad has been most satisfying. Many excellent QSOs have been completed using everything from ground wave and sporadic E to the more esoteric aurora mode. The antenna has held up well, and I highly recommend it for the occasional user of 6 meters who is unwilling to lay out a lot of cash for a new Yagi array. Fig. 4 shows the quad as it should look after assembly is completed.

Incidentally, my neighbors thought the quad was a kite, the eight-year-old junior

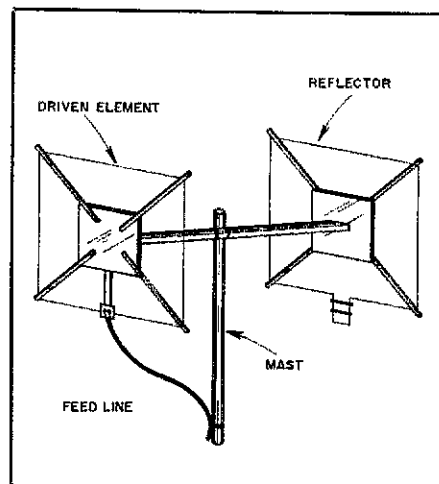



Fig. 4 — An overall view of the Carpenter's Delight 6-meter quad. The feed line and terminal block should be supported by a wooden strip attached to the bottom of the driven element end plate, as shown.

op likened it to a *Star Wars* "tie fighter," and all the local "good buddies" just shook their heads and agreed that my "set of beams" was much too small! 

## Feedback

□ WA8JND reports that there should be an additional number after the Supertex VMOS transistors specified in DeMaw's article, "An Experimental VMOS Transmitter," May 1979 *QST*, pages 18-22. The TO-3 device number is VN1206N-1 and the TO-39 (smaller) transistors are VN0106N-2 units. Apparently the -1 stands for TO-3 and the -2 signifies a TO-39 case. He also reports that the Supertex VN5-A is an equivalent part for the VN88AF (Siliconix) VMOS transistor specified in the Hayward article in the same issue of *QST*, "A VMOS FET Transmitter for 10-Meter CW." WA8JND goes on to say that the Siliconix parts are almost impossible to purchase in small quantities, but that Hamilton-Avnet outlets seem to have a limited number of the transistors for single-lot purchasers.

□ A number of errors occurred in "A Digital Morse-Code Clock" (July 1979 *QST*, page 33). The schematic diagram shows U10 as a 7400 NAND gate; it should be a 7408 AND gate. Pin connections for both ICs are the same. On both the schematic diagram and the foil pattern, pin 14 of U3 should be connected to pins 3 and 8 of U2, not pins 2 and 9. The 470-Ω resistors shown between pins 7 and

8 of U20 and U21 should be changed to 470-kΩ resistors. Although U1-U8 are decade-divider ICs, U2, U4 and U6 are used in the circuit to divide by 6. On the parts-placement guide, the 0.01-μF capacitor connected to pins 6 and 7 of U20 should have been shown as a 1-μF capacitor. Also, the jumper going from pin 8 of U18 to ground actually should go to +V<sub>CC</sub>.

□ In the TR-7 Product Review published in May 1979 *QST*, on page 37, column three, first paragraph, the words "(third order intercept)" should be deleted, as the IMD measurement discussed is dynamic range.

□ The article on page 77 of June *QST* should have been titled, "Results, 1979 Simulated Emergency Test — Edition One."

□ The June cover showed the Field Day tower of the Glen Gates Gang, whose members hail from Wisconsin, not Indiana.

□ In "Silent Keys," April *QST*, page 75, the QTH of Jack L. Drinkall, K7IRY, was listed as Nampa, FL. It should have read Nampa, ID.

## Strays

### PROJECT GOODWILL

□ Many amateurs are inquiring about the availability of the Project Goodwill transmitter and receiver kits for domestic use. We can't provide the kits for anyone but radio amateurs in developing countries, because the kits are sponsored by contributions from clubs and individuals expressly for amateurs in these countries. But you can build the kits yourself by using the articles found in April 1978 *QST* (receiver) and December 1978 *QST* (transmitter). (See also "Feedback," May and July 1978 and February 1979 *QST*.) Parts should be easily obtained. Or, if you prefer, you may purchase pre-packaged kits with stenciled cabinets and circuit boards directly from Circuit Board Specialists, P. O. Box 969, Pueblo, CO 81002; or from G. R. Whitehouse, 11 Newberry Dr., Amherst, NH 03031. — Bruce Johnson, WA6IDN

### NET DISCONTINUED

□ KA8AKL reports that the 15-meter WAS net has been discontinued. A 40-meter net has been started on 7.135 MHz at 0800 UTC Saturdays, though.

# The CMO — A Capacitance-Measuring Oscillator

Put this handy device to work at your bench. With the help of your receiver, the novel instrument checks the values and tolerances of capacitors. It's reliable!

By Frank Noble,\* W3MT

In line with the ARRL members' expressed interest in simple weekend project articles for *QST*, I offer this description of a practical capacitance-measuring device I made recently. Any amateur who enjoys construction or is concerned about tests should find this inexpensive instrument a useful adjunct to equipment now owned. I cannot conceive of a simpler or more economical way of finding the values of unmarked capacitors, whether they are fixed or variable.

By means of this capacitance-measuring oscillator, I've found that tolerances on various capacitors are often exceeded. That's an eye-opener! The CMO may be applied, too, where oscillator and crystal capacitances must be measured with considerable accuracy such as in the verification of VXO theory.

If you look at Fig. 1, you will observe that the MOSFET oscillator circuit is designed with a Hartley configuration. I chose to have the fundamental frequency in the region of 1.75 MHz because coil forms I already had on hand were well suited for coils designed for that part of the frequency spectrum. Another reason is that my dip oscillator does not tune below that frequency.

Operation of the CMO for the purpose outlined here depends on the use of the fourth harmonic of the fundamental signal. You can easily verify that an oscillator operating with a capacitance  $C_0$  at any subharmonic,  $n$ , of 7000 kHz will have a harmonic that appears as though the oscillator were on 7 MHz. The fourth harmonic of the CMO is tuned in on the station receiver for the purpose of performing capacitance measurements. Accordingly, the range of  $C_x$  in Fig. 1 is 0 to 300 pF, inasmuch as the receiver tunes across the 40-meter band (7000 kHz to 7300 kHz). It is not accidental that the fre-

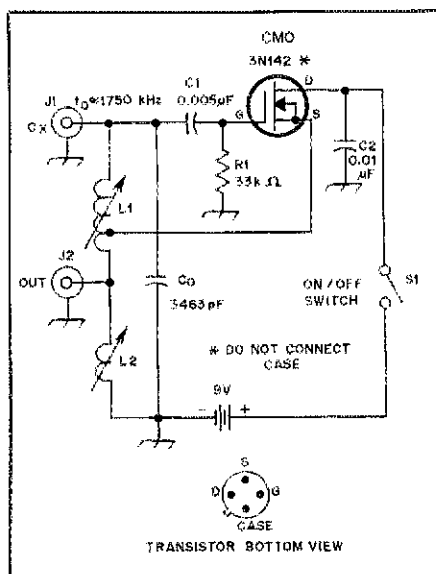


Fig. 1 — Circuit diagram for the W3MT capacitance-measuring oscillator. Many old-timers who started in Amateur Radio with single-tube transmitters will recognize this as a transistorized version of the well-known Hartley oscillator. National XR-50 mica-filled Bakelite slug-tuned coil forms are used for L1 and L2. The form winding dimensions are length — 11/16 inch (17 mm); width — 1/2 inch (13 mm). The Millen no. 69046 ceramic coil form approximates these dimensions. Millen coils and forms recently have been produced by the Electronic Instrument and Specialty Co., 42 Pleasant St., Stoneham, MA 02180.  
 $C_0$ ,  $C_x$  — See text.  
 J1, J2 — Coaxial connectors, type SO-239.  
 L1 — 14 turns of hookup wire on 1/2-inch (13-mm) dia slug-tuned coil form. Move tap down to increase feedback.  
 L2 — 1 turn of hookup wire on same type form as L1.

quency deviation, about which we are concerned in these measurements and indicated in kHz, equals  $C_x$  in pF.

The circuit diagram indicates that  $C_0$  is a fixed capacitor, which may seem large at first when you are thinking in terms of 40 meters. Keep in mind, however, that the

oscillator is fundamentally operating just outside the 160-meter band.

Tuning adjustments are made by means of slug-tuned coils, L1 and L2. L2, being the smaller of the two, facilitates obtaining the final slug setting. A capacitor having a very small value couples the low-impedance output of the oscillator to a coaxial cable leading to the receiver antenna terminals.<sup>1</sup>

## Accuracy

In regard to accuracy of the measurements made with the CMO, Fig. 2 shows that the error is zero at midrange and increases linearly to a maximum of  $\pm 1$  percent at the ends of the tuning range. In a practical sense, however, unless a frequency counter is employed and extreme care is used, this degree of accuracy normally will not be obtained. Nevertheless, by performing the measurements meticulously, highly reliable results may be produced. Besides the use of a frequency counter for more precise measurements, you can also employ capacitance substitution methods if precision components are available.

## Capacitance Ranges

There are two ranges for measuring unknown capacitances by means of the CMO. The basic range A covers from 0 to 300 pF. Range B extends from 300 to 10,000 pF but involves the sacrifice of a direct-indicating feature that is available for the lower range measurements. Inductances between 0 and 50  $\mu$ H may also be measured with the CMO.

## Using the CMO

Calibration of the capacitance-measuring oscillator is accomplished with the aid of a known 150-pF capacitor. This standard is connected to the  $C_x$  ter-

\*10004 Belhaven Rd., Bethesda, MD 20034

<sup>1</sup>Notes appear on page 39.



minals. L1 and L2 are adjusted so that the fourth harmonic of the oscillator is found at 7000 kHz, as indicated by the receiver. The standard is then disconnected and the signal is tuned to zero beat at what should be 7150 kHz. If the new frequency is above 7150 kHz,  $C_0$  is too small and vice versa. Once set in this manner, the system provides direct reading in kHz of  $\Delta f$  per pF of  $C_x$  within approximately 1 percent. Of course the absolute accuracy can be no better than the 150-pF standard. Air variables in good condition are dependable as standards.<sup>7</sup>

If the CMO is stored for any length of time, recalibration should be performed before a measurement is run to make sure that  $C_0$  has not wandered in the meantime. This task may be performed quickly.

### CMO Mathematics

The procedure for determining the value of  $C_0$  may be understood more fully through application of the following equations. Let us begin by presuming we have a fixed-coil VFO operating at frequency  $f_{hi}$  with capacitance  $C_0$ .

$$f_{hi} = \frac{1}{2\pi\sqrt{LC_0}} \quad (\text{Eq. 1})$$

Now connect an additional capacitance  $C_x$  in parallel with  $C_0$ . The frequency will decrease to the value

$$f_{lo} = \frac{1}{2\pi\sqrt{L(C_0 + C_x)}} \quad (\text{Eq. 2})$$

Then

$$\frac{f_{hi}}{f_{lo}} = \sqrt{\frac{C_0 + C_x}{C_0}} = \sqrt{1 + \frac{C_x}{C_0}} \quad (\text{Eq. 3})$$

$$f_{hi} - f_{lo} = \Delta f = f_{lo} \left[ \sqrt{1 + \frac{C_x}{C_0}} - 1 \right] \quad (\text{Eq. 4})$$

From Eq. 4,

$$C_0 = \frac{C_x}{\left[ \frac{\Delta f}{f_{lo}} + 1 \right]^2 - 1} \quad (\text{Eq. 5})$$

Substituting  $C_x = 150$  pF,  $\Delta f = 150$  kHz, and  $f_{lo} = 7000$  kHz,  $C_0 = 3462.92$  pF, or about 3463 pF.

Recall that the term  $\Delta f$ , referring to the amount of frequency deviation produced when the unknown capacitance is disconnected from the CMO, has been mentioned previously. The following equations are related to this deviation. For measuring capacitances in range B (those exceeding 300 pF), we connect the unknown in series with the 300-pF standard. Reference is made particularly to

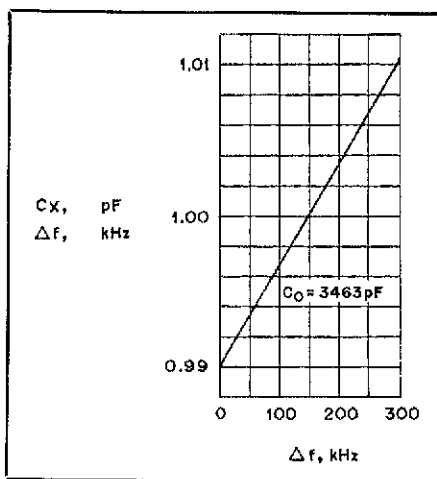


Fig. 2 — A graph showing the linear behavior of the CMO accuracy. The error is zero at midrange and increases to approximately  $\pm 1$  percent at the ends.

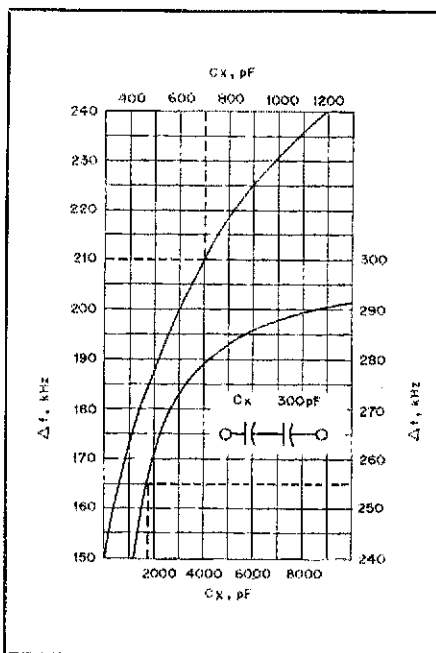


Fig. 3 — A graphical representation of the relationship of capacitance to deviation in frequency for the CMO.

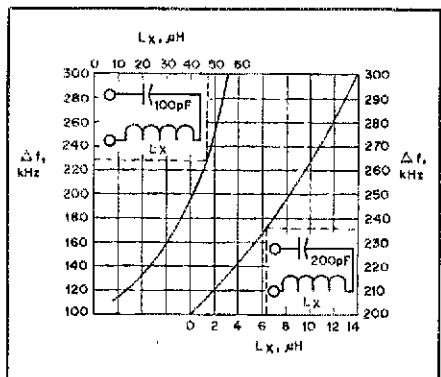


Fig. 4 — A limited amount of inductance can be determined with the aid of the CMO. The representations in this figure indicate the effects of inserting a 100-pF or 200-pF capacitor in series with the unknown inductance.

the paragraphs on capacitance ranges. To determine the frequency deviation in terms of kHz on the 40-meter band, then

$$\Delta f = \frac{300 C_x}{300 + C_x} \text{ kHz on 40 meters} \quad (\text{Eq. 6})$$

For inductance measurements, we make use of the fact that an inductance connected in series with a capacitance will reduce the net capacitive reactance, i.e.,

$$\frac{1}{\omega C_x} = \frac{1}{\omega C_s} - \omega L_x \quad (\text{Eq. 7})$$

where

$\omega$  corresponds to 1750 kHz, the actual measurement freq.

$C_x$  is the apparent capacitance of the LC combination

$C_s$  is a known capacitance

$L_x$  is the unknown inductance

From this


$$C_x \Delta f = \frac{1}{\frac{1}{C_s} - 120.9 \times 10^{-6} L_x}$$

kHz on 40 meters

$$\begin{aligned} C_s \text{ in pF} \\ L_x \text{ in } \mu\text{H} \end{aligned} \quad (\text{Eq. 8})$$

Plots of the above equations are given in Figs. 3 and 4.

### Construction

The CMO is housed, complete with a 9-V battery, inside a steel  $4 \times 4 \times 2$ -inch ( $102 \times 102 \times 51$ -mm) box. The top plate has been replaced with a 1/8-inch (3-mm) thick aluminum cover for mechanical stability and workability. The  $C_x$  and output terminals are SO-239 connectors located on opposite side walls. The coil slugs are rigged with knobs<sup>3</sup> adapted to the threads by tapped 1/4-inch (6-mm) shafting secured by means of lock washers and nuts. Most of the components, including the transistor, are soldered to a terminal strip placed along the center of the top plate. If reasonable care is exercised in keeping things mechanically stiff, it will be found that measurements are reproducible to within the ambiguity of the receiver zero beat adjustment. 

### Notes

<sup>1</sup>A small capacitor is made by leaving the polyethylene unstripped at one end of the RG-58/U cable. The insulation will pass through the sleeve of the PL-259, forming a very neat capacitor having about the right value. Label this end for connection to the CMO and to avoid having the cable inadvertently connected elsewhere.

<sup>2</sup>A neat standard that seems stable can be made by connecting three 100-pF 5-percent silver-mica capacitors in a delta configuration. Clearly, there is 150 pF between any pair of junctions.

<sup>3</sup>Use plastic knobs. Metal knobs will cause some frequency shift when touched, even with the coaxial-cable shield connected between the CMO and the receiver.

# Photographic PC Boards Without Expensive Equipment

Top-quality boards can be made using this method. An inexpensive transparency, a printing frame, and the sun are the tools!

By William D. Taylor,\* W4POS

For some time, I searched for a method that would enable me to duplicate the printed-circuit etching patterns that are often found in magazine construction articles. The search led me to a method that I now use with great satisfaction and excellent results. Now that *QST* is printing separate etching patterns, we can look forward to producing amateur gear that will resemble professional equipment.

While searching for a process, I tried various methods that would give me a good negative image. The negative or black image is the heart of the photographic process. You will notice that most patterns are printed in black. This is for the purpose of good reproduction. Magazine-printed etching patterns are of high quality, thus permitting high-

quality reproduction. Some of the methods I tried were either too costly, too time consuming, or the results were far less than professional looking.

The photographic process of obtaining a negative is a good way to get excellent results. However, the cost of the necessary equipment might be more than you want to invest in.

## Without Photographic Equipment

Reproduction is the name of the game. The objective is to reproduce the etching pattern on a clear sheet, such as transparent Mylar. The steps involved in reproducing the pattern can be quite easy, and inexpensive.

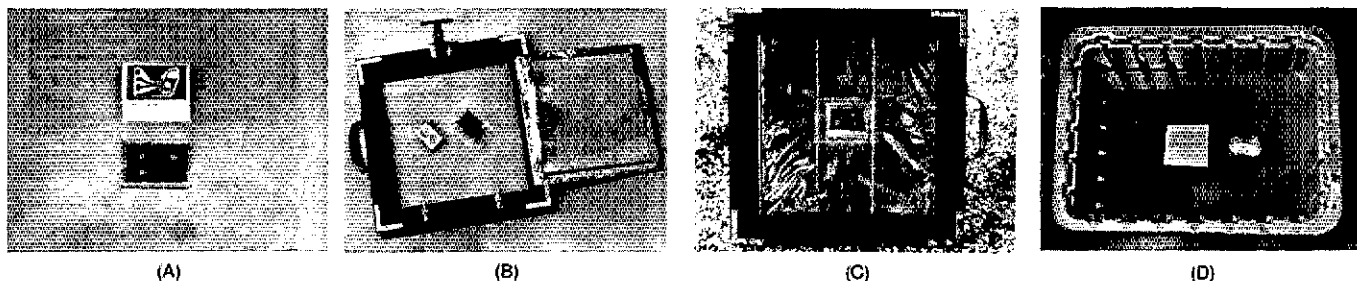
Once you have decided on a pattern that you want to reproduce, it is just a matter of cutting it out of the magazine and taking it to your nearest elementary school, high school, college or university.

Most schools have a Thermo-fax transparency-producing machine. This is just what you want . . . a transparency to use as a negative. The Thermo-fax equipment will produce a black image on clear plastic. It takes approximately five seconds to reproduce your circuit-board etching pattern on the transparency sheet.

## The Benefits of Using Transparencies

The original magazine artwork you cut out will not be ruined by making a transparency of it. Thus, you can make several copies of the pattern for others who might be interested in the circuit. The transparency is not produced like a photographic negative, but more like a photocopy. If you desire, you can scrape any portion of the image away with a pen knife, and you can still retain the desired image. But the most beneficial aspect of using transparencies is the ability to

\*809 Alton Rd., Danville, KY 40422



A pc etching pattern and transparency made from it are shown at A. The pattern is from the ARRL Code Kit booklet — a code practice oscillator. In the photo at B, the transparency and a completed pc board made from it are inside the open printing frame, shown here from the back. A sensitized pc board and transparency pattern are stacked and sandwiched inside the printing frame, at C. The exposed board, shown at D, is treated with a developer to remove unwanted portions of the etch-resist coating. When this is completed the circuit pattern is clearly visible.

reproduce the pattern at *actual size*. This is important for accurate component placement. IC pin spacing can be very critical on a circuit board, and accuracy should be considered when you reproduce your pc board. One thing is certain: You can't beat the accuracy of a good transparency.

### Presensitized Circuit Boards

Normally the size of your artwork will dictate the size of the presensitized copper board you select. If your cut-out magazine pc pattern is rather small, say two inches (50 mm) square, the smallest presensitized board you will be able to purchase will probably be a 2 × 4-inch (50 × 100-mm) piece. The answer to this problem is to cut the circuit board in half with a hack saw, and save the other half for a future project. Remember, presensitized boards are just that: sensitive to light. Cut the board in diffused white light or in a dark room using a yellow "bug light." A red light will also work. Presensitized circuit boards are usually wrapped in black plastic. If you need to cut the board, leave the black bag attached. This will prevent light from striking the board, and also prevent you from handling the board itself.

GC Electronics produces a line of products that will more than adequately meet your needs for presensitized circuit boards and developing solutions. Quality pc etching materials may also be obtained from DATAK Corp., KEPRO Systems and others, but the pc duplicating method may vary with differences in materials from manufacturer to manufacturer. For the past two years, I have been using the *positive* presensitized circuit boards without any difficulty.

### The Contact Printer

The contact printer or contact frame is a piece of equipment you will use over and over again. This is where you place your transparency and presensitized board that is to be exposed to light. It would be wise to buy or build a contact printer. Since the contact printer is relatively simple in design, it should be very easy for you to construct one. Essentially, the contact printer is nothing more than a 12 × 12 × 1/8-inch (300 × 300 × 3-mm) piece of plate glass with a wooden frame around it and a removable back door. The photographs in this article should give you ideas on how to construct your own printing frame.

### Exposing the Circuit Board

Once you have a transparency and a presensitized circuit board, you are ready to expose the circuit board to a light source. Place the transparency over the presensitized board. Do this in subdued light. Although diffused white light is sufficient, I prefer to play it safe and use a low-wattage red light bulb. Put the

transparency and the circuit board into the contact printer. The transparency goes against the glass, with the circuit board behind it. Be sure the proper side of the transparency is against the pc board. If the wrong side is facing out, the board will come out backward. For some projects this is not a problem, but with circuits that contain ICs or other multipin devices, the pc artwork must be transferred correctly to the board. When the materials are placed inside the printing frame, look at the pattern through the glass front. The pattern should appear as you want the board to appear. Close the unit and you are ready to expose the board to a source of light. You can use direct sunlight, as I do, or you can use a sun lamp for exposure. Either way works fine.

Here is the important item: time of exposure. The exposure time I use is 1 to 1-1/2 minutes. If you use more time than this, the light source will begin to penetrate the black image on the transparency and this will cause small pin holes to develop on the circuit board during the etching process. Therefore, use a clock or wristwatch when exposing the board to sunlight. One to 1-1/2 minutes is also the approximate exposure time when you use a sun lamp placed 12 or 14 inches (300 or 350 mm) from the printing frame. *Don't use a heat lamp for exposure.* The heat lamp does not emit enough ultraviolet radiation to do a good job. Experiment with the bulb-to-printing-frame distance until you arrive at an optimum combination of exposure time and distance. Use small pieces of pc boards for this.

### Developing the Circuit Board

Retrieve the circuit board from the contact printer and you are ready to develop the board. This is a relatively easy step. The developer I use is a GC Electronics positive type developer concentrate. Use the positive type only if you used a *positive* presensitized circuit board. The instructions on the developer call for one part of the developer concentrate to four parts of water. With this mixture, your developer will last for quite some time. Put the solution into a plastic or glass tray. Slip the board into this solution and begin agitating the solution by rocking the tray. The instructions also call for a cotton ball to gently swab the board. The developing time is not very critical, as compared to the exposure time. I usually swab the board for approximately two minutes. After about one minute, you will notice the image of your pattern beginning to appear on the board. At the end of two minutes, the image will be clearly visible. Wash the board with fresh tap water for as long as it takes to rid the board of the developing solution. This takes approximately one minute.

### Putting It All Together

Etching the circuit board is the final

step. I will not elaborate on the etching process, for the *ARRL Handbook* explains this very well. However, I will add this information: The etching process takes longer than any of the previous steps. It usually takes me 1 to 1-1/2 hours to etch a circuit board when using ammonium persulfate as an etching solution.'

There you have it. Five seconds to produce a transparency, 1 to 1-1/2 minutes to expose the circuit board, 2 minutes to develop the board, and 1 to 1-1/2 hours for etching.

After almost two years of using the transparency method, I am convinced that this is the way to go for a clean, professional-looking circuit board. For those of you who enjoy working up your own circuit designs, this method is also for you. Just draw your printed-circuit pattern on a clean white sheet of paper. Use a heavy drawing pencil (H or HB). Darken your drawing as much as possible. The Thermo-fax machine picks up the pencil marks, and any part of the drawing that is not *well darkened* will not be printed black on the transparency. If you are still not satisfied with your transparency, photocopy your drawing and run the photocopy through the Thermo-fax machine. You will notice a great change.

Editor's Note: Ferric chloride (FeCl<sub>3</sub>) etchant solution should produce completely etched boards in less time, typically 30 minutes to an hour.

## Strays

### I would like to get in touch with . . .

amateurs who want to start a 10-meter, a-m net in the Tidewater, VA, area. Andrew Clegg, KA4EXF/NF, 649 Astor Ln., Virginia Beach, VA 23462.

hams interested in joining the TRS-80 computer net. For net times and frequencies, send s.a.s.e. to William R. Hickok, WD8SAS, 3260 Winfield Rd., Winfield, WV 25213.

anyone interested in starting an informal net for hunters, shooters and fishermen on about 21.40 to 21.41 MHz daily at 1500 Z. Contact Art Santella, K1VKO, 43 Seaview Ave., East Norwalk, CT 06855.

qualified amateurs interested in joining the Baltimore County (MD) RACES group. Contact Francis K. Dill Jr., WA3GYW, 12409 Hennessy Ln., Kingsville, MD 21087.

# Technical Correspondence

The publishers of QST assume no responsibility for statements made herein by correspondents.

## A ONE-YEAR STUDY OF THE 1750-METER BAND

L.I. Have you ever been interested in a hobby and found few people and little information to answer your questions? Looking around my area, I found only one experimenter in the 1750-meter band. The limitations are severe power restrictions and plenty of man-made noise. I decided to monitor, and work when convenient, a 28-mile distant one-watt experimenter station owned by Ed Phillips, W6IZJ. His transmitter is controlled by a timer that turns it on at 6 A.M. and off at 8 P.M.

The area in which I live is heavily populated and full of noise sources — a near-worst case! To keep costs down, Ed suggested I convert my ARC-5 receiver for this band. It does a fine job. My transmitter is crystal controlled. The antenna is a 40-foot telescoping TV mast with an 8-foot-radial capacitance hat at the top, a ground connection to a water pipe, and several ground rods around the yard. When you start setting up a beacon, you'll wonder whether it will be heard very far away. In time, you'll get a QSL confirming reception from something like 200 miles! But since the feeble signal must compete with the noise, such occasions are rare.

Reliable communication is possible over short distances, and the purpose of this study is to evaluate propagation locally. Except on weekends, the sampling times have been limited to early morning and evening. The evening sampling is bad because of appliance noise. There will be times when a tunable ferrite-loop antenna will provide better results than the full-size vertical, because the former can be used to null out the noise. A small loop also allows portable operation. A sharp audio filter also improves the S/N ratio.

I tuned the receiver to 170 kHz, connected the audio output to a chart recorder, and let it run for 72 hours to record the noise level. Fig. 1

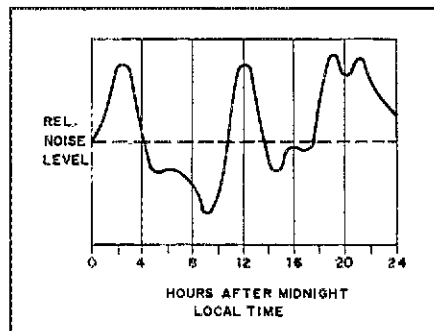


Fig. 1 — Noise level versus time for a typical 24-hour period on 170 kHz (1750-meter band), as recorded by WA6GGI. When the noise was below the level indicated by the dashed line, the beacon of W6IZJ, 28 miles away, was audible. The noise levels shown are relative.

shows the noise level for one 24-hour period. Ed's beacon was audible when the noise was below the level represented by the dashed line.

The beacon was heard on 110 days during the year 1978. Most of these occasions (78 days) were morning copy; the rest were afternoon and evening copy. Generally, the morning signals were better. July, November and December yielded the greatest number of days the beacon was heard. Although the noise level was the lowest in August, the beacon was not operational that month. September had the highest overall noise levels; only four days produced results during that month. This could have been because of rainy weather, which affects antenna loading adversely.

For additional information on the 1750-meter band, consult the Longwave Club of America, Box 33188, Granada Hills, CA 91344. Also, there is good reading material in *The Low- and Medium-Frequency Radio Scrapbook* by Ken Cornell, W2IMB, distributed by *Ham Radio* magazine. Information also appears in the January 1974, February 1974 and June 1977 issues of *QST*. — Clifford M. Walker, WA6GGI, 12824 Cometa Ave., Sylmar, CA 91342

## ZIP-CORD ANTENNAS

I just read the article on page 31 of March 1979 *QST* about "zip-cord" antennas. Shades of Marconi! I'm not the only one who remembers the old 5-meter band of the '30s. We all used cloth-covered lamp cord for feed lines then, even after Johnson came out with its EO-1 cable. The only difference in the commercial line was that the cloth was weather-proof.

If your technical editor had twisted the zip cord, he would have found that the impedance was lower. Without all that arithmetic, he could have looked in any edition of the *ARRL Handbook* and found the impedance of parallel wires by the formula  $Z_0 = 276 \log(b/a)$ , where  $Z_0$  is the characteristic impedance,  $b$  is the center-to-center distance between conductors, and  $a$  is the radius of the conductors (in the same units as  $b$ ).

He tried to measure the impedance by using a 100-foot piece of the lamp cord, without considering whether this was any odd or even multiple of a wavelength on each of the individual bands. One simply cannot measure a length of wire 100 feet long and expect to come up with anything meaningful. One needs at least 1,000 feet to do the job.

At 6 cents per foot, lamp cord comes in a very poor second to even a cheap piece of 300-ohm TV ribbon, which costs only 2 cents per foot. One can make a folded dipole out of the ribbon and really have an antenna! The feed-line loss is negligible on all hf bands. The velocity factor of ribbon is 0.95, compared to the 69.5 percent factor for the zip cord (which I doubt is accurate). It would be no problem to

use zip cord if a tuner was used, taking into account whether an odd or even multiple of a wavelength was employed.

Velocity factor is more easily measured by passing a simple wavemeter over the line, regardless of how it is terminated, and making a mark each time a null or peak is seen on the meter. Measuring the length between these dips or peaks would give the necessary data for calculating velocity factor.

In the example shown, where the author says an 80-meter antenna exhibits a center feed impedance of about 40 ohms and the feed-line impedance is 105 ohms, the SWR will be 2.6. This could be matched with a simple quarter-wave stub. Also, I hesitate to visualize what occurs if an "electrician's knot" is used on 10, 15 or 20 meters! This is a large lumped inductance.

The *QST* technical articles in the last 3-1/2 years are a shame. In my opinion, *QST* is catering to the lowest common denominator in the ham ranks. — Joe Rice, W4RHZ, 916 Western Ave., Covington, KY 41011

## NOTES ON PHASED VERTICALS

Many amateurs have successfully used phased verticals; however, less than optimum performance will result in some cases if proper attention is not paid to the current balance in the two elements.

When two elements are fed in phase or 180 degrees out of phase, symmetry causes the currents to be equal. However, when two elements are fed 90 degrees out of phase, such as in the common 90-degree-feed, 90-degree-spaced cardioid-pattern array, mutual coupling raises the feed-point impedance of one element and lowers that of the other. This unbalances the currents.

How serious is this imbalance? Using formulas provided in the *Antenna Engineering Handbook* by Henry Jasik, a current ratio of 2:1 will reduce the forward gain (relative to a similar single element) an insignificant 0.45 dB; the front-to-back ratio, however, is reduced from theoretically infinite to less than 10 dB. These figures will vary slightly depending on the radial system, but are very close if the elements are resonant and about 1/4 wavelength in height.

Luckily, one of the simplest feed systems turns out to be nearly the best. Antennas fed as shown in Fig. 2 conduct nearly equal currents because of the impedance transformation provided by the quarter-wavelength line section. For systems with more than about 12 radials per element, or for elevated (ground plane) systems, 50-ohm line is the best choice for the quarter-wavelength section. For less efficient systems, 75-ohm line is better. Either line may be used for the half-wavelength section. An added bonus is that a good match is obtained at the connection point. Cable of either impedance may be run to the shack, but if a very low SWR is important, choose cable of the

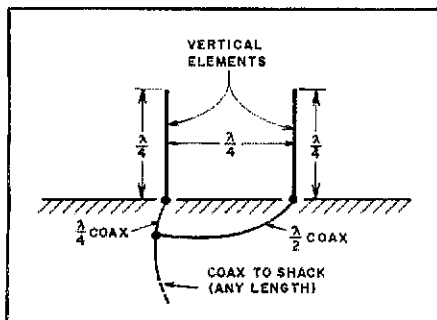


Fig. 2 — Method of feeding phased verticals, as discussed by W7EL. See text regarding feed-line impedance. It is important that proper current balance be maintained between the two vertical elements; otherwise, the front-to-back ratio will be severely affected.

same impedance as the quarter-wavelength feed section.

Theory shows that if this simple method is followed, the element current ratio will not exceed 1.5:1 over the range of impedances presented by quarter-wavelength elements and any radial system. This represents a worst-case, front-to-back ratio of 14 dB or greater. If the individual feed lines must be lengthened, only integral multiples of half-wavelength sections may be inserted in each line without disturbing the current balance.

Measurements of a two-element system using 24 and four radials per element were made; the results closely fit the theory. In the 24-radial systems, 50-ohm line was used. The current ratio was 1.15:1, and the front-to-back ratio was close to the theoretical 23 dB. In the four-radial system, current balance was nearly perfect using 75-ohm line, and the front-to-back ratio was so good that it was difficult to measure from received signals. In both the four-radial and 24-radial systems, the forward gain (relative to a single element with the same number of radials) was 3 dB. — Roy W. Lewallen, W7EL, 5470 S. W. 152, Beaverton, OR 97005

## TIROS-N AND THE DESK FAX

□ The writer's articles<sup>1,2</sup> on the use of the Telefax transceiver for the reception of weather satellite pictures covered the methods for the then-existing satellites. With the failure of the last of the 48-line NOAA satellites, and their replacement with the 120-line TIROS-N series, a method for reception of the latter seems in order.

TIROS-N is basically a 120-line satellite, though it differs from the 120-line Meteor series in that its product is composed of two side-by-side pictures — usually one in the far infrared and one in or close to the visible range. This is similar to the picture composition of the now-defunct NOAA satellites.

Fortunately, these pictures may be received either "real time" or recorded, without the speed changes necessary in the former system. This is done by driving the "gray motor" with 40 Hz to a speed of 120 rpm (capacitance must be added to the motor capacitor to get maximum torque).

There is, however, one catch in this neat little picture. The 1-rpm drum-advance motor turns too rapidly and finishes an elongated picture in

about 2-3/4 minutes, while the satellite is in range for about 15 minutes. The drum will accommodate a 10-minute picture (representing the desirable portion, leaving the first three minutes and the last three minutes, which are often noisy). It is thus desirable to substitute a 1/4-rpm (15-rph) motor. This should be a "clutch-type motor" (which may be hard to get) to allow drum return. In the absence of this last feature, a regular clock motor<sup>3</sup> can be used with the following modification: The round head of the bolt holding the rubber idler wheel that rides behind the rack, drawing the drum forward, must be removed. When the drum trips the built-in switching mechanism, and thus stops the drum advance, the drum may be returned to the starting position. Lift off the idler wheel; this allows disengagement of the rack from the pinion, letting the drum return. There is a shelf above the idler wheel in switch-off condition, so that some adjustment in the length of the "beheaded" screw may have to be made.

Alternatively, if the transmission is prerecorded at 3-3/4 in./s along with 40 Hz on the other track, then speeded up on playback to 7-1/2 in./s, the result will be a drum speed of 240 rpm driven by the resultant 80 Hz. The problem is thus somewhat simplified, because the picture speed is doubled but the drum advance speed remains the same. This is W6KT's system of slowing this clock motor by about half, running it on about 40 Hz. (These little synchronous motors run readily down to about 30 Hz.) The 40 Hz may be obtained from any amplified source; it need not be controlled by a standard.

To receive the Russian Meteor satellites in "real time," one must run the drum with 80 Hz to turn it at 240 rpm. This will produce two "near identical" 60-line pictures and restore a workable length-to-width ratio if the drum advance is slowed to 1/4 the original speed described above. In any case of "real time" picture making, the drum is fed directly by ac produced from a standard 40- or 80-Hz source after appropriate simplification.

Should the photographic option<sup>4</sup> be used, considerable reduction in lamp current is necessary because of the increased exposure time. This does not necessarily prolong the life of this labile item, though; the lamp will be on for a correspondingly longer period of time.<sup>5</sup> — Lindsay R. Winkler, W7AVE, Rte. 1, Box 209, Walla Walla, WA 99362

### Notes

<sup>1</sup>Winkler, "Fax Transceiver for Weather Satellite Pictures," *QST*, May 1974, p. 59.

<sup>2</sup>Winkler, "Producing Weather Satellite Pictures at Lower Cost," *QST*, June 1978, p. 32.

<sup>3</sup>One source is Herbach and Rademan, Inc., 401 E. Erie Ave., Philadelphia, PA 19134.

<sup>4</sup>See note 2.

<sup>5</sup>The R1130B crater tubes are now available at \$15 each from Hy Ness Co., 2105 Cruger Ave., Bronx, NY 10462.

## CDR ROTATORS AND CONTROL UNITS

□ If your antenna is slow to rotate, don't go immediately climbing your tower to service the rotator. First suspect the control box. CDR antenna rotators (as well as many other types) use a phase-shift motor in the rotator unit. The phase-shift motor has two windings connected in series. One winding is excited by an in-phase current directly from a 28-volt transformer in the control unit; the other winding is excited by

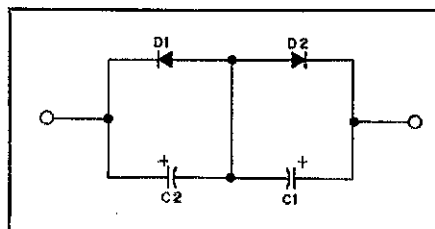


Fig. 3 — Method of connecting two diodes and two electrolytic capacitors to provide a large capacitance that will pass alternating current, as discussed by WØPD.

the same transformer, but its phase is caused to lead the current in the first winding because of the electrolytic capacitor in the control box. The control unit alternately switches the capacitor and leading current into either of the two motor windings, depending on the direction of rotation. To check the control unit, you must measure two ac voltages and determine their ratio. The voltages across the two motor windings can be measured at the terminal panel of the control unit without disturbing the remote wiring. On all CDR control units, terminals 1 and 8 are for one motor winding, and terminals 1 and 4 are for the other. (For other manufacturers' control units, consult the schematic diagram.)

Measure the two ac voltages while turning the rotator clockwise. A voltage ratio of about 30:25 is normal for CDR rotators. If the ratio is around 30:15, the capacitance of the electrolytic has decreased and the rotator will turn more slowly. As the ratio approaches 30:8, the speed will be very slow. Repeat the measurements with the rotator turning counterclockwise. The ratio should be the same, but the voltages reversed with respect to the two windings. Should the voltage ratio be unity (30:30) in these tests, suspect that one of the motor windings or its associated circuit is open.

As you probably realize, an electrolytic capacitor is a poor vehicle to pass alternating current. A suitable paper capacitor would be prohibitively large, however. The electrolytic capacitor in the CDR control unit apparently lasts from six months to three years. There is a trick that can greatly lengthen the life of this capacitor, shown in Fig. 3.

This "fix," as originally designed and suggested by Irving McNally, K6WX, provides a means of using two electrolytic capacitors for passing ac without violating polarity requirements. There is sufficient space in the CDR control unit to add the additional components. Current on one half of the cycle will flow through D1 and C1, but D1 will short out C2, preventing reverse polarity on C2. By the same token, D2 prevents reverse polarity from appearing on C1. C1 and C2 should be equivalent to the capacitor originally contained in the unit. D1 and D2 may be any silicon rectifiers having a rating of at least 100 PRV at 2 A dc.

Another item of interest in preventive care has been brought to my attention by our Canadian friends. Many hams in extremely cold climates take apart the rotator units and replace the existing grease with snowmobile grease, available at stores where snowmobiles and associated equipment are sold. — C. Bill Wilkinson, WØPD, 3103 East Pikes Peak, Colorado Springs, CO 80909

# Product Review

## Yaesu FT-127RA 220-MHz Scanning Transceiver

A scant seven years ago, had you looked for a way to get on 220-MHz fm with commercially made equipment for the band, you would have come up empty handed. Activity on 220 has come a long way since then, to the point where unassigned repeater frequencies are scarce in some parts of the country. In most areas, the 220-MHz band has not come into its own until all available 2-meter repeater assignments are taken. This is unfortunate, because those who pioneered the use of the band for fm repeaters discovered that it has some unique advantages. Because 220 is far removed from the commercial land-mobile bands, it is possible for a 220 repeater to share a site with commercial repeaters where a 144- or 450-MHz repeater would be impossible. The entire band is available for RACES operation, even in a declared War Emergency, making it ideal for emergency communications systems. Most scanning receivers such as are sold to the general public do not cover the band, which means that 220-MHz communications are somewhat secure from eavesdropping. Wider separation between repeater inputs and outputs than is found on 144 MHz means fewer problems at the repeater site. Channel spacings of 40 kHz (now split to 20 kHz in many areas) avoid the problem of adjacent-channel interference that we have with 15-kHz channel spacing on 2 meters. Coverage is essentially the same as on 144 MHz for equivalent antennas and power levels, and there are far fewer problems with cochannel interference.

The 220-MHz band is not available to amateurs outside North and South America. This has caused the large Japanese companies to be somewhat slow in developing equipment for the band, because they cannot spread the development costs across their huge domestic and European markets. Now, Yaesu has introduced a 220 rig for the American market: the FT-127RA. To our knowledge, this is the first commercial 220 rig to feature scanning, memories, and remote frequency selection (from the microphone). The features are essentially identical to the popular 2-meter version, the FT-227RA.

The scanning feature is very useful when you want to monitor activity on the band, or when you wish to keep tabs on several frequencies at once. While we were testing the FT-127RA, there were five active, open 220 repeaters on the air in the greater Hartford area. Keeping tabs on this many frequencies, plus 223.5 simplex, was quite easy with the scanning option. The feature would have been even more useful, however, had the programming been more flexible. As supplied by Yaesu, the rig will repeatedly scan from one edge of the 222- to 225-MHz band segment to the other and back again until it finds either a busy or a clear channel, depending on the operator's desires. It takes 16 seconds to accomplish one sweep of the band, which is long enough to miss a short call. The time could be shorter if the scanning



The Yaesu FT-127RA scanning 220-MHz fm transceiver. Note the "up" and "down" buttons on the microphone. These allow the operator to control the scan feature without reaching for the front-panel controls.

### Yaesu FT-127RA 220-MHz Scanning Transceiver

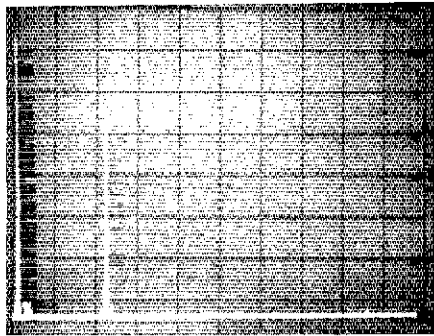
	Claimed by Manufacturer	Measured in ARRL Lab
Power output (at 13.8 V):	10 watts	14.5 watts.
Spurious radiation:	60 dB below carrier.	-73 dB (harmonics), -67 dB (other).
Maximum current drain at 13.8 V dc:	2.5 A (tx), 0.5 A (rx).	2.5 A (tx), 0.4 A (rx).
Size (HWD):	2-3/4 x 7-1/2 x 9-1/2 inches (70 x 190 x 240 mm) exclusive of knobs and connectors.	
Weight:	6 pounds (2.7 kg).	
Price class:	\$480.	
Importer:	Yaesu Electronics Corp., 15954 Downey Ave., Paramount, CA 90723.	

range included just the simplex frequencies and repeater outputs, instead of covering the input frequencies as well. You might want to listen on an input frequency once in a while, but it's unlikely that you would want to scan that part of the band.

The memory feature is equally useful. There are four memories. Two may be used for either simplex or repeater operation; one, for repeater operation only; and the fourth, for transmitting on an "oddball" repeater input frequency (very rare on 220). The operation of the memories may be a bit difficult to visualize. For the first two memories, picture that they

are used to memorize the *received* frequency. By selecting the appropriate switch position, you can then transmit either on that frequency (simplex) or 1.6 MHz below or above. Note that this means it is possible to transmit outside the band if you're not paying attention. The third memory is the same, except that you cannot operate simplex. The fourth memory is different; it remembers the frequency you want to transmit on, but the receiver is governed by the main dial.

One possible problem is that, except when transmitting from fourth memory, the digital display shows the *received* frequency, and does



Output of the FT-127RA as displayed on a spectrum analyzer. Vertical divisions are 10 dB each; horizontal divisions are 100 MHz each. The large pip is the transmitter fundamental, which has been notched approximately 30 dB to prevent overload distortion in the analyzer. The most significant spurious signal is close in at about -68 dB. The 4th harmonic, at 880 MHz, is down approximately 73 dB with respect to the unnotched fundamental. The small white blob at the bottom left-hand corner of the photo was caused by a reflection, and is not part of the spectral photo. This unit complies with current FCC specifications regarding spectral purity. All tests performed in the ARRL lab.

not show the transmitted frequency. Thus, the digital display gives no clue that you might be transmitting outside the band. In actual operation this is not likely to occur, because use of 1.6-MHz input/output separation and low-in, high-out is practically universal on 220 repeaters. However, you *do* have to be careful if your operating departs from the norm.

Remote frequency selection is accomplished through the use of two push buttons on the corner of the microphone, labeled "up" and "down." Push one, and the frequency (both transmit and receive) shifts by 10 kHz. Hold one down for a second, and the rig begins to scan in the respective direction. Touch a button momentarily and it will stop. As supplied, the rig contains tone burst for those repeaters which require this for access, and subaudible tone squelch is optional.

The FT-127RA weighs about six pounds, which is heavier than it looks. It is supplied with a mobile mounting bracket, and the speaker is mounted in the bottom for maximum efficiency and clarity in mobile operation. The fixed-station operator is not forgotten, either; a stand is provided to tilt the front panel upward, and there are rubber feet at the rear of the rig to avoid marring the operating surface.

While the rig is essentially identical in appearance to its 144-MHz brother, its performance suggests that it is not just a modified 2-meter rig. Spectral purity is excellent (see photo). Some of the oscillators operate in the 66-MHz range, so we thought there might be an interference problem with TV channels 3 and 4. No TV was evident with the rig placed right next to the rabbit ears on our lab TV set. We could not measure sensitivity to compare with Yaesu's specification of 0.35 microvolts for 20 dB quieting, because the leakage from the lab signal generator was sufficient to quiet the receiver. The rf amplifier and both mixers are dual-gate FETs.

Although the price tag may seem a bit hefty, the appearance of the FT-127RA should be a

catalyst for increased 220-MHz activity because it brings to the band many of the operating conveniences we have come to expect in 2-meter rigs. If you're on the band, you should be hearing an FT-127RA pop up from time to time. If you're *not* on the band, what are you waiting for? — David Sumner, K1ZZ

## DATONG ELECTRONICS MODEL FL1 AUDIO FILTER

Almost all of us have wished we could improve our receiver performance at one time or another. Perhaps you were on the verge of working a rare DX station or just having a friendly chat with a ham in a neighboring state when old man QRM came knocking at the door. On other occasions you may have noticed your receiver just wasn't quite sensitive enough to pull a signal out of the noise level to permit comfortable copy. If this sounds at all familiar, you are probably a good prospect for some kind of audio filtering.

Just what can audio filtering do for you and what are its limitations? This is a common question asked by many amateurs considering some modification to an existing receiver. Audio filtering is *not* a substitute for good receiver design, but it can improve selectivity, and as a result, signal-to-noise ratio. It can greatly improve the performance of a direct-conversion receiver or a simple superhet. It also can make marked improvements when used with a high-performance receiver, although not as dramatic as on a receiver lacking proper filtering and overall selectivity.

The Datong FL1 has a number of features that make it very useful for the ssb, RTTY or SSTV operator, as well as the cw enthusiast. It is adjustable in both bandwidth and band-pass frequency, a very important feature for cw operation. With the filter in the "manual" mode, it is actually possible to "tune" the audio passband of the receiver with the frequency control and separate cw signals differing by only about 20 hertz! The passband can then be narrowed to eliminate almost all of the adjacent-channel signals.

The FL1 can also be operated in the "auto" mode. In this mode of operation the filter sweeps continuously over its full tuning range until it locates a continuous signal. It only takes about three seconds for the filter to sweep the entire audio passband. In conjunction with this automatic sweep function, the filter may be used either to peak or notch the signal it locks onto. The writer does not recommend that the filter be operated in the auto-peak mode when copying cw, since it is very annoying to have the filter constantly sweeping the passband during breaks in the transmission or times when the signal drops into the noise level. When in the auto mode, the filter is frequency sensitive — that is, it will sweep the passband until it finds a continuous tone. This limits the benefits of the auto-peak mode when copying a modulated signal such as ssb or SSTV, for we find the same thing happening as with the cw signal — the filter will tend to sweep continuously even with the signal present.

One of the strong points of the FL1 is improved ssb operation with the filter in the "auto-notch" mode. Here the filter will sweep the passband until it locates a heterodyne or other continuous tone, then lock on the signal, and notch out the signal. All the operator has to do is relax and enjoy the QSO. This is extremely useful on crowded amateur bands such

as 40 meters during the evening. Many times a signal that was not readable because of a heterodyne was made Q5 when the filter was switched in. One word of caution though: The FL1 only has one notch, so if there is more than one interfering signal, it will notch the strongest signal only. In the case of multiple heterodynes it is sometimes more effective to operate the filter in the manual mode. In this way it is possible to position the notch over the most annoying signal (not necessarily the strongest) and improve reception.

When operated as a conventional audio filter, the FL1 does a nice job on cw. With our receiver operating with about a 3-kHz passband, several cw signals could be copied. Switching in the FL1 enabled us to have single-signal reception. It is possible to select any signal that falls within the passband of the receiver by just turning the frequency control knob on the filter. Then the bandwidth can be progressively narrowed until only the single signal is heard. The degree to which the bandwidth can be narrowed depends somewhat on where the signal is located in the receiver audio passband. Signals near the half-power (-3-dB) points of the audio passband cannot be copied if the filter passband is narrowed too much. The receiver would have to be returned in order to position these signals near the center of the passband.

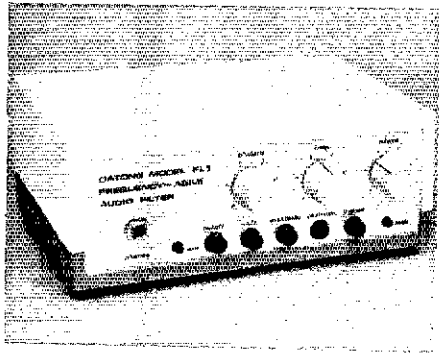
Even with the bandwidth control adjusted for *minimum* bandwidth, the audio filter did not break into oscillation. There was a tendency for the cw signal to ring slightly when the bandwidth was minimum, although the signal was still solid copy.

The FL1 can also be used in the peak mode on ssb to a certain extent. The frequency control can be adjusted for the clearest ssb signal, then the bandwidth control can be advanced as far as possible without losing good voice quality. It was interesting to note that when used in the peak mode, the FL1 reduces both receiver-generated noise and external QRN.

Layout and construction of the filter were well planned. Almost all of the components are mounted on two single-sided, glass-epoxy circuit boards. The two boards are stacked horizontally to provide a neat, orderly appearance inside the unit. The boards are interconnected with pieces of multiconductor

### Datong FL1 Audio Filter.

Maximum input level: 1-1/2 volts (pk-pk).  
Minimum signal required for automatic locking: 100 mV (pk-pk).  
Input impedance: 100 kΩ.  
Output power (10 percent distortion at 1 kHz): 0.75 to 2 watts.  
Power requirements: 6-16.5 V dc.  
Quiescent supply current: 24 mA.  
Center-frequency tuning range: 280 to 3000 Hz.  
Bandwidth in band-pass mode: 25 to 1000 Hz (claimed); 24 to 924 Hz (measured in ARRL lab).  
Notch width in band-reject mode: 20 to 800 Hz (claimed); 7 to 810 Hz (measured in ARRL lab).  
Battery: Mallory M1603 or equiv.  
Dimensions: 8 × 3 × 5-1/2 inches (203 × 76 × 140 mm).  
Weight less battery: 1.7 lbs (0.78 kg).  
Price class: \$180.  
Supplier: AR Technical Products Corp., Box 62, Birmingham, MI 48010.



The Datong model FL1 frequency-agile audio filter. Push-button controls for the various functions are located at the bottom of the front panel. The LED indicator at the left is for power; the one on the right indicates automatic locking of the audio filter.

ribbon wire, and provisions are made so that the upper board may be lifted away to provide easy access for servicing. The front-panel operating controls all have a very smooth feel and this reviewer had no difficulty adjusting the filter for optimum performance. The push-button function switches make it easy to select the proper mode of operation instantly.

The FL1 is equipped with a front-panel-mounted headphone jack and a rear-apron external speaker connection. Three DIN connectors are provided for input, output and, if desired, an external power supply. The volume potentiometer located on the front panel controls the input to the 2-watt audio amplifier contained in the filter. It is used to control the audio output of the receiver whenever the filter is in the on position — even if the bypass function is selected. It takes a little time to break the habit of reaching for the receiver af gain control whenever a loud signal comes crashing through the headphones! The LED on the front panel indicates when power is applied to the filter, and doubles as a battery indicator that will warn you when the battery is low before the filter stops working. Another LED indicates when the filter has locked onto a signal in the auto mode. This really isn't too functional because the LED may flash on and off in the presence of a low-level signal even if the signal is still within the capture range. Power may be supplied to the audio filter by an external 6.3-16-V power supply (furnished by the purchaser). Instead, a Mallory M1603 or equivalent 9-volt battery can be installed inside the FL1. This is *not* a standard 9-volt transistor battery, although one can be used if the battery connector in the FL1 is changed.

The operating manual supplied with the FL1 leaves a little to be desired, but it does provide enough information to operate the filter correctly. It would have been much nicer to see a complete schematic diagram supplied with the manual rather than just a block diagram; also some trouble-shooting information would be desirable.

This reviewer's overall impressions of the Datong FL1 are all positive; the filter would make a welcome addition to almost any shack. In the few short months the filter was used, some dramatic improvements in reception were noticed. Once you get used to operating with a good audio filter you probably won't ever want to be without one again. — *Garry F. Bartels, WB1CPM*

## WILSON SYSTEM THREE TRIBAND YAGI ANTENNA

The Wilson System Three is the newest and smallest in a series of triband antennas recently introduced by Wilson. The largest, the System One, is a four-element beam on a 26-ft boom. The System Two is a three-element antenna on an 18-1/2-ft boom. Both of these antennas use a reflector on 10 meters that is separate from the one used on 15 and 20. The driven elements and directors work on all three bands. The System Three utilizes three elements on a 14-1/2-ft boom. Unlike the other two antennas, it uses all three elements on all three bands. Another difference is that the first two use beta matching while the coaxial cable connects directly to the driven element on the System Three. (The System One was reviewed in September 1978 *QST*.)

So how does this newest and smallest beam perform? A System Three was procured from Wilson and we set out to answer that question. The antenna arrived disassembled. With it came 10 pages of instructions and illustrations, and a one-year limited warranty. The written instructions are a bit sparse, but there are ample illustrations. With the use of a little common sense, we found that the antenna went together smoothly. The only problem encountered during assembly was that a few of the parts were mislabeled on the parts list. This was straightened out after some head scratching. The antenna may be built to exhibit the lowest SWR in either the cw or the phone part of the band.

All of the parts are of high-quality materials. The boom consists of three pieces of 2-inch OD aluminum tubing. The center tube has swaged ends over which the ends of the other two tubes fit. Two muffler-type clamps help hold the three pieces together. The elements are made of telescoping aluminum tubing. These have an outer diameter of 1-1/4 inch (32 mm) at center and 5/8 inch (16 mm) at the end. The end of each piece is slit so that it may be compressed to hold the next section. The clamps that provide the compression are made of extruded aluminum. The labels on the traps are color coded to indicate which element they are used on and are marked to show which end of the trap should be placed nearest the boom. As a finishing touch, Wilson provides plastic caps to cover the ends of the elements and boom.

Rf may be applied directly to the driven ele-

ment (in this case the beam was fed directly without the use of any kind of balun), or an optional balun may be used.

The antenna now sits at the top of a tower 30 feet above the Headquarters building and has survived one New England winter. This brings us back to the original question, "How does it work?" The answer is that it works well, considering its size. One must realize that this antenna is a compromise between size and performance, especially on 20 meters. Exact measurement of parameters such as gain and front-to-back-ratio are beyond our capability as we lack an antenna test range. In actual operation, however, this antenna has given a good account of itself. In the six months or so that it has been in operation at W1NF, approximately 50 countries have been worked by staff members during nonworking hours. The general consensus is that the antenna performs best on 15 and next best on 10 meters. It seems that the System Three antenna is a good compromise and that it performs well at its appointed task. It should work well at stations where space limitations do not allow the use of a full-size antenna. — *Jim Westbrook, K1FD*

## MIRAGE MP2 VHF WATTMETER

Some device is used to indicate power output at almost every Amateur Radio station. It may vary from a neon bulb rf detector to an elaborate, in-line rf wattmeter. One could argue that an indication of rf output is not necessary; however, there are valid reasons for having a method of measuring output power.

The Mirage MP2 is a recent addition to the SWR/power-meter market. This SWR bridge and PEP output-power indicator has features that are not included in most competing products: The meter is housed in an attractive, two-tone, beige cabinet that complements the Mirage line of vhf amplifiers. The large meter is calibrated in three scales, one for each power range. Front panel selection of the desired range (50, 500 or 1500 watts full scale) is by rotary switch. Two slide-switches select peak or average meter display and forward or reverse power and SWR indication. A threshold control allows meter sensitivity adjustment for checking SWR. Just above the meter is an LED indicator that flashes when battery voltage falls below that required for proper operation of the meter.

### Wilson System Three Triband Yagi

#### Claimed Specifications

Frequency coverage (1.5 SWR bandwidth):  
14.03-14.35 MHz,\* 21-21.5 MHz,\*  
28.05-28.75 MHz.\*  
Maximum power: Legal limit.  
Boom length: 14 ft 4 in.\*\*  
Longest element: 27 ft 4 in.  
Turning radius: 15 ft 9 in.  
Maximum mast diameter: 2 in.  
Surface area: 5.7 sq ft.  
Wind loading at 80 mi/h: 114 lbs.  
Assembled weight: 37 lbs.  
Price class: \$180.  
Manufacturer: Wilson Electronics, 4288 S.  
Polaris Ave., Las Vegas, NV 89103.

\*Antenna adjusted for phone segments.

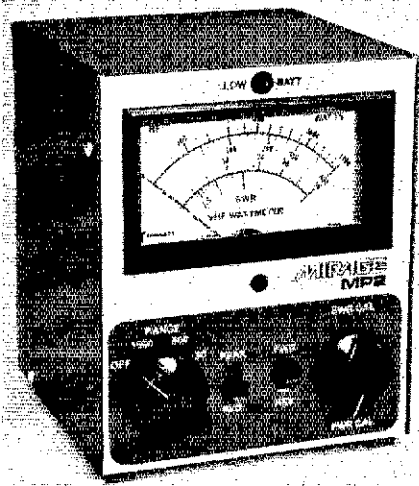
\*\*m = ft x 0.3048, mm = in. x 25.4, kg = lb x 0.4536, sq m = sq ft x 0.0929.

### Mirage MP2 VHF Wattmeter

Frequency range: 50-200 MHz (calibrated at 145 MHz).  
Power ranges: 50, 500, 1500 watts; fwd/rev.  
Impedance: 50 ohms.  
Power capacity: 1000 watts continuous, 1500 watts intermittent.  
SWR sensitivity: 0.2 watt minimum required for accurate reading.\*  
Power requirement: 9-V dc internal battery or ac adaptor.  
Accuracy (at 145 MHz): ± 5 percent rf calibration, + 1 percent meter error.\*  
Dimensions: 5.75 x 4.5 x 5.75 inches (146 x 114 x 146 mm).  
Manufacturer: Mirage Communications, P. O. Box 1393, Gilroy, CA 95020.  
Price class: \$120.

\*Verified in ARRL Lab.





The Mirage MP2 vhf wattmeter is a power and SWR meter that the serious 6- and 2-meter operator will find useful.

The rf sampling technique used in the MP2 is the time-tested and accepted through-line method used by many other manufacturers in the field. The PEP indication is not found in any other currently available vhf power meter known to this reviewer. The MP2 has a dc power jack on the back panel. Any 9-V adaptor can be used to extend the life of the internal battery. Attached to the back panel is the removable sampling module that is placed in the antenna feed line.

Tests performed in the ARRL lab confirm that the meter meets the advertised sensitivity and accuracy specifications. Operating the meter with an IC-215 alone (less than 1 watt output), or with the Mirage B108 amplifier (80 watts), we found that the MP2 agreed with a Bird model 43 at all power levels.

When the MP2 is operating off of the internal battery, it is important to remember to turn the meter off when not in use to conserve the batteries. When the meter is turned off, the LED flashes a few times. As pointed out in the manual, this permits you to verify proper operation of the low voltage indicator. The MP2 is easy to use. The instrument should be reliable, as Mirage offers a five-year limited warranty on the unit! — *Jim La Porta, N1CC*

### KLM ELECTRONICS 16-ELEMENT 2-METER YAGI

KLM vhf Yagi antennas are an offshoot of the Oliver Swan design of the early 1960s. Swan sought to design a wide-band television broadcast antenna. The antennas which resulted weren't much different, electrically at least, from the current KLM product.

Most Yagi-type antennas have a single driven element, usually some form of dipole with a matching scheme. The close proximity of parasitic elements to the driven element, and the subsequent coupling to them; causes the actual impedance of the driven element to be considerably lower than that of a dipole. It isn't difficult to match to this lower impedance — several schemes are used. Discussions of gamma, T and delta matches are given in *The ARRL Antenna Book*. Where problems often develop in matching to vhf antennas is in

matching-system losses. Because of the low impedance (often less than 25 ohms) and *skin effect*, a fair amount of loss can occur in the driven element. This points out the fallacy of using directivity as a means of determining gain. Many antenna builders, amateur and commercial, frequently measure the horizontal and vertical patterns of an antenna, compute the directivity and multiply that value by a constant that supposedly takes losses into account. This may indeed work when the antenna is new and all the metal-to-metal joints are clean. After a few months in our less-than-clean air, however, the ohmic losses may be severe.

A perhaps lesser but not insignificant problem the vhf operator often faces is that of accurately matching the antenna. Chances are that the owner of some new antenna doesn't have enough money left to buy a suitable SWR bridge. It can be a hassle adjusting matching systems when you really want to get on the air. KLM antennas effectively deal with both these problems.

The driven element on the KLM Yagi is a four-element log-periodic-dipole array. The *Antenna Book* also discusses this antenna. For our discussion it is enough to say that the driven element is broadband, has low loss, and requires no adjustment. Driving impedance is 50 ohms and KLM recommends that a 1:1 sleeve balun be used to mate with nominally 50-ohm unbalanced transmission lines. A sleeve balun is sold separately for use with this and other KLM antennas.

Because four dipoles are driven in parallel, ohmic losses are divided between them, rather than in one dipole as in standard matching systems. The dipoles are precut to cover the frequency range the particular antenna is designed to cover. The array we tested is intended for use on the low end of the 2-meter band, although it will accept power up the band. The SWR-vs.-frequency characteristic is better than the gain-vs.-frequency characteristic. This is because the parasitic elements are cut for a narrower bandwidth in order to yield a higher gain at the desired portion of the band.

What do we want from a vhf antenna in the way of performance? Our 3- to 30-MHz cousins want reasonable gain and a good front-to-back ratio to reduce interference from stations behind them. The tropo vhf DXer wants gain and a clean pattern, meaning one with few sidelobes. The moonbounce operator especially wants the sidelobes to be low, to reduce the amount of cosmic noise intercepted by the array. Lastly, we want an antenna that is able to stand up to adverse weather, since some of us live in places where Mother Nature can get fierce, or we like to operate from mountaintops. The KLM antenna does well on all counts. It is difficult to measure the gain of a 2-meter Yagi with any accuracy, although the West Coast VHF group does try at its annual convention, as does the Central States VHF Society. KLM antennas usually perform well in these contests. For day-to-day tropo work, most operators should be satisfied with the results obtained with this KLM array.

The system we tested consisted of a pair of 16-element Yagis with 20.7-foot (6.31-meter) long booms. Boom diameter is 1.5 inches (38 mm). Also provided by KLM, in addition to the antennas and two sleeve baluns, were a two-way power divider and two pieces of low-loss coaxial cable to connect the antennas to the divider. Stacked vertically, this represents good artillery for the serious operator. A sta-

tion running about 100 watts input will give a good account of itself during thermal inversions and sporadic-E openings. If an amplifier capable of generating 300 watts or more is available, a reasonable meteor-scatter station will result. Four of these big KLM Yagis are a minimal array for 2-meter moonbounce, although contacts have been made by stations using only one! This would seem to require a great deal of perseverance and a *very efficient amplifier*.

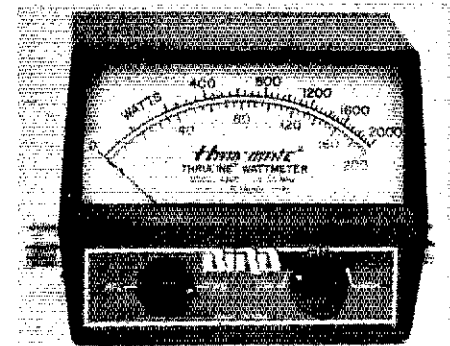
Mechanically, the KLM vhf antennas are also quite satisfactory. Each element rests on a plastic insulator that provides more than enough support. A machine screw passes through the element, insulator and boom. The combination holds each element firmly in place. I had some reservations about the boom-to-mast clamp, especially when the entire antenna was covered with a half inch (13 mm) of ice. The boom sagged a little under the load, but righted itself when the ice melted.

KLM antennas are manufactured by KLM Electronics, 17025 Laurel Rd., Morgan Hill, CA 95037. Price class of a single 16-element is \$75. The sleeve balun price class is \$25, and the two-way power divider is in the \$30 price class. — *Jim Kearman, W1XZ*

### BIRD 4360 AND 4362 HAM-MATE RF WATTMETERS

Over the years, radio amateurs have employed various means to give some indication of transmitter, feed-line and antenna performance. During the 20s, hot-wire and thermocoupled ammeters were popular. Later on, amateurs used inexpensive field-strength indicators which could easily be built from a surplus microammeter and a diode. As the use of coaxially fed antennas became popular, the SWR bridge found its way into many ham shacks. (Other less objective methods have been used, such as the brightness of neon bulbs, or the length of arc you could draw off the feed line with a pencil — with burned flesh often as a result!) The outgrowth of all this has been the directional wattmeter.

Bird Electronic Corporation has built its reputation around its precision (and relatively expensive) Thru-line wattmeter. In 1972, Bird introduced its first line of Ham-mate wattmeters, which were less expensive but just as accurate "little brothers" to the Thru-line. The



The Bird Ham-mate model 4360 wattmeter, designed to cover 1.8 to 30 MHz. Identical in appearance, the model 4362 covers 140 to 180 MHz.

### Bird Ham-mate Wattmeters

	HF Model 4360	VHF Model 4362
Frequency range:	1.8-30 MHz	140-180 MHz.
Forward power range:	0-200/2000 W	0-25/250 W.
Reflected power range:	0-200/2000 W	0-25/250 W.
Impedance:	50 ohms.	
Insertion VSWR:	1.1 to 1.0 max.	
Accuracy:	±8 percent of full scale.	
Directivity:	20 dB min.	
Connectors:	Female UHF (SO-239).	
Dimensions (HWD):	3-15/16 × 6 × 3-3/8 inches (100 × 152 × 86 mm).	
Weight:	1 lb. (0.45 kg).	
Price class:	\$95.	
Manufacturer:	Bird Electronic Corp., 30303 Aurora Rd., Cleveland, OH 44139, tel. 216-248-1200.	

two new Ham-mate hf and vhf models just introduced are much more than dressed-up versions of the original Ham-mates. Each of the new models has the meter movement and circuit components tightly shielded. This, plus the use of a rotating element, provides excellent directivity. Without such precautions, it is possible that some forward current could be picked up during the measurement of "reverse power." This would cancel out the desired reading, and the result would be a false minimum reading of "reverse power."

The Ham-mates are designed to be placed near the transmitter, and the meter cannot be separated from the rest of the unit. Controls consist of a HIGH, OFF or LOW power selector and a forward-reflected switch. The case housing the unit is made of high-impact plastic. Connection to the feed line is made through two SO-239 (UHF) connectors. Insertion VSWR is rated at 1.1 to 1.0 maximum.

Although the manufacturer claims eight percent accuracy, we found no discernible difference between the hf Ham-mate we tested and the Thruline (model 43) meter. On the models 4360 and 4362, a wider meter scale with large printing makes precise meter readings quite easy. The meter is very well damped, and will indicate the average power of most transmitters. The instruction booklet includes power-to-SWR nomographs if SWR readings are desired. — *John Nelson, W1GNC*

### SDI-700 QUICK-DISCONNECT SLIDE MOUNT AND SDI-500 UNIVERSAL MOUNTING BRACKET

Almost every law enforcement official preaches the same line. "If you want to safeguard your valuables, put them beyond reach." Until now, this has been a bit difficult with most Amateur Radio equipment installed in cars. It has been inconvenient, awkward and very time-consuming to disconnect external speaker leads, power leads and coaxial connectors. Some of us have even adapted audio slide mounts in an effort to make things easier when it came time to remove radio gear — but still — those pesky coaxial connectors. First you have to reach them, and that's not always easy.

Here is a device that, at least for small transceivers up to 50 watts input, will handle the dc and rf power. Currently in use by many commercial communications-gear suppliers and recommended by them, the SDI-700 slide is

specifically designed for mobile communications gear. When you want to take your gear out of the car, just pull up on the latch and out it comes. All wires and coaxial cables are automatically disconnected. The device is made of 16-gauge steel and will hold just about any of the mobile vhf rigs (and some hf ones, too) that an amateur might want to install on it.

The SDI-700 features a modified AMP Dualatch connector system. The connector houses the AMP miniature Coaxicon contact, as well as the four power and accessory contacts.

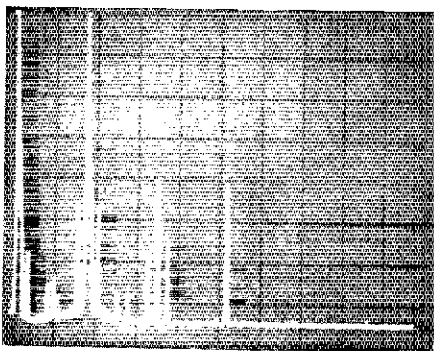
The specifications that AMP places on the connector are impressive: VSWR 1.4:1 at 500 MHz; rf shielding, 38 dB at 500 MHz; durability greater than 2000 matings and separations. A three-way spring lock eliminates rattles while holding the radio firmly until it is removed by the operator.

While the slide mount may be used alone, a companion universal mounting bracket, the SDI-500, offers some unique features. It provides 50 degrees of tilt as well as 50 degrees of turn. Thus, head-on visibility may be obtained just about anywhere the bracket is mounted: hump, floor, roof or under-dash. The bracket is made from the same material as the slide mount.

The SDI-700 Quick-Disconnect Radio Slide Mount and the SDI-500 Universal Mounting Bracket are available from Scientific Dimensions, Inc., 309 McKnight N.E., Albuquerque, NM 87102. Price class, \$20 and \$9 respectively. — *Lee Aurick, W1SE*

### TEN TEC 544 SUPPLEMENT

The Ten Tec 544 Product Review, which appeared in July 1979 *QST*, did not contain the spectral photograph referenced in the text. Here are the worst-case test results, as displayed on the spectrum analyzer. The fundamental (80-meter) is represented by the large pip near the left side of the photo. Vertical divisions are each 10 dB; horizontal divisions are each 2 MHz. The most significant spurious emissions are the second and third harmonics, both approximately 40 dB below the fundamental. The 544 complies with current FCC regulations regarding purity of emissions. Tests were made in the ARRL lab.



## New Books

□ *The Radio Amateur Antenna Handbook*, First Edition, by William Orr and Stuart Cowan, published by Radio Publications Inc, Wilton

CT. Paperback, 8 × 5-1/2 inches (203 × 140 mm), 192 pages. Price: \$6.95.

When you stop to consider what subject hams talk about the most, you've got to come up with antennas. We all dream of putting up the largest skyhook around — one that lets us dig out that rare DX station that just happens to be running 10 milliwatts. But in these days of high prices, it's getting hard to realize that dream. However, there are ways to get super antenna performance without high cost. *The Radio Amateur Antenna Handbook* is full of simple and inexpensive antenna designs.

*The Radio Amateur Antenna Handbook* is divided into two sections. Chapters 1 through 5 discuss fundamental aspects of antenna design, how to choose the best place to locate an antenna, the basics of design evaluation, and a comprehensive section on towers and rotators. Chapters 6 through 10 cover the many different practical applications of proven antenna design. Over 100 pages are devoted to construction projects of all kinds and description; vertical, sloper, Yagi, and wire antennas — both hf and vhf types. Each design is accompanied with helpful hints and illustrations to help ensure that the antenna will work the first time.

*The Radio Amateur Antenna Handbook* is a good introduction to antennas for the beginner and should make a nice reference for the more experienced builder. — *Craig Clark, N1ACH*

□ *Practical Electrical Wiring*, by H. P. Richter and W. C. Schwan, 11th edition, published by McGraw-Hill Book Company, 1211 Avenue of the Americas, New York, NY 10020. Hardback edition, 6 × 8-1/2 inches, 664 pages. Price: \$18.

Hams are natural do-it-yourselfers. After building a few pieces of station equipment, many amateurs probably start feeling confident that they could repair a defective electrical outlet or even rewire the entire house. "Surely simple electrical wiring can't be any harder to repair than radio equipment, right? Just have to follow the code, that's all. Let's see now . . . I wonder how many pairs of 12-2 I can put in this junction box?"

The answers to questions like this are easily found in *Practical Electrical Wiring*. The book covers most installations in homes, farms, schools, churches, and even small industrial and commercial buildings. All instructions are in accordance with the 1978 National Electrical Code.

The authors explain each type of installation in simple language, giving not only the step-by-step procedure for doing things, but also the reasons why things should be done a certain way. No prior knowledge of electronics is needed to understand the detailed instructions provided in this book. Hundreds of illustrations, tables and charts are included to help the reader through the various stages in the wiring process. All math is kept at a grade-school level.

Although radio equipment installations are not specifically covered in this book, the reader should be able to obtain all the necessary details for wiring 235-volt receptacles and any other special items included in the shack wiring plan.

Amateurs desiring to do their own electrical wiring should benefit from the information contained in *Practical Electrical Wiring*, but should also obtain a copy of the local codes and obtain a construction permit, if necessary. — *Jim Bartlett, K1TX*

# Hints and Kinks

## KEYED OSCILLATOR FOR CW RECEPTION

With a minimum expenditure of money and time, cw operators can easily build and install a keyed oscillator that offers immunity to QRM and QRN that would otherwise impair reception. In addition, no filter ringing or hollow sound are to be heard when using this device. It is essentially similar to a code-practice oscillator except that it is triggered by a received signal rather than by a key.

The ubiquitous 555 timer serves to drive a loudspeaker in addition to the timing function. It may be operated with any supply voltage from 4.5 to 13.5 V dc. If desired, the circuit may be used as a code-practice oscillator or as a sidetone monitor for an electronic keyer.

The filtering action of R1 and C2 should be such that it will filter the incoming audio fre-

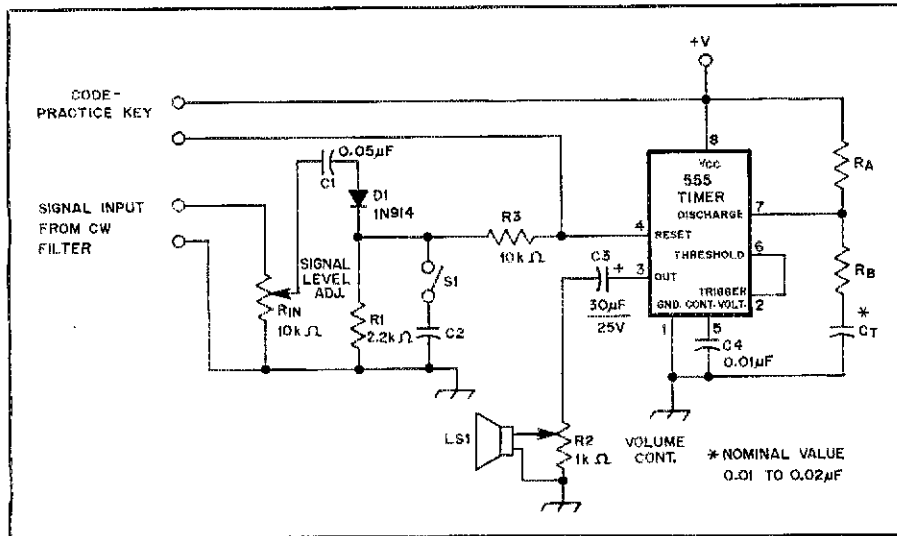
quency from the receiver and cw filter. The values of R1 and C2 must be large enough for this purpose. The filtered pulsating dc voltage, which must be smooth, has to continuously trigger the 555 astable IC while a dit or dah is being received. The time constant of R1 and C2 must not be so long that it noticeably affects the space between dits and dahs. My oscillator has a time constant of 2.2 ms, but I do feel this is a bit small.

Any one of a variety of enclosures will be satisfactory for the project. Mine is homemade, being covered with vinyl contact paper. Speaker mounting is easily performed with the use of some RTV silicone adhesive, small brackets, or mounting bolts. Size of the speaker depends on the builder's choice. I have built a keyed oscillator and a cw filter in the same enclosure, an arrangement that is neat and compact.

The builder might consider including other methods of controlling the volume. The receiver volume control can be used to set the threshold level, allowing the input potentiometer to be eliminated. Another approach would be to place a resistor (10 to 470 ohms) in series with the input lead. A smaller coupling capacitor (0.1  $\mu\text{F}$  or less) will reduce the volume also.

Where direct coupling is possible, C1 can be omitted. An extra connector or a switch provides a convenient means of converting the device to a code-practice or sidetone oscillator.

Other options include the deletion of C4 which bypasses pin 5 of the 555 timer. If problems seem to occur in changing the frequencies of the 555 output, C4 should not be removed. Resistors R<sub>A</sub> and R<sub>B</sub> are replaceable with potentiometers that can be connected in series with fixed resistors. These allow experimentation with timing and tone of the 555. A momentary-contact, normally closed switch (S1) may be used to remove C2 from the circuit in order to obtain the fundamental frequency from the receiver. This is to be used when adjusting the circuit. — James Rohler, N0DE, Bettendorf, IA

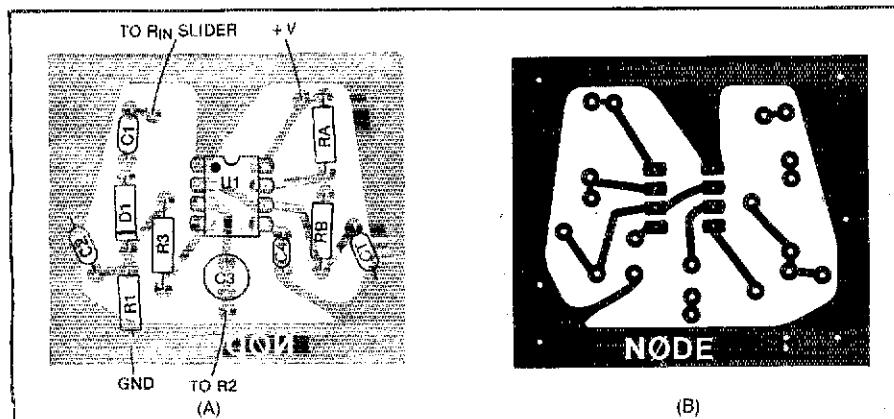


The keyed oscillator in this diagram is designed to provide the cw operator with interference-free reception. C<sub>T</sub>, R<sub>A</sub> and R<sub>B</sub> determine the audio frequency of the output.  $C_T = 1.44/f_{\text{Hz}}(R_A + 2R_B)$ . R<sub>A</sub> can be 6.8 k $\Omega$  and R<sub>B</sub> 150 k $\Omega$ . C<sub>2</sub> should be about 1.0  $\mu\text{F}$ .

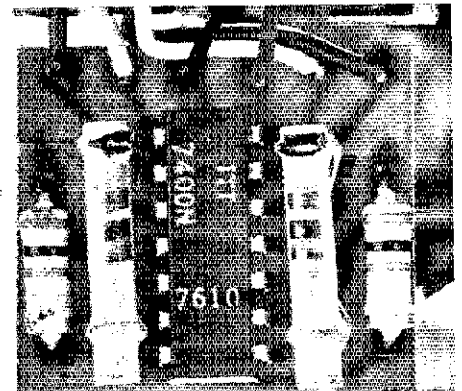
## COUNT UP TO 30 MHz WITH COMMUNICATIONS RECEIVER COUNTER

With a small modification you can use the counter of the communications receiver described in the 1977 *Handbook* (pages 274-289) to count up to 30 MHz. What is needed is a 7400 TTL IC which contains four NAND gates. The original circuit was designed to operate up to 20 MHz.

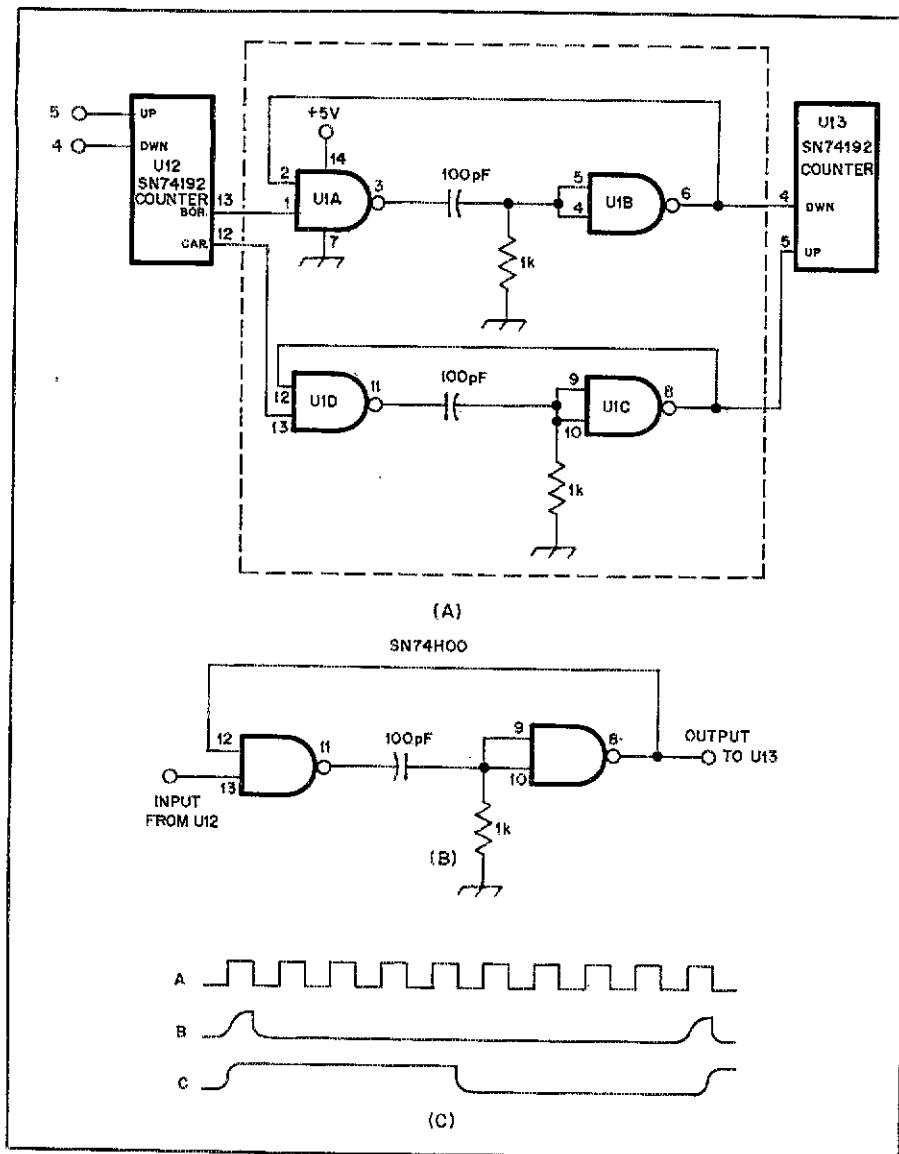
The upper frequency of this counter is limited by two factors. One of them is the maximum speed of the input gates, which limits the frequency at about 30 MHz. The other is the maximum speed of the 74192 up-down counters.



At A, parts placement guide for the Keyed Oscillator. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern. Resistance and capacitance values are provided with the schematic diagram. At B, the circuit-board etching pattern. Black represents copper. The pattern is shown at actual size from the foil side of the circuit board.



A small circuit board accommodates these few parts needed to extend the range of the 1977 *Handbook* communications-receiver counter up to 30 MHz. U1 is a type 7400 quad dual-input positive NAND gate IC, with two sections unused.



The communications-receiver counter, described in the 1977 *Handbook*, will cover up to 30 MHz with this modification provided by TA1AV. The complete diagram is shown at A, while B illustrates the monoflop circuit. Waveforms at C represent (A) the input pulse of U12, (B) the output pulse of U12 and (C) the output pulse of the additional circuit.

The pulse train generated by the gate circuit is fed to the first up-down counter, U12, and divided by 10. The duty cycle of the pulse produced is about 5 percent. The duration of that pulse is smaller than the duration of the input pulse because of the limited rise time of the divider circuit. Every divide-by-10 circuit in the chain has the same effect on that pulse and as a result the output pulse of U17 may become so short that it cannot trigger the last divider. This is so if the input pulse duration, which depends on the input frequency, is not wide enough.

Because the duty factor of the input pulse of counters is not effective in the triggering action, we can alter that freely. If we widen the duration of the output pulse of U12 by 10 times, the duty cycle becomes 50 percent and next counters, U14 to U18, count as if the input frequency is 10 times lower. See the waveforms in the accompanying drawing. Only the first up-down counter U12 will limit the maximum countable frequency which is about 30 MHz.

The circuit consists of two monoflops which are triggered by the pulses produced by the first divider U12. At the highest frequency, 30 MHz, the input pulse duration is about 15 nanoseconds. To obtain 10 times wider pulses, the duration of the monoflops are chosen to be about 150 nanoseconds. A complete diagram of the circuit is shown in part A of the accompanying drawing.

A small pc board will accommodate the whole circuit. It may be hard wired to the original circuit. If you don't have the original printed circuit ready, it is better to design and build that circuit and this modification together.

With this modified counter you can count your 28-MHz transmitter frequency directly. Be careful not to apply the output of the transmitter to the counter input without proper attenuation. Otherwise the input circuits will be damaged. Because the input impedance of the counter is very high, a small piece of wire

should be sufficient to pick up the signal from the transmitter without the need to make a direct connection (with attenuation) between the two units. — Avni Morgül, TA1AV, Vice President of the Amateur Radio Society of Turkey, Istanbul

## HELP FOR THE HW-16

Often I have noticed that the output of my HW-16 is not over 25 watts when operated on the 21-MHz band. This happens if the antenna system loads properly, but the amplifier tuning capacitor, C28, is tuned to the minimum position without actually reaching resonance.

My remedy is to increase the spacing of the lower turns on L12, the amplifier plate-tank inductance. I carefully pushed apart the lower five turns of this coil. This can be done by pushing them down and then apart with the aid of a thin-bladed screwdriver. Care must be taken to ensure that the bottom turn does not touch the coil-form support lugs that are fastened to the chassis. Now C28 properly tunes the circuit to resonance. With a Bird wattmeter I find that the output on this band is now over 35 watts. There are no tuning problems on other bands. — Stan Grimes, W7CQB, Seattle, WA

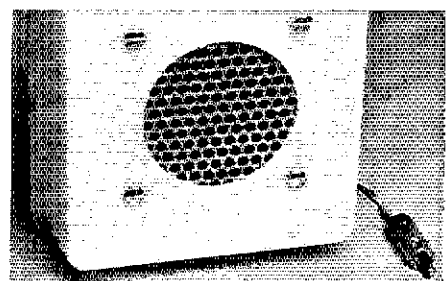
## ELIMINATING HW-101 TVI

An aggravating problem of TVI caused by my HW-101 transceiver ended after I corrected the poor continuity between the chassis and the top and bottom metal covers of the rig. The liberal amount of paint applied during the manufacture of the HW-101 prevented the housing cover and bottom from serving effectively as a shield.

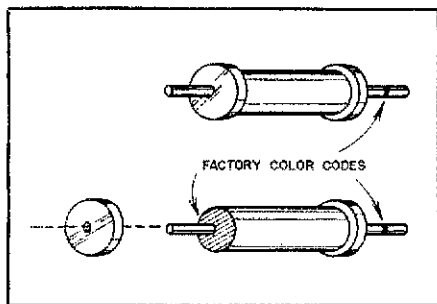
I removed a small area of paint around one of the screw holes on the back of both the upper and lower covers. From each of these holes I connected a wire to the ground terminal on the transceiver. To ensure, furthermore, that the HW-101 has a good earth connection, I installed a ground lead from the set to the cold-water-system plumbing. Now peace has been restored to the VE3HBP household. — Doug McLennon, VE3HBP, Ancaster, ON, Canada

## SPEAKER ENCLOSURE

A 4-3/4-inch (121-mm) square plastic freezer container having a depth of 1-3/4 inches (44 mm) is practical for enclosing a 3-inch (76-mm) loudspeaker. Perforated metal, obtainable at many hardware stores, may be installed as a grille. Amateurs will find this inexpensive method of housing a loudspeaker useful at the workbench and in portable operation.



An inexpensive plastic freezer food container may be converted to a practical loudspeaker enclosure.



W1HYN suggests that if the color code for the traps of your beam antenna have disappeared because of age and weather, check the end caps. Removal of the caps on Mosley traps as indicated in this drawing should disclose another set of color codes.

### BEAM-ANTENNA COLOR CODE

Have you ever bought a used beam antenna only to find out that time and weather had removed all traces of marking from the traps? To find which end is which for Mosley traps, simply remove the end caps. The markings which used to appear on the outside are also duplicated on the end of the trap covered by the cap. The inside color code will be on the opposite end from the original outside marking. See the accompanying drawing. — *Ed Shekleton, W1HYN, Dayville, CT*

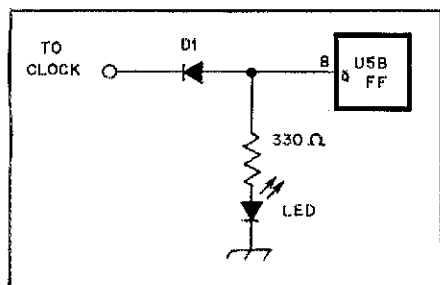
### TWO HINTS FROM THE KITCHEN

When you want to clean pc boards or copper connections such as those on antennas, don't overlook the use of copper pan cleaner. It's a lot cheaper than some commercial electronic cleaning products.

When you want to sort out that collection in the junk box or just keep parts for a project together, try the zip-lock type refrigerator storage bags. They're resealable and offer an easy way for finding the part you want without dumping everything out on the workbench. Furthermore the bags are easy to organize in a drawer or can be hung on hooks. — *David Ferguson, W6TFJ, Lakewood, CA*

### CLOCK INDICATOR FOR THE ACCU-KEYER

An LED clock indicator I installed on my Accu-Keyer lets me know when the clock is running and the automatic character spacing is in operation. The LED is lit when the clock is *not* running by the keyer is on. Should the LED come on during transmission of a message, im-



AG6B modified his Accu-Keyer with this clock-indicator circuit as a means of observing if the clock is running and the automatic character spacing is in operation.

perfect sending with spacing that is too long is indicated.

The LED is connected with a limiting resistor to pin 8 of U5 as shown in the accompanying diagram. The other end of the LED is connected to ground. — *Bill Foote, AG6B, Morro Bay, CA*

### POWDER SOLVENT REMOVES TAPE RESIDUE

I find that Hoppe's no. 9 gunpowder solvent will remove a lot of tape residue and marker inks from most surfaces in those cases where other solvents are ineffective. Hoppe's no. 9 is available in hardware and sporting goods stores. — *C. C. Thompson, W0RTK, Belfield, ND*

### NO MORE WHINING

After connecting a Touch-Tone pad to my ICOM 22S, I discovered I had poor audio. Some hams reported it to be alternator whine and others indicated there was a whistle on my signals. After many hours of troubleshooting and trying various remedies, I found one that worked.

I connected a 0.01- $\mu$ F disk-ceramic capacitor between the positive power supply lead and ground. Also 0.01- $\mu$ F capacitors were installed between the audio lead and ground at both the Touch-Tone end and the transceiver end of the line. In addition to the bypassing, I placed two 10- $\mu$ H chokes in series with the audio line, one at each end. Two similar chokes were placed in the positive supply lead, again one at each end of the line. — *Mark Klocksir, WA9IVH, Phoenix, AZ*

### HW-2036 CHANNEL-SWITCH VISIBILITY

The channel switch levers of the HW-2036 are difficult to see when the rig is mobile mounted. To make them more visible I have coated the upper side of the controls with white nail polish. Now they stand out even in faint light. — *Max E. Pierce, K8DYI, Detroit, MI*

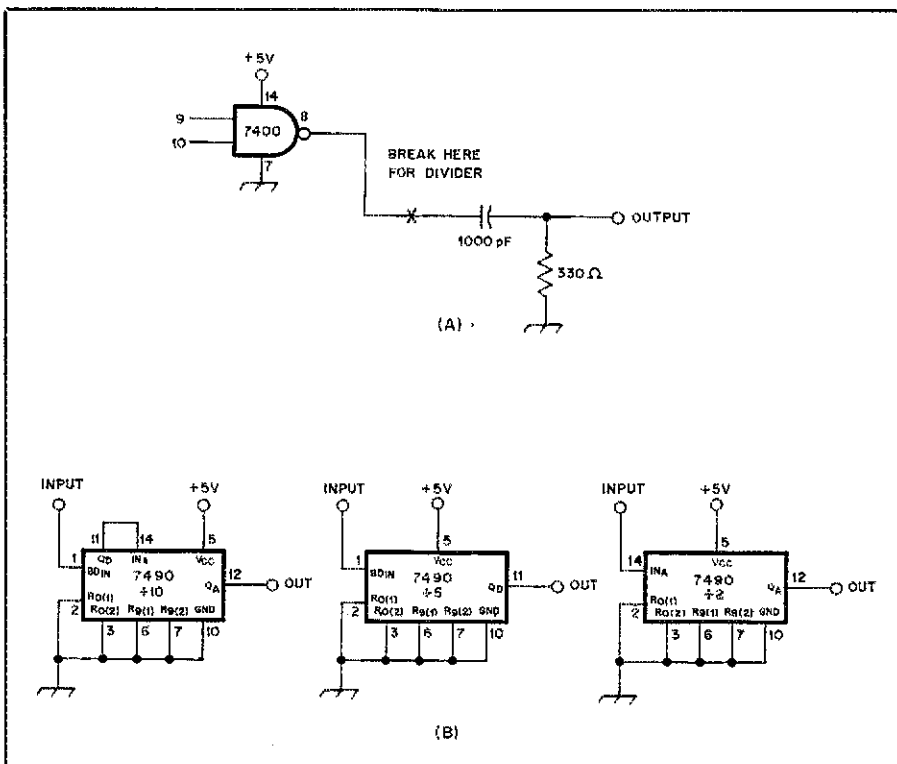
### LUBRICATION SOLVES NOISE PROBLEM

What is commonly called alternator noise may not always be caused by the alternator. In trying to solve such a problem connected with my mobile installation, I narrowed the possibilities down to the rotor in the distributor. I found that the rotor lubrication pad was dry and making a high-frequency squeal that resulted in the electrical interference. A light spray of household oil on the lubrication pad solved the difficulty. — *Thomas Martin, WD4ACW, Dublin, GA*

### CRYSTAL CALIBRATOR MODIFICATION FOR TEN TEC TRITON II

Although the pulsed 100-kHz crystal calibrator in my Ten Tec Triton II works well, I desired extra markers in order to enhance the rather close spacing of dial marks on 10 meters. The following modification has been in use for some time at WA7YWK, a welcome addition to the Triton II.

The 100-kHz output in my unit comes from a 7400 quad two-input NAND gate. Because this output is at a TTL level, it becomes obvious



This simple circuit modification of the Triton II crystal calibrator provides marker signals every 10 kHz. The partial diagram at A indicates the point in the Ten Tec calibrator where the divider is inserted. At B, connections to the 7490 IC are shown for obtaining +10, +5 and +2 outputs.

that a 7490 decade counter could be pressed into service to divide the output by 10. The modified calibrator now has marker signals every 10 kHz instead of the former 100 kHz.

There is very little unused space on the Ten Tec calibrator circuit board so the 7490 chip has been mounted dead-bug style with pins pointed up. A spot of contact cement holds everything firmly in place. Wiring is point to point, with the wires soldered directly to the pins of the 7490. An external on-off switch could be included to bypass the modification.

If other marker spacing is desired rather than every 10 kHz, the 7490 will still do the work. The chip contains a divide-by-two and a divide-by-five counter which can be used independently or together for a divide-by-10, as illustrated. Therefore, markers can be generated at 50

kHz, 20 kHz, or 10 kHz, as desired. — Malcolm D. Dunford, WA7YWK, Vancouver, WA

### LOW-COST DOT-MEMORY KEYSER MODIFICATION

After completing my Low-Cost Dot-Memory Keyer (June 1978 QST) it played an ill-natured trick of sending out a dah should the dit paddle be released before the dit was completed. The source of this misbehavior turned out to be a timing problem on U2B. After the modification shown in the accompanying diagram was performed, proper deportment was restored. The circuit change involves only the addition of another 7400 TTL IC and the use of two spare gates on U4, which is also a type 7400 IC. — Paul W. Hales, K7SDN, Clinton, UT

### TYPEWRITER PART SECURES DRAKE KNOB

The middle knob on my Drake MN-2000 tuner kept coming off even though the set screw seemed to be tight. I replaced the screw with an IBM typewriter part no. 112055. This is a spline screw, but it can be adjusted with an Allen wrench. Most typewriter repair shops will have this screw which will eliminate the slippage problem. — Sidney G. Campbell, WD0AFW, Springfield, MO

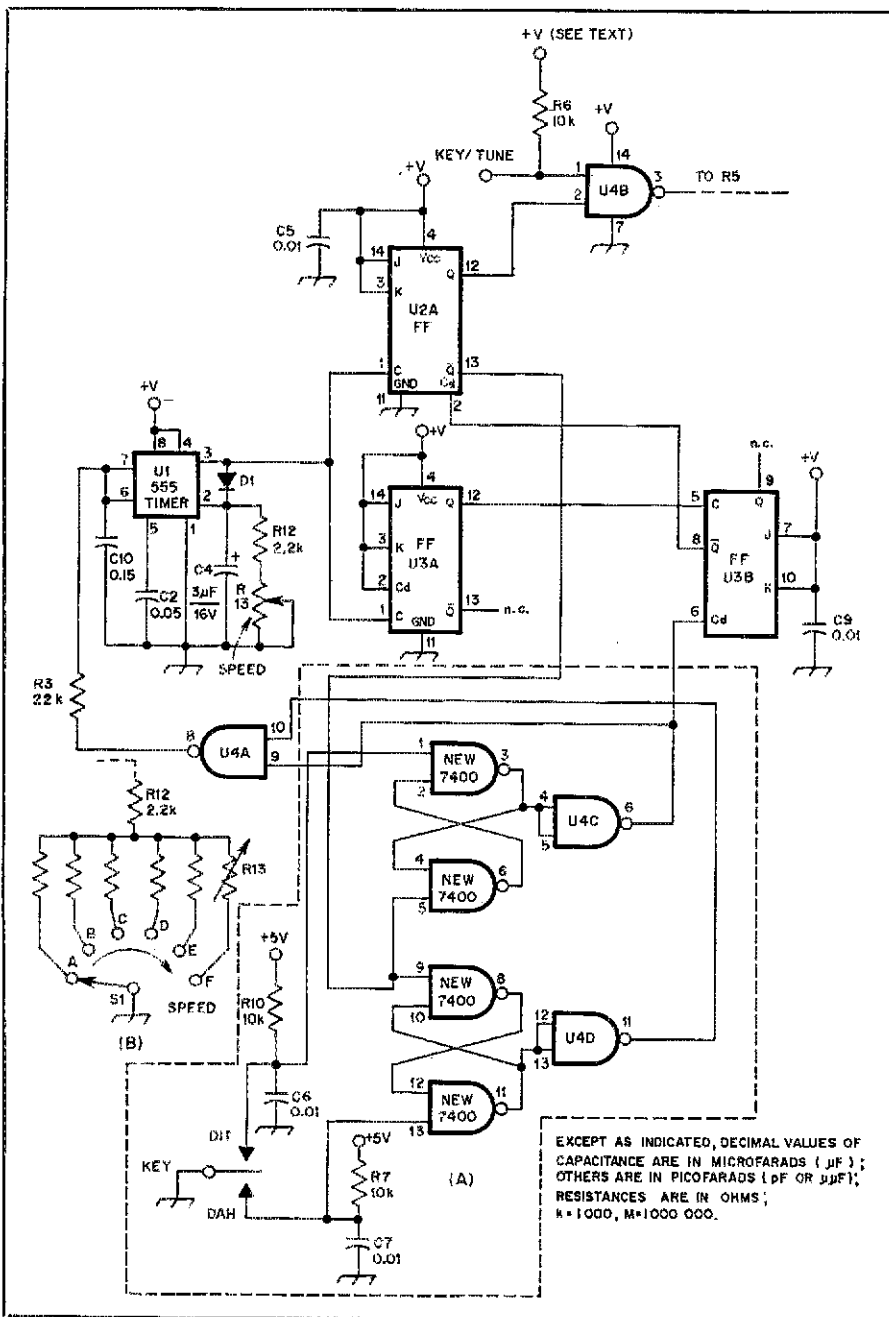
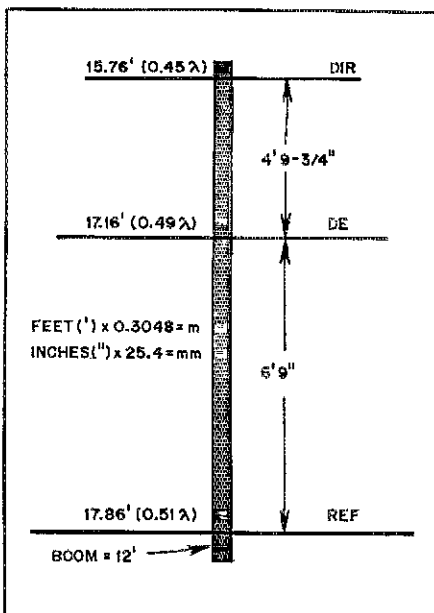
### THE BEARCAT AND THE BIRDIES

The Product Review of the Bearcat 210 Scanner in the July 1978 QST mentions the disadvantages of the two birdies in the amateur 2-meter band (146.5 and 147.4 MHz) which lock up the receiver in the search mode near "52" simplex. The outputs of most repeaters are between 146.61 and 147.39 MHz. If these two frequencies are programmed in as the upper and lower limits in the search mode, the birdies will be out of range and will not lock up the receiver. This enables constant searching of most repeater outputs without the user continually having to reprogram past the birdies. — John F. Pane, AF3B, Baden, PA

### THE 10-METER CHEAPIE — A YAGI ANTENNA

A number of amateurs have written to me asking for the specific dimensions of the finished 10-meter Yagi featured in "The 10-Meter Cheapie" published in March 1979 QST. Here are some dimensions that were calculated from the 3-element-Yagi design information contained in *The ARRL Antenna Book*. These dimensions were selected for a good compromise antenna with reasonable gain and front-to-back ratio. The finished antenna should exhibit a feed-point impedance close to 50 ohms. — KITX

Dimensions for the 10-Meter Cheapie Yagi antenna (March 1979 QST). Measurements provide resonance at 28.1 MHz. See original article for gamma-match information and other details.



EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (μF); OTHERS ARE IN PICOFARADS (pF OR μμF); RESISTANCES ARE IN OHMS; K=1000, M=1000000.

This modification of the Low-Cost Dot-Memory Keyer (June 1978 QST) improves performance of the unit. Only one additional 7400 TTL IC is added and the two spare gates of U4 are put to use. Pin 14 of the new 7400 is connected to +V and pin 7 of this IC is wired to ground.

# Ground Zero

American folklore says that spring is a pleasant carefree season. But people living along the Oklahoma/Texas border, in Jackson, MS, or in Harrisburg, PA, may not agree. This series of articles chronicles Amateur Radio's role during and after the crises — tornadoes, flooding and a nuclear accident — that combined to give spring a rude awakening.



(Mike Wann, Jackson Clarion-Ledger photo)

## A Terrible Tuesday

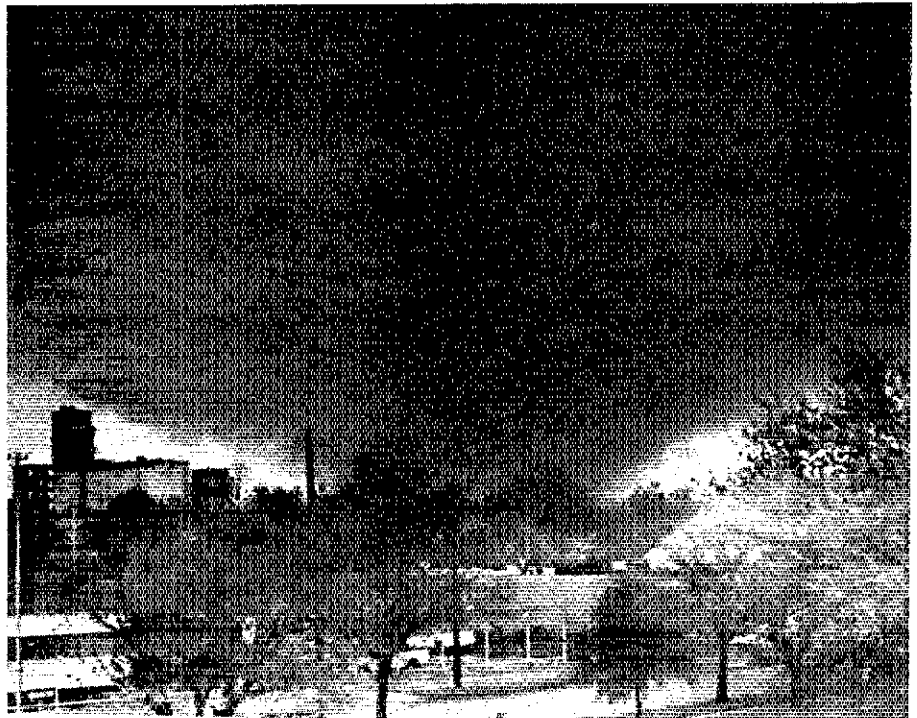
“We were tracking so many funnels that day . . . We were scared as hell . . .”

By Charles Byars,\* W5GPO

On the evening of April 10, 1979, disaster struck the city of Wichita Falls, Texas. A devastating tornado touched down on the southwest side of the city and cut a mile-wide path that ran approximately 30 miles. In its wake, it left 45 dead, 1500 injured, 6500 homes destroyed, 1500 apartments and 175 mobile homes wiped out. In a matter of minutes, one-fifth of the population of a city of 100,000 were homeless. The entire city was without commercial power and telephone service.

At 2:30 P.M. the National Weather Service (NWS) posted tornado watches in Wichita Falls. By 3 P.M. area amateurs began to gather on our 34/94 repeater to prepare for dispatch to observe any threatening weather. Soon things began to happen.

During the next three hours, NWS radar tracked several tornadoes in the area, with the assistance of approximately 20 Amateur Radio mobile units, who were utilized as ground observers. These observers reported through the net control to our 2-meter station, located at the



The killer tornado enveloped the entire city. (Wichita Falls Times & Record News photo)

\*4217 Meadowbrook, Wichita Falls, TX 76308

**Training Sessions Pay Off**

About an hour after the tornado hit Wichita Falls, the Disaster Services section of the local Dallas Chapter of the Red Cross requested that the Dallas County ARES activate and man the message center to handle emergency and priority traffic between the Red Cross office and an hf link station operating from the Rockwell International plant in Richardson. The Dallas ARC station, W5FC, was set up and a 2-meter link was established via the club repeater, WR5ABY, with WR5AHE serving as a secondary channel. As time permitted, the tremendous influx of inquiry traffic was processed from the Red Cross switchboard and transmitted via the 2-meter link to Richardson, then on to the disaster area via the Rockwell hf link (K5MWC) to N5WB, ARRL Northern Texas section emergency coordinator, operating at the disaster scene from a communications van supplied by Rockwell. The dual link was maintained continuously for over 80 hours until normal communications channels were restored. Many of the stations were newly trained traffic handlers from the DFW Metrolplex Traffic Net which meets nightly on WR5ABY. It was their first baptism of fire and it was immediately apparent that the training sessions had paid off. The Red Cross officials were very pleased with our services; we provided their only means of communication with the Wichita Falls chapter for the first 12 hours following the tornado. — Phil Clements, K5PC, SCM NTEX

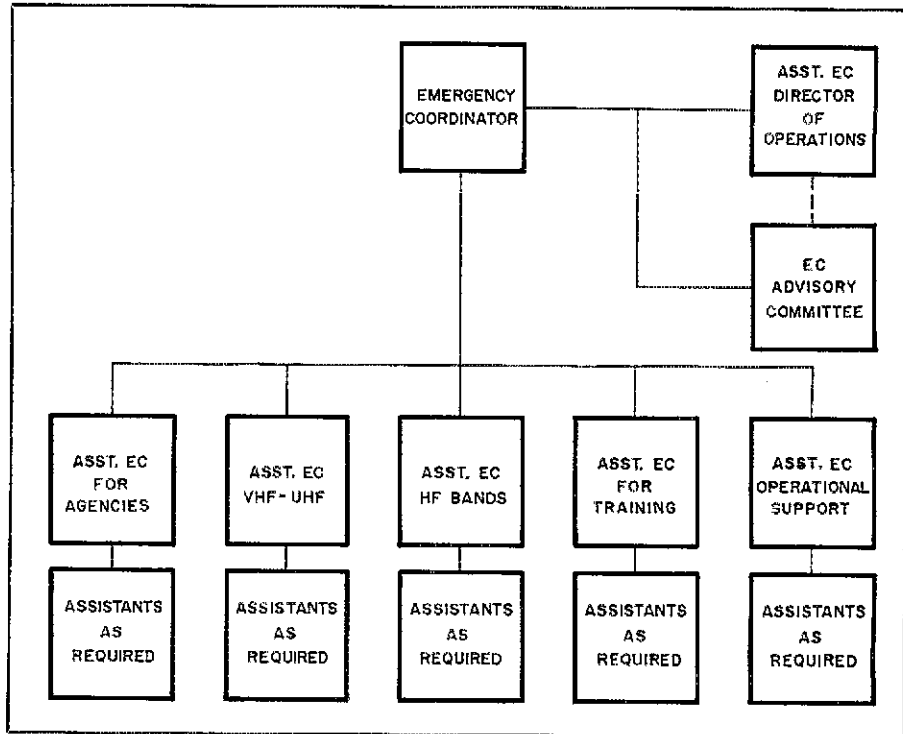


Fig. 1 — The Wichita Co. ARRL ARES organization looks like this. The system worked well during the tornado emergency.

National Weather Service. "There is heavy baseball-size hail in my location," one unit reported. "There is a funnel cloud developing southwest of me," yelled another. Soon the reports were coming in so fast that the net control station asked for help at his home QTH to assist in the operation.

At 4 P.M. the NCS received a report that a tornado had struck Vernon, TX, approximately 50 miles west of Wichita Falls. He alerted mobile units to stand by to move to Vernon to determine what assistance would be needed there.

At approximately 5:30 P.M. the NWS asked that we carefully observe a "hot area" southwest of our city. Mobile units already in the area reported heavy hail, rain and a great deal of turbulence in the cloud formations.

"A funnel is formed and it's on the ground, approximately four to five miles southwest of the stadium," a unit reported. "It's headed our way and I'm getting out of here," he added. NWS had the hot point on the radar but could not positively identify an actual funnel being formed; they depended on the Amateur Radio operators to provide information concerning the intensity and direction of movement of this storm. As NWS personnel received word that the tornado was forming, they initiated the necessary actions to sound tornado warning sirens throughout Wichita Falls.

Since the net control station's QTH was very close to where the tornado was forming, he abandoned his station and went mobile to get clear of the storm. When he

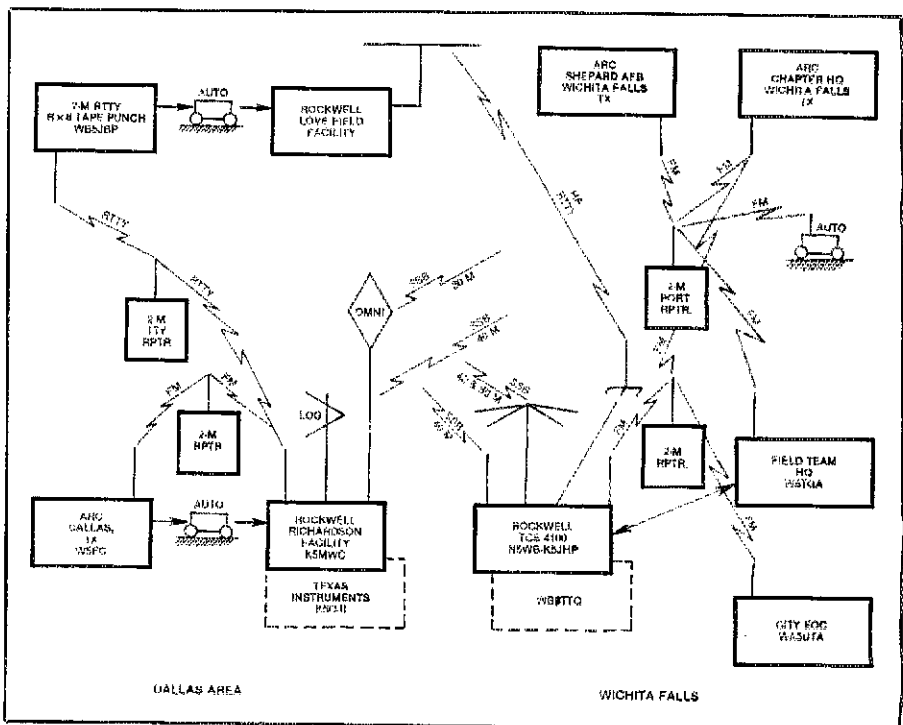


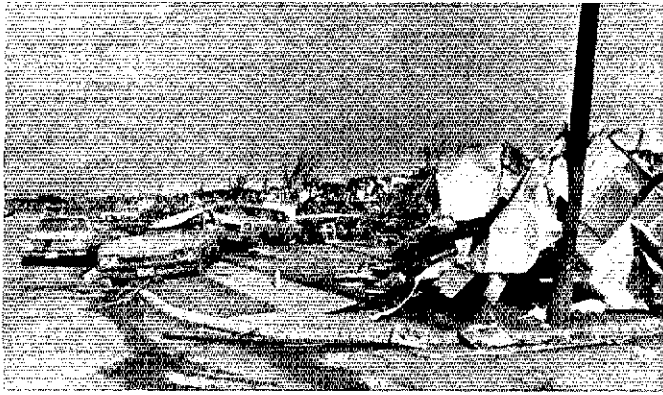
Fig. 2 — Communication links in and between the Dallas and Wichita Falls areas allowed emergency and priority traffic to pass during the time normal communications service was inoperable.

finally reached the expressway, the tornado was approximately 400 to 500 yards behind him. "It's the biggest thing I've ever seen," he reported excitedly.

At this point, the storm had already

begun its devastating effects. All commercial power in the city was gone, people were being killed and homes were being destroyed. Most mobile units went to 94 direct after losing commercial power and





The tornado struck — and Wichita Falls was immediately a case for urban renewal. (Becky Chaney, Wichita Falls Times & Record News photo)



Northern Texas Section Emergency Coordinator N5WB operating from the disaster area in Wichita Falls from a fully equipped emergency communications van. (photo courtesy Rockwell International)

### Health and Welfare Messages Get Through

Members of the Garland ARC and Garland RACES, headed by W5TGA, were among those who traveled to Wichita Falls to help, bringing with them the club's own portable repeater. After a meeting between EC WA5UTA and W5TGA, it was decided that the Garland group should specialize in servicing health and welfare inquiries. Almost 1500 of these messages had piled up by this time.

Traffic was relayed into the communications center via teletype or ssb in an around-the-clock effort. After being transcribed and logged by the Garland group, the messages were then

sorted according to geographical location and map grid coordinates. The control station then assigned the traffic to mobile operators stationed in the various grid-map areas. The mobile units then attempted to locate the house or in most cases, what remained of a house. Compounding the problem was the fact that no street signs or house numbers remained; only the numbers painted on the curb served to identify places where houses once stood.

Garland hams sought out people attempting to salvage their belongings, to relay the

message that a particular relative or friend was worried about them. They were successful in about 75 percent of the attempts to get information about the particular resident. When a person or family named in a message was contacted, confirmation was relayed back to the person originating the message.

The hams checked out an average of 400 on-the-scene messages each day, working from their own cars in two-man teams. Most of the stories had happy endings. — Gary Engleman, K5HGL, Garland, TX

they were able to track the storm's path through the city, reporting its movements directly to NWS.

Remaining units immediately changed to our alternate repeater in Henrietta, 07/67, located about 14 miles east of Wichita Falls. Net operations continued on this frequency for a brief time until Henrietta lost all commercial power; all mainline power trunks into our area had been demolished by the storm. We then moved to our second alternate repeater, the 75/15 machine, which utilizes battery power in emergencies. As the storm progressed, those amateurs not directly involved in the net operations were already moving to their appointed locations throughout the city, to provide emergency communications where necessary. The emergency operations center was set up and manned at the local police station. Others became operational from local hospitals, utility companies and ambulance services.

### Disaster Plan Takes Shape

The rest is history. People were screaming; rescue vehicles were trying to remove the dead and injured. It was a scene of total destruction — the area looked like a war zone. Immediately, our Amateur Radio Emergency Service (ARES) disaster plan began to take shape. Amateurs pro-

vided communications where needed. With such total devastation, why weren't more people killed? Amateur Radio is the answer.

Amateur Radio operators had provided the necessary "eyes" for the National Weather Service, which allowed NWS to give ample warning for the citizens to take cover prior to the storm. We did our jobs and did them well. The training, discipline and dedication of our volunteer ARES members paid off.


Only one week before, a practice disaster drill had been conducted by the city of Wichita Falls, with amateurs providing all communications. All city departments participated, along with utility companies and other disaster agencies. After the practice, our emergency coordinator critiqued the operation to iron out all the rough spots. We thought we were ready; April 10 proved we were.

WA5UTA was appointed ARRL emergency coordinator for Wichita Falls and surrounding area in June 1978. He provided the stimulus for a well-organized disaster organization. His control is exercised through six assistant ECs who have specific job assignments (Fig. 1). Specific information concerning this emergency plan may be obtained from WA5UTA or W5GPO.

Only one significant communications

deficiency was noted during and after the storm: Our high-frequency capabilities were not organized to handle the tremendous volume of traffic that followed. Fortunately, amateurs from throughout the state reported to the area to provide necessary assistance. Their service to our community is to be commended.

Following the storm, the community became well aware of the necessity for a good communications system. Local hospitals asked that permanent amateur station installations be made. One hospital has agreed to allow one complete repeater station to be moved to their building, which will allow the repeater to operate on emergency power when necessary. The local Air Force base hospital will install a complete 2-meter station for amateur use during emergencies. Other governmental and private agencies are asking that emergency communications be supplied by local amateurs when necessary. The local FAA office will provide equipment for emergency hf operations when needed. These are examples of interest in Amateur Radio on the part of those who need our assistance in times of disaster.

No one in our city thought we would ever be hit by such a devastating storm — but the ARES was prepared and will even be more prepared in the future. 

# Action in Jackson

By Alan Clark,\* WD5IKD and James Davis,\*\* WB5VFS

*Amateurs received high praise for services rendered during the severe flooding in the Jackson, MS, area during mid-April. WD5IKD filed a report on the organizational aspects, while WB5VFS sent in his personal impressions in a diary format, as one of the more than 100 amateurs involved.*

For the third time in 10 years, Jackson area hams were faced with a major emergency. By Friday morning, it was clear that the hams in the Jackson area would be required to make a maximum effort to assist. Fortunately, the organization — the Capital District Amateur Radio Emergency Service, the Jackson Amateur Radio Club and the ECHO Repeater Association — was ready.

Because of previously made emergency plans, three 2-meter stations went on the air from the Red Cross building, and a coordinated emergency effort was under way. K5GRV's 16/76 repeater, WR5ACC, was assigned under the emergency plan, as the emergency net's operating frequency. Outlying stations were established at the Jackson/Hinds Emergency Operations Center, the state civil defense headquarters, evacuation centers, Salvation Army and many other locations.

In order to handle the extensive amount of administrative traffic, WR5ABT 28/88, was established as the coordinating frequency. It was used to recruit hams and pass operating locations and times. When the 28/88 repeater lost power, coordination was switched to 04/64, until a generator was carried up 19 stories to the original repeater!

On Sunday afternoon, a high-frequency station was established at the Red Cross for traffic from the Mississippi Sideband Net and for liaison with the National Traffic System. The major stations maintained an around-the-clock vigil until midnight, April 19, when things began to slacken off, permitting assistance to downriver flood victims.

It is estimated that radio amateurs conducted communications for 21 different agencies. Here are some of the lessons learned:

- 1) Use one 2-meter frequency for a formal emergency net.
- 2) Use one 2-meter frequency for scheduling operators.



Interstate 55 under water in Jackson, MS. Suddenly it didn't matter if the gas stations were open or not. (Laura Fistler, Clarion-Ledger photo)

- 3) Use radiogram format to pass all traffic.
- 4) Let the hams outside the disaster area handle the health and welfare traffic on hf.
- 5) Train hams how to handle traffic; they should know what to do and especially what not to do during an emergency.
- 6) Do a lot of listening; transmissions should be brief.

## A Night to Remember

*12:10 P.M. CST, Thursday, April 12, 1979. From the National Weather Service* — This statement applies to the Pearl River at Jackson — a revised crest forecast has been issued. (Flood stage at Jackson is 18 feet.) At noon, the Pearl River was at 31.3 feet. A revised crest is expected to be 36 feet by Saturday. At Jackson airport, 5.9 inches of rain has fallen in the past 18 hours, filling up small creeks and drainage ditches — strong potential for more heavy rains — adding more water to the already flooded area. This could make the river go even higher than 36 feet. Those along the Pearl River and its tributaries are urged to take immediate action to move property and livestock to higher ground. If you live in

an area that will be affected by this higher stage, you should make plans to move to higher ground . . . or get a boat!

*11 A.M. CST, Friday, April 13.* Rain-falls over the past two days are in the order of 10-20 inches. This has put creeks and rivers higher than they have ever been before . . . at least since record-keeping started! The Pearl River was at 35.4 feet at 8:30 this morning. The river should reach 37 feet late tonight and near 37.5 feet by tomorrow morning. An additional rise seems possible with near 38 feet by Sunday not out of the question. Immediate action should be taken by people who will be affected. Previous records were 37.5 feet in 1901 and 37.2 in 1961 before the reservoir and levee systems were built. This is a very dangerous situation — don't take chances.

*10 P.M. CST, April 14.* The Pearl River now stands at 40.1 feet . . . a flood of this magnitude has never been experienced in this area before — many streets and highways are now impassable.

*3 P.M. CST, April 15.* 41.9 feet and still rising. Thousands have fled . . .

I'm in the life insurance business and do a lot of traveling. While en route to Cleveland, MS, contacted WB5SXX at NWS in Jackson on 75. He informed me situation serious. Amateur operators in Jackson very tired — needed relief. So I volunteered my station to come to Jackson . . . Reported to Red Cross headquarters approximately 1900 hours local Monday night.

Reported to city of Jackson Waterworks and set up a 2-meter station on 16/76. Requested by supervisor at Water Department to obtain river readings . . . first reading at 9:30 P.M. — river gauge 42.93 feet and rising. River readings every 30 minutes; at 3 A.M. 43.06 and . . . still rising.

Heard on 16/76: "URGENT — request 50 sandbaggers report to Jefferson Street Electric Power Station . . . Gravel trucks with police escort headed for sub-station (power plant was saved)."

Forty-three point one feet and still rising. Waterworks personnel moved to another building . . . Reported back to Red Cross headquarters and manned 3987 kHz (Mississippi Sideband Net). Traffic coming into Jackson from all over the U.S. Most handled within five minutes. Relief operator and much needed sleep at 10 A.M.

Reported back to Red Cross hq. at 7 P.M. Handled H&W traffic until about 4

\*3223 Virginia St., Pearl, MS 39208  
\*\*P. O. Box 332, Senatobia, MS 38668

A.M. Then the traffic got serious. The river was rising very rapidly downstream headed toward Georgetown, Monticello and Columbia. Situation critical. **EMERGENCY MESSAGE — TO ALL MISSISSIPPI AMATEURS X REQUEST HATTIESBURG AREA OR VICINITY OPERATORS REPORT TO COLUMBIA MS WITH 2 AND 75 METER CAPABILITIES IMMEDIATELY. Later — PRIORITY MESSAGE — TO ALL MISSISSIPPI AMATEURS X**

**REQUEST 10 OPERATORS REPORT TO JACKSON RED CROSS HEADQUARTERS IMMEDIATELY FOR RELIEF OPERATION. Instant response. Ops on the way!**

Hungry people coming into the Red Cross; they have had no food for over 24 hours; lost everything.

River finally crested on April 17 at approximately 2:30 P.M.; 43.25 feet, 25 feet above flood stage. I managed a 165-mile drive back home and finally, sleep. But in-

volvement not over yet.

*Friday morning, April 20.* Another appeal for amateurs urgently needed in Jackson. Reported to Jackson civil defense headquarters and was assigned to help with Pearl River readings from Columbia. Readings made on the hour and passed on to c.d. personnel. Then, relief was needed for amateurs at NWS. Reported there at midnight . . . At long last, I secured for the last time at 8 Saturday morning . . .

## Meltdown!

By Frank Masters,\* W3ABF and Robert Josuweit,\*\*WA3PZO

On March 28, 1979, the Three Mile Island Nuclear Power Plant, near Harrisburg, Pennsylvania, experienced a control failure which caused public officials to call an alert. A new word was added to the nation's vocabulary — MELTDOWN! This affected a five-county area in central Pennsylvania, home of the Central Pennsylvania Repeater Association.

That morning, a call for communications assistance came from the county Office of Emergency Preparedness. Under the direction of WA3AVX, Repeater Association members set up a communications link between PEMA (the Pennsylvania Emergency Management Agency) at the state capitol, Dauphin County O.E.P., Middletown (TMI), Red Cross and WHP television/radio, which served as the rumor control center. The Repeater Association or individual hams provided equipment and antennas. All of the club's four repeaters were utilized to their fullest extent: the 16/76, 34/94 and 220 for voice and 375/975 for RTTY. Confidential traffic was passed on RTTY for public security reasons. And operators on 16/76 in Philadelphia, Baltimore and State College (PA), voluntarily co-operated and curtailed their use of high power on the repeater pair, preventing occasional interference on the Harrisburg machine. During this operation, WA3AVX and county officials made plans to move all operations to Millersburg, about 30 miles north of Harrisburg, if it became necessary to evacuate the Harrisburg area. Information provided by Amateur Radio had a calming effect on the community, offsetting some of the rumors which were rapidly spreading through the area.

Later that day, following a recommendation by Governor Thornburg that pregnant women and preschool children within five miles of TMI leave the area, communication was established at the Red Cross Evacuee Shelter in Hershey. For the next two days, the situation remained in a

holding pattern as officials attempted to determine the extent of damage at TMI.

Friday morning, the "patient" went into critical condition. A hydrogen bubble was expanding inside the damaged reactor. Eastern Pennsylvania ARRL Section Emergency Coordinator WA3PZO received a call from the American Red Cross, Mid-Atlantic Division. The message was simple, but it sent shock waves through the state: "There is a possibility of a three-county evacuation — please establish communications." As the day progressed, that figure increased to five counties or everything within a 20-mile radius of TMI; population 630,000.

State government officials quickly drew up the evacuation plan. This plan quickly revealed the importance of Amateur Radio. Amateurs would provide primary communications between the evacuation centers and PEMA headquarters, and communications between the areas being evacuated and PEMA. People would be moved up to 100 miles from the damaged reactor. Most counties were preparing to receive approximately 20,000 to 25,000 evacuees. Philadelphia was designated to receive up to 70,000 people. Schools were to be used as shelters, each housing between 1,000 to 3,000 citizens. Each shelter would require Amateur Radio communications 24 hours a day. Amateurs from the CPRA and from surrounding areas were fully mobilized.

By Monday, however, the hydrogen bubble in the deteriorated reactor was reduced and the need for evacuation appeared to lessen. But amateurs continued to provide communications as they had during the entire incident. Finally, 10 days after the whole thing started, the Governor lifted his recommendation for people to stay out of the affected area. The country and the world breathed a collective sigh of relief. The shelters closed, but the controversy concerning nuclear power had just begun.

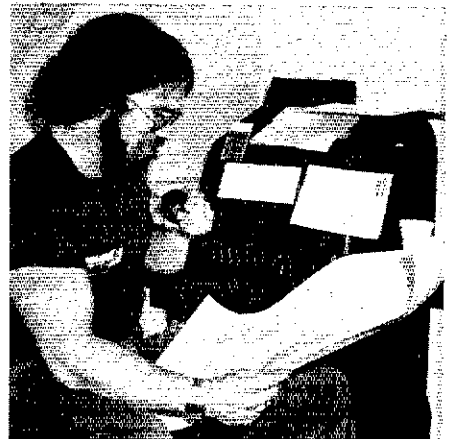
Two unique aspects of this operation bear mentioning. One — normally the disaster occurs first, then Amateur Radio

becomes involved. This time, Amateur Radio was involved full-scale before the disaster, which, luckily, was averted. Two — up until this point, Amateur Radio involvement with a nuclear crisis, other than an enemy attack, was never discussed. No one ever thought that the enemy would be us.

Fortunately, little if any health and welfare traffic came into the affected area. In preparing for it, it was obvious that most 2-meter repeaters would be engaged in important c.d./shelter communication. Suddenly, other vhf repeaters became a prime consideration for the handling of inquiry traffic. Computers were set to play a major role in processing and sorting inquiries at amateur stations and shelters.

Citizens of Pennsylvania placed a big load of responsibility on the Amateur Radio community and overall the operation went very smoothly, with hams meeting the challenge to serve the entire community. While all here trust that there will never be a duplication of such a crisis, we are making plans for a more comprehensive operation, if needed.

Pennsylvania hams are RADIO-active. REB-1



WB3JFA operates from WA3KXG, Central Pennsylvania Repeater Association club station, located at the county courthouse. (photo courtesy of KA3AAQ)

\*Box 123, Harrisburg, PA 17108

\*\*9 Derwen Dr., Havertown, PA 19083

# Learning Code by Osmosis

Anybody who's learned to talk can learn cw. It's easy. Just live with it and it will come to you.

By George Hart,\* W1NJM

I practically was born with a key in my hand, so cw is as natural to me as talking. In the early stages of my long, checkered career as a cw operator, it astonished me that many beginners considered code the major stumbling block in Amateur Radio. I became interested in this phenomenon and devoted some study to it; here is what I found.

The greatest obstacle to learning code is the method used. Most of us are in a hurry, so we go for "trick" methods, gadgets or gimmicks. All we want to do is get our tickets and spend most of our amateur careers yapping into microphones. If this description fits you, no wonder you're having (or had) a tough time passing the code test. It shouldn't be too surprising that you are already getting weary of Amateur Radio. You are missing

half the fun — more than half, in my opinion (but I may be prejudiced).

Most teachers of code are either teachers or code experts. Very few are both, and, unfortunately, some are neither. I don't claim to be an expert teacher, but I do know quite a bit about code — what it is, how it is formed, and, through decades of experience, the best ways to learn it. I'm not talking about passing a code test. I'm talking about learning the code much as you learned to talk, and just as expertly. (Not that many of us have really learned to talk, but that's another story.) Passing the test is only the first turn on the road to gaining maximum enjoyment out of Amateur Radio.

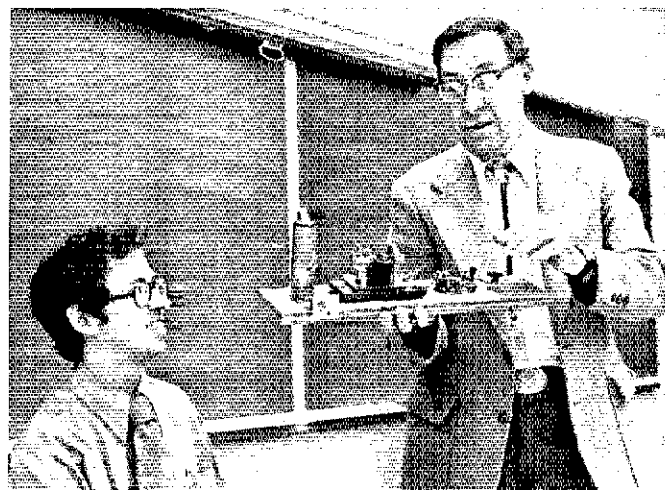
## A Few Basics

Let's start with a few fundamentals. No, I don't mean memorizing the code by dots and dashes, or any other rote or special method. Let's consider the foun-

dation we're building on. In speaking, there is a great variety of sounds and inflections formed by passing air from our lungs through the voice box, the tongue, the lips, teeth, larynx and nasal passages. It's really complicated: There are voiced stops, sibilants, liquids, gutturals, explosives, and a host of other methods of forming different sounds. With code, there are only three elements — a long sound, a short sound and spaces between them. You may say that spaces are not elements (i.e., they are silence, therefore nothing), but in code they are just as important as the sounds. So learning the code, involving only three basic elements, is a thousand times easier than learning to talk, which involves dozens of elements — and you started to master speech when you were about two years old.

Theoretically, learning code should be a snap — look how much smarter you are now than when you learned to talk! If you

\*66 Highland St., Newington, CT 06111



Whether you're a youngster or an old-timer, learning code is just a matter of learning to talk in a different way.

aspire to "learn cw," not just pass a code test, it is essential to begin with the right perspective. You say you only want to pass the test? Okay, you can do that at 5 wpm without learning code, and some of you probably have. But, you'll have to unlearn some bad habits if you decide to get your General class license and later the Extra. So you might as well start right; it's just as easy.

The basic unit of code has been called various names. Let's follow Webster and call it a baud. The baud is the length of the short sound in code, the nearest vocal equivalent of which is "dit." The other sound is three times as long and is expressed as "dah." Spaces between dits and dahs also are measured in bauds. *They are just as important as the sounds themselves.* When we say that a dit is one baud and a dah is three bauds, one naturally assumes that a dah is three times as long as a dit, but this is a misconception. A dit cannot be a dit nor a dah a dah unless it has spaces before and after it. Therefore, since spaces must be an integral part of code, we consider a dit as one baud of sound plus one baud of space (ergo, two bauds). A dah is three bauds of

sound and one baud of space. So a string of dahs is only twice as long as a string of dits.

You start with a string of dits. Then you uncork a string of dahs. Alternate them to get something that sounds like didahdidahdidahdidah, or dahdidahdidah dit. Excellent! As an infant code learner, you've just utter your first "goo." From there, you learn to combine the dits, dahs and spaces together to form words, characters and sentences. With only three elements to worry about, it's a lead-pipe cinch. All you have to do is apply the seat of your pants to the seat of a chair and stick with it. The basic units become combination sounds, each conveying a character. Just as in speaking, where you combine the basic sound "ah" with the basic sound "ee" to form the vowel "ah-ee" (I), you join the basic sound "dit" with the basic sound "dah" to form the character "didah" (A). By the time you've mastered all the letters of the alphabet, you'll know some of the basic words, like didah dahdit dahdit (AND) and dah dididit dit (THE). As your speed increases, you'll recognize longer words, phrases and sentences. You'll start

"copying behind" just as you do if someone is dictating to you, and a stream of code will make sense without writing it down.

A person's fist in sending code is almost as distinctive as his voice in speaking. Many old-time operators feel that the mechanized fist that is gaining popularity will rob the individual of his on-the-air personality. Maybe so; some day we may have mechanized voices and everybody's speech will sound alike. It would be the same thing — a boon for those with speaking or voice problems, but it would take away a lot of personality.

This brief article is not intended to be a substitute for a complete code course. The ARRL and other organizations do that — some right, some wrong. But if you start out as described in this article, and stick with it (don't let anyone kid you that there is an easy way), you won't go wrong. Some day you'll be capable of getting intelligence from code sent at fantastic speeds. Once you start out right, it's just a matter of practice. There are few or no "plateaus" to hurdle on the way to proficiency in the amateur's common bond, the international Morse code. □

## Strays



### CLARENCE C. MOORE, HC1JB/W9LZX, QUAD INVENTOR

□ Sharp-eyed readers may have noticed the name of the Reverend Clarence C. Moore, HC1JB/W9LZX, in the June "Silent Key" listing. Clarence invented the cubical quad antenna in 1942 when he was an engineer for HCJB in Quito, Ecuador. The design came as a solution to large corona discharges at the ends of existing beam-antenna elements, at the location two miles above sea level. Clarence was the founder of Crown International Inc., a leader in the audio industry, developer of a quarter-inch, four-track tape recorder, and owner of radio stations WXAX and WMCR. He died of a heart attack on January 24, 1979. — Perry F. Williams, WIUED

### 160-M QSLs LOST

□ Fire has claimed my QSL cards, including a 125-card, 160-meter cw county collection. Would my amateur contacts please send me replacement QSLs? My new address is Dick Griffith, N5XU, Box 2424, Abilene, TX 79604.



Hams are more likely to see "out of state" amateur calls on "in state" license plates since the FCC decided to let hams who move to a different call-sign district keep the same call. However, Bob Fehr, K4HLT, had a rough time convincing the Missouri Motor Vehicle Bureau that it was "okay" to have a 4-land call sign on a Missouri license plate. After considerable hassle, Bob finally got his call-sign license plate — and a letter of apology from the governor! Since Bob had blazed the trail, his son Steve also decided he wanted a call-sign license plate. Steve got his (WA4AIR) without a hitch!



Ken Stecker, W8SS (center), receives congratulations from Great Lakes Division Director Richard Egbert, WBETU (right), on his 50th anniversary as a licensed radio amateur. On the left is division Vice Director George Goldstone, W8AP. (photo by W8MPD)

### QST congratulates . . .

□ Ray E. Meyers, W6MLZ, former ARRL director, on his 70th anniversary as a licensed radio amateur. Ray was first on the air in 1910 with the call MI. (Maine Mason)

# Maritime Mobile (Almost)

This club station operates aboard a ship which, at zero knots, is going nowhere very fast.

By Michele Bartlett,\* N1AGD

**Q**uickly now: Which famous English queen weighs over 50,000 tons, is taller than Niagara Falls, had a \$250,000 price on her head, and calls CQ? If you said Queen Victoria, you haven't been to Long Beach lately.

As almost any ham in southern California can tell you, the former luxury ocean liner *RMS Queen Mary* is the new home of W6RO, the club station of the Associated Radio Amateurs of Long Beach, Inc. For the members of the ARALB, the culmination of 12 years of planning came on April 22, 1979, when California Angels left-fielder Joe Rudi, WA6PVA, made the first contact over W6RO from its new location. This historic event was celebrated by more than 500 people, who toasted the occasion with champagne as Rudi sent "CQ DE W6RO" on a straight key. Celebrities, city officials and amateurs mingled in the restored Wireless Room and Exhibit Room, recalling the early days of the project.

The saga of the *Queen* began in 1926, when plans were made to build the biggest and fastest superliner in the world. Work began in 1930 at the John Brown's shipyard on the Clyde River in Scotland. The *Queen* was launched in 1934, and spent the next two years afloat undergoing final preparations for her maiden voyage, which took place amid much fanfare in 1936.

After only four short years as a luxury liner, the *Queen* was stripped of her fine accouterments and was outfitted as a troop carrier, ferrying a total of 765,429 military personnel. It is said that Adolph Hitler offered a prize of \$250,000 to



Nate Brightman, K6OSC, operating his dream station — the outcome of 12 years of labor.

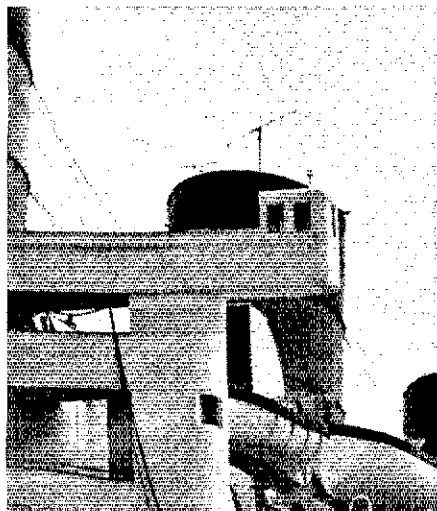
anyone who succeeded in sinking the *Queen*. Fortunately he was never called upon to open his wallet.

On the romantic side, the ship carried more than 12,000 GI brides and children to be reunited with their husbands and fathers. Prosperity soon returned, and with it came the revival of passenger service in 1947. While crossing the Atlantic, the *Queen* consumed a gallon of fuel for every 13 feet traveled, or 406 gallons per mile!

With the advent of transatlantic air travel, fewer tourists were opting for the seafarer's life. So in 1967, after 1001 crossings, escorted by a flotilla of every

sort of craft, the *Queen* sailed into Long Beach harbor, having been sold to the city by the Cunard Steamship Company. Aboard ship for the last voyage were amateurs operating ARALB special events station GB5QM. This operation was the brainchild of Nate Brightman, K6OSC — but he didn't stop there. Why not refurbish the *Queen's* Wireless Room, he thought, making it a permanent part of the new floating museum? Nate already knew that plans were being made to install a marine life exhibit and to convert some of the passenger cabins to hotel rooms. The *Queen Mary* would become a major southern California tourist attraction, and

\*9000 Pickwick Dr., Indianapolis, IN 46260



At 160 feet above sea level, the four-element tribander and 2-meter vertical draw signals from all parts of the globe from their perch on the middle funnel.

Tours, proceeded full steam ahead.

### Shiphshape at Last!

Finally, after a few skirmishes with Murphy, the ARALB celebrated the grand opening of the reconstructed Wireless Room. A four-element hf beam and a 2-meter nondirectional antenna are part of a system that Nate hopes will eventually include OSCAR and other state-of-the-art communications equipment. Most ancient mariners would feel at home in the nearby Exhibit Room which displays maritime radio gear dating to the turn of the century.

Every amateur who agrees to operate the station at least once each month for a four-hour stretch is issued a Radio Operator's badge which permits access to the ship, and wears a dark jacket with gold braid which contributes to the atmosphere of the halcyon days of a great luxury liner.

A unique (at least in California) advantage for this club station QTH is that it is nearly impervious to the ravages of earthquakes. Tethered to the shore by strong steel cables, the *Queen* might be tossed around a bit, but it is unlikely that any serious damage would result. The Wireless Room is equipped with an emergency generator to keep W6RO on the air, passing vital health-and-welfare messages through the National Traffic System. On a less earthshaking (but no less exciting) level, W6RO served as the Command Station for amateurs who were tracking and spotting for the Gordon Bennett International Balloon Race May 26, 1979.

The *Queen Mary* lowers her gangplank daily at 10 A.M. Tickets are \$5.50 for ages 12 to adult, \$2.50 for children ages 5-11, and no charge for children under 4. A special discount ticket is being offered to all attending the ARRL Southwestern Division Convention in October.

ARALB operates the station seven days a week from 9 A.M. to 4 P.M. Visiting hams are allowed 30 minutes of operating time. No doubt the highlight of the *Queen Mary* tour for radio enthusiasts is the long-awaited Wireless and Exhibit Rooms.

what better way to bring Amateur Radio before the public? So began a decade of hard work for Nate, the ARALB, and a whole crew of amateurs, historians, craftsman, engineers and public relations personnel.

In 1971, after four years of reconstruction, the *Queen* slipped into her present berth. Nate and his son Howard, K6OSD, were aboard for that short voyage, and operated W6RO on that occasion. By this time Nate's dream was beginning to take form, and a couple of years later he made his move. On June 20, 1974, Nate submitted "A Proposal for Amateur Radio Operation Aboard the *Queen Mary*" to Marvin M. Wolff, the director of Queen Mary Operations. Nate suggested that the former radio room be refurbished and that amateur equipment on permanent loan from various Amateur Radio manufacturers be used in the rack panels alongside regular maritime equipment. The room would be restored to resemble the original as much as possible. The "all clear" signal was given in 1978, and Nate and his crew, together with *Queen Mary*

### Liberty Ship to Be Maritime Museum

California will soon have another floating maritime museum when the WW II Liberty Ship SS *Jeremiah O'Brien* is restored and berthed in San Francisco's Golden Gate National Recreation Area. The exhibit will commemorate the continuing contribution of the United States Merchant Marine to this country's history and security. The ship's radio room will be restored as a ham station and visitor operation will be allowed. Amateurs who served aboard any of the Liberty Ships, or others who would like to help with the project, are urged to contact Henry E. Johnson, National Liberty Ship Memorial, c/o Jefferson Federal Savings & Loan, 1680 K St. N.W., Washington, DC 20006.

### See London's HMS Belfast

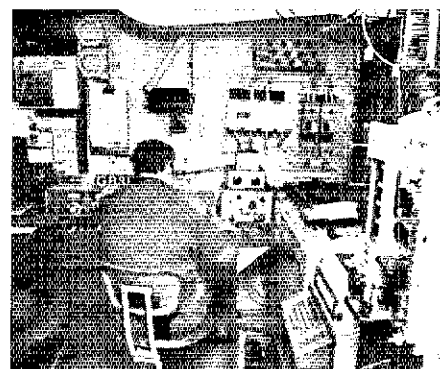
"Breathes there a ham with soul so dead he or she has not dreamed of shipboard operating?" Amateurs planning to visit England can operate aboard *Her Majesty's Ship Belfast*, which is moored permanently in the Thames River in London. The refurbished ship, once one of the world's most powerful cruisers, is equipped with a modern Amateur Radio station, G4HMS/GB2RN (ex-GB3RN), and authentic World War II naval radio gear in its Bridge Wireless Office. The equipment was installed in 1975 by the Royal Naval Amateur Radio Society, which also maintains and operates the station.

Prior to its preservation as a floating museum in 1971, the *HMS Belfast* served for 32 years in the Royal Navy, seeing action in World War II and the Korean War. When first put on exhibit, the 613-foot warship was maintained by the *HMS Belfast* Trust without government funds. Today, the ship is in the hands of the Imperial War Museum and the RNARS.

The RNARS is composed of hams who are serving or have served in the Royal Navy or its equivalents from the United Kingdom and Commonwealth merchant navies. Associate members, including civilians, are from navies all around the world. Numerous international RNARS nets, using all modes and bands, tie the group together.

For more information on the *HMS Belfast* exhibit or the RNARS, contact Don Walmsley, G3HZL, 153 Worpole Rd., Isleworth, Middlesex TW7 7HT, England. — Charles J. Ellis, W0YBV

The W6RO QSL. Note the high-rise oil derricks in the harbor.



Lt. Stan Ridgway, G3TZQ, of the Royal Marines, mans the main operating position aboard the floating museum *HMS Belfast*. Note the nonoperating antenna patch panel (right, background) and authentic vacuum tube, navy-issued receivers (right, foreground). (Guardian photo)





## King Hussein and Amateur Radio in Jordan

Travel has long played a vitally important role in our worldwide preparations for the 1979 World Administrative Radio Conference. Members of the IARU Geneva WARC Team have not only met with national administrations on all six continents, but have as well devoted a good deal of time to visiting and assisting the member-societies of the Union.

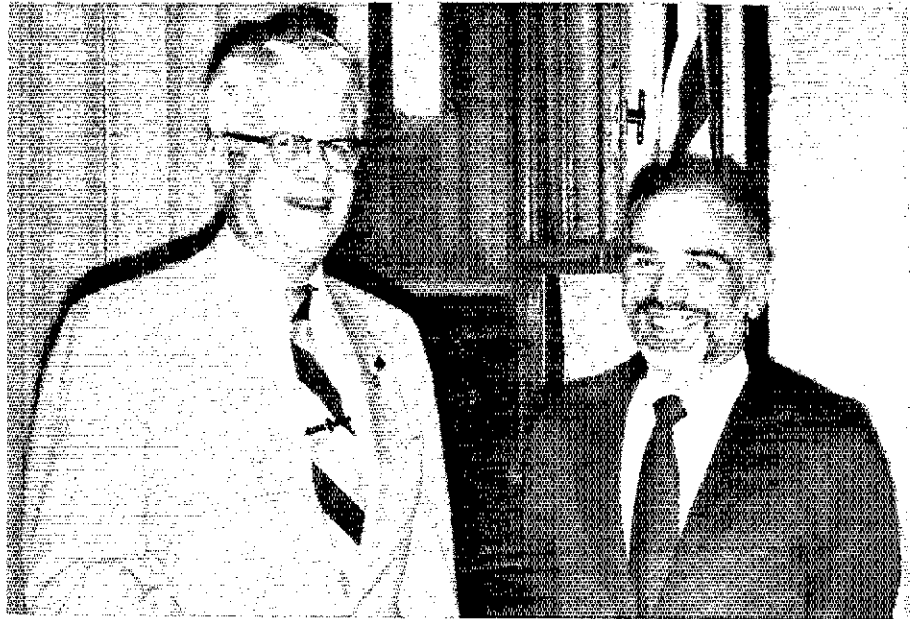
In May of this year, IARU President/ARRL Vice President Noel B. Eaton, VE3CJ, paid such a visit to the Royal Jordanian Radio Amateurs Society — and to His Majesty King Hussein, JY1. Immediately after the IARU Region 1 Division Executive Committee meeting near London, Mr. Eaton flew to Amman intent on meeting with His Majesty to obtain counsel on how IARU should pursue the WARC interests of the Amateur Radio Service with non-IARU Arab nations.

To be sure, our expectations were met. But Mr. Eaton was pleased to report upon his return to Canada that the visit had turned out to be a most beneficial exchange of information and assistance, bilaterally.

Bruce Blackburn, JY9BB/W4TA (Royal Telecommunications Advisor to His Majesty), was Mr. Eaton's host. Shortly after his arrival in Amman, JY9BB took Mr. Eaton to meet with Mohammed Ismael, the Director General of the Jordan Telecommunications Corporation. (This is the Jordanian counterpart to the FCC and DOC.) While the RJRAS had done a superb job of presenting the position of the Amateur Service to the Jordanian administration, Mr. Eaton was asked to assist the government's WARC officials in understanding some of the intricacies of the September conference. Jordan is by no means unique in this respect: We have found that many of the developing nations feel uneasy about WARC's general complexity, and for good reason. Hence we have been grateful for such opportunities to assist concerned administrations.

The result of this meeting was a deeper commitment to the Amateur Service by Jordan, and a better understanding on our part of the unique challenges facing the Arab nations in telecommunications. Mr. Eaton held a similar meeting with General Shaker, JY3ZS, commander-in-chief of the Jordanian armed forces.

Of course, the highlight of the visit was Mr. Eaton's meeting with King Hussein, who showed contagious enthusiasm for the Amateur Service. His Royal Highness Prince Raad Bin Zeid, JY2RZ (chairman of the society), participated as adjutant to His Majesty, and was instructed to attend to several issues which His Majesty felt would enhance Amateur Radio's image in the Middle East. Perhaps even more important, he advised Mr. Eaton on how Jordan could assist in furthering the understanding of Amateur Radio in the



His Majesty Al-Hussein Ibn Talal, JY1, King of Jordan with IARU President Noel B. Eaton, VE3CJ/JY8CJ, at the Royal Palace in Amman.

Arab Telecommunications Council. We are most grateful to His Majesty for his assistance and interest in WARC preparations. His enthusiasm for Amateur Radio is also evidenced by his cooperation with Dave Bell, W6AQ, producer of a new ARRL film on Amateur Radio, to be released soon.

According to the officers of the RJRAS (who were incomparably hospitable to Mr. Eaton during his visit), there are 81 licensed amateurs in Jordan, all of whom are members of the society. A general broadcast to the members is made each Saturday on 14.250 MHz at 0800 UTC from JY6ZZ, the society's

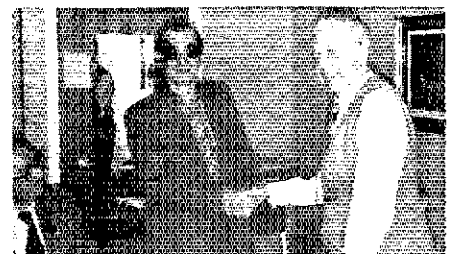
headquarters station.

Jordanians may apply for a license once they reach the age of 16, whereupon they may sit for a basic exam similar to the U.S. Novice class (including a five-wpm code test), or the Class B exam, which requires a code test of 10 wpm and grants 1-kilowatt privileges on all bands.

Amateur Radio is a thriving — and growing — enterprise in the Hashemite Kingdom of Jordan. We are delighted to have had the opportunity to visit with this new IARU member, and with the royal gentleman who has done so much already for Amateur Radio's future in the Middle East.



Left to right: Bruce Blackburn, JY9BB/W4TA, Royal Telecommunications Advisor to His Majesty; VE3CJ; H.R.H. Prince Raad Bin Zeid, JY2RZ, president of the RJRAS; Nayef Abu-Rumman, JY4NA, RJRAS secretary; Ibrahim Ayuob, JY4IA; RJRAS vice president; Moham-med Balblisi, JY4MB, IARU liaison officer.



The IARU Region 1 Division Executive Committee met near London to complete preparations for WARC-79 during May. The Division includes the IARU societies in Europe, Africa and the U.S.S.R. Left to right: Lou Van Der Nadort, PAØLOU, president; Wojciech Nietyksza, SP5FM, EC member; Roy F. Stevens, G2BVN, secretary — for many years an inspiring and guiding force in the region. (photo by VE3CJ)

\*International Services Officer, ARRL

## Spectrum Pressure Evident in VHF/UHF Proposals

Last month we looked at the first 43 administrations' WARC-79 proposals for changes in the international Table of Frequency Allocations as they would affect the Amateur Service below 30 MHz. This month we'll do the same for the bands above 30 MHz, and will include the Amateur-Satellite Service in the analysis. Overall the picture is not quite as encouraging as at hf, with numerous proposals for narrower amateur allocations in those parts of the spectrum which are under great pressure from the growth of other services. On the other hand, proposals for the elimination of entire amateur bands are essentially nonexistent and there are numerous proposals for new satellite allocations.


The Amateur Service may be at a philosophical crossroads at this conference with respect to its higher-frequency allocations. Today, nearly all of the bands above 148 MHz are shared with one or more other services, on a secondary basis. We tend to think of them as "our" bands, whereas in fact we operate there only at the sufferance of the primary services. The most common sharing partner is the Radiolocation Service, usually government-operated, ground-based radars. Historically, this sharing arrangement has worked out quite well for us. Only minimal restrictions have been placed on amateur operations in order to protect radiolocation, and radiolocation requirements have protected us from encroachment by other services. Through sharing with radiolocation, amateurs have enjoyed access to wider bands than could have been justified on the basis of amateur requirements alone. Of course, in the process we have suffered some interference from radars, but on balance it has been a good arrangement.

Responding to the requirements of the Mobile and Fixed Services in particular, a number of administrations propose reductions for the Radiolocation and Amateur Services between 220 MHz and 10.5 GHz. Some of the proposals, while they would narrow one or more of the amateur bands, would improve our status in the remainder of the band at the same time. The result would be that we could claim protection from interference from other services in that part of the band which would be retained, something we cannot do today. There are even proposals for exclusivity in some bands. We know from experience that it is much easier to obtain allocations for the Amateur-Satellite Service in exclusive amateur bands than in shared bands. Also, looking beyond WARC-79, it is apparent that new uses for this portion of the spectrum will continue to be found and will need to be accommodated at the expense of existing services. Thus, the question is this: In the long term, which is the better strategy for the Amateur and Amateur-Satellite Services: to argue for retention of as much as possible of the present wide, shared

**Table 1**

**Summary of present ITU amateur allocations above 30 MHz. (Note: Not to scale; footnotes not included; frequencies in MHz.) Region 1: Europe, Africa and the U.S.S.R. Region 2: The Americas, including Hawaii. Region 3: The rest of Asia and Oceania.**

REGION 1	REGION 2	REGION 3
	50-54	AMATEUR
144-146	AMATEUR AMATEUR-SATELLITE	
	146-148	AMATEUR
	220-225	AMATEUR RADIOLOCATION
430-440	420-450	RADIOLOCATION Amateur
1215-1300	RADIOLOCATION Amateur	
2300-2450	2300-2450	RADIOLOCATION Amateur Fixed Mobile
	3300-3400	RADIOLOCATION Amateur
	3400-3500	FIXED-SATELLITE (Space-to-Earth) RADIOLOCATION Amateur
5650-5670	RADIOLOCATION Amateur	
5670-5725	RADIOLOCATION Amateur Space Research (Deep Space)	
5725-5850	5725-5850	RADIOLOCATION Amateur
FIXED-SATELLITE (Earth-to-Space) RADIOLOCATION Amateur	5850-5925	RADIOLOCATION Amateur
10,000-10,500	RADIOLOCATION Amateur	
24,000-24,050	AMATEUR AMATEUR-SATELLITE	
24,050-24,250	RADIOLOCATION Amateur	

 NO ALLOCATION

allocations, or to press for exclusive (but much narrower) bands?

Of course, as mentioned last month, the most desirable outcome would be to have narrow, exclusive segments within the present shared bands. But this leaves unanswered an important question: Which should be given the greater priority, exclusivity or bandwidth?

How you answer that question yourself, is likely to reflect your own operating interests. How it is answered by the IARU team in Geneva, in its strategy sessions during the conference, will depend upon developments at the conference itself. But the time to think about our options is now.

Before we look at the proposals themselves,

\* Assistant General Manager, ARRL

let's examine the amateur allocations as they now exist above 30 MHz. See Table 1. Services shown in upper-case letters (e.g., AMATEUR) are *primary* services; those in lower case (e.g., Amateur) are *secondary* services. Secondary services in a shared band may not cause harmful interference to stations in a primary service, and may not claim protection from interference from such stations. Through footnotes to the Table of Frequency Allocations, some additional services are permitted to operate in these bands, usually within specific countries. For example, such a footnote permits the Amateur Service in the southern part of Africa to operate in 50-54 MHz. Another footnote reads as follows: "In China, India and Japan, the band 146-148 MHz is also allocated to the fixed and mobile services." This means that in these three countries, the telecommunications administrations are free to assign fixed and mobile stations to frequencies in the band without protecting the Amateur Service from harmful interference.

Another footnote, which is very important to amateurs, reads as follows: "In the band 435-438 MHz, the amateur-satellite service may be authorized, on condition that no harmful interference shall be caused to other services operating in accordance with the Table. Administrations authorizing such use shall ensure that any harmful interference caused by emissions from an amateur satellite is immediately eliminated in accordance with the provisions of No. 1567A." This is the basis for the operation of OSCAR 8 Mode J, and for the planned operation of the Phase III satellite to be launched next year. Some administrations, including the U.S. and Canada, are proposing to extend the provisions of this footnote to other bands above 1 GHz. Obtaining access to some of these bands for amateur satellites is an important objective of the International Amateur Radio Union.

There is one more kind of footnote which should be mentioned. There are spot frequencies throughout the spectrum which are designated for the use of industrial, scientific and medical (ISM) equipment. Probably the most common example of such equipment is the microwave oven. This equipment is not used for communications, but its operation can cause harmful interference to communications services. Footnotes to the Table of Frequency Allocations put communications services on notice that they are not protected from interference from ISM equipment on or near certain frequencies. The ones of major interest to amateurs are 433.92 MHz  $\pm$  0.2 percent (certain countries in Region 1 only), 915 MHz  $\pm$  13 MHz (Region 2 only), 2450 MHz  $\pm$  50 MHz, 5800 MHz  $\pm$  75 MHz, and 24.125 GHz  $\pm$  125 MHz.

It would take more space than we have available to describe in detail all of the proposals which might affect us above 30 MHz. Therefore, what we will try to do here is to identify the significant trends, recognizing that the conference itself may result in changes which bear little resemblance to the preliminary proposals.

Little has surfaced to trouble us at 50 MHz. Norway proposes the following footnote: "When the broadcasting service ceases operation in the band 47-68 MHz, the amateur service should be permitted to use exclusive segment or segments in the band 50-54 MHz, preferably 50-50.5 MHz."

China, Indonesia and Singapore propose various sharing arrangements at 144-146 MHz.

Cuba, Japan, Korea and Thailand propose to withdraw the Amateur Service from 146-148 MHz in favor of Fixed and Mobile. Indonesia, Pakistan and Singapore propose sharing with Fixed and Mobile at 146-148 MHz.

The U.S. proposes sharing with Maritime Mobile at 220-225 MHz (see last month's column). Cuba proposes 220-223 as exclusively Amateur in Region 2, with 223-225 going to Fixed and Mobile. Aside from that, the proposals for the band are generally favorable. Argentina and Canada would reduce the status of Radiolocation to secondary, retaining Amateur as primary. Trinidad and Tobago proposes adding Amateur-Satellite as primary in Region 2. Papua New Guinea proposes a new band in Region 3 at 230-235 MHz, shared with Fixed and Mobile.

The 70-cm band is under a great deal of pressure. In Region 1 today it is only 10 MHz wide (see Table 1), although the Amateur Service has primary status there (co-equal with Radiolocation). The proposals there vary greatly. At one end of the scale, the Federal Republic of Germany proposes no change in 430-434 MHz with 434-440 MHz exclusive for Amateur and Amateur-Satellite. France agrees at 434-440 MHz, but would make Amateur secondary at 430-434 MHz. Austria, The Netherlands, Norway, Sweden and the United Kingdom would improve our status in a narrower band, six to eight megahertz wide, while withdrawing the rest.

In Region 2, Argentina, Cuba and El Salvador would make Amateur primary (co-equal with Radiolocation) at 430-440 MHz but would delete the segments 420-430 and 440-450 MHz. Canada would use 420-430 MHz for domestic Fixed and Mobile. On the other hand, Trinidad and Tobago proposes 420-450 MHz as exclusively Amateur! The U.S. has no proposals affecting the band.

In Region 3, a number of administrations wish to introduce Fixed and Mobile into the band while continuing the Amateur Service in all or most of the band on a shared basis. New Zealand has a unique proposal to permit the Amateur Service there to operate at 610-620 MHz on a secondary basis, to compensate for the proposed withdrawal of 420-430 MHz in that country and to permit the operation of amateur television repeaters.

Canada, the U.S. and Trinidad and Tobago propose an Amateur allocation at 902-928 MHz.

The 1215-to-1300-MHz band is another pressure point. France states that it is firmly opposed to an Amateur allocation near 1300 MHz, even on a secondary basis, "...because of the protection which the radiolocation and the aeronautical radionavigation services should enjoy." Instead, France proposes 1248-1260 MHz as exclusive, worldwide, for Amateur and Amateur-Satellite, with the rest of the band withdrawn from amateur use. Norway has a similar proposal, but for 1280-1300 MHz. Papua New Guinea proposes 1290-1300 MHz as exclusively Amateur and Amateur-Satellite, and would retain 1240-1290 MHz for Amateur on the present, secondary basis; however, it joins with several other countries (including the U.S.) in proposing to withdraw 1215-1240 MHz in order to protect a proposed Radionavigation-Satellite system which will use that segment. The Federal Republic of Germany has a most welcome proposal to open the entire 1215-to-1300-MHz band to amateur satellites. Sweden would do the same for 1250-1300 MHz, but would reallocate

1215-1250 MHz to Land Mobile. The U.S. supports amateur satellites at 1250-1260 MHz, and Canada and New Zealand at 1290-1300 MHz.

In another example of the "narrow exclusive vs. wide shared" philosophy, Norway and the Federal Republic of Germany propose 2400-2450 MHz as exclusively Amateur and Amateur-Satellite in Region 1. However, note the interference potential of ISM equipment mentioned earlier. Austria would make the same segment exclusively Amateur, and all three would withdraw the remainder of the band from Amateur use. Sweden, the United Kingdom, Canada, the U.S. and New Zealand would make some provision for amateur satellites. Australia proposes 2300-2310 MHz as exclusively Amateur and Amateur-Satellite, with no change in the rest of the band. Papua New Guinea would make the same 10-MHz segment available for exclusive Amateur-Satellite use.

The 3300-MHz band is available only in Regions 2 and 3, and Switzerland (a Region 1 country) proposes withdrawing 3400-3500 MHz in those Regions. Despite the fact that it is not a worldwide band, Canada, Australia and New Zealand propose making some provision for amateur satellites. Papua New Guinea goes even farther, proposing a worldwide secondary allocation at 3100-3400 MHz for both our terrestrial and space services, with the latter limited to the Earth-to-Space direction. Several other countries propose introducing new services in the band, on a shared basis.

The 5650-to-5850-MHz band (5650-5925 MHz in Region 3) is one to which many of our satellite hopes are pinned. Austria, Norway, Sweden, Canada, Trinidad and Tobago, the U.S., Australia, Japan and New Zealand support the Amateur-Satellite Service in some part of the band. The U.S. would not propose an Amateur-Satellite Service allocation at 10 GHz, but several others have done so, including Austria, France, Norway, the United Kingdom, Canada, Trinidad and Tobago, Australia, New Zealand and Papua New Guinea. Having the support of this many countries is encouraging, but there are differences between the various proposals which must be reconciled if the fight for the allocation is to be won.

Only a few countries have made proposals for changes above 40 GHz; however, of those that have, most have made some provisions for amateurs. These include France, the Federal Republic of Germany, the United Kingdom, Canada, Trinidad and Tobago, the U.S., Japan, New Zealand and Pakistan.

And that, in a nutshell, is what has been proposed for us by the first 43 countries to submit proposals for WARC-79. A logical question which may have occurred to you while reading this is, "Why does the ITU make a distinction between the Amateur and Amateur-Satellite Services?" Of course, as amateurs we make no such distinction. The answer is that the ITU treats all radiocommunication services in this way, to increase the possibilities for sharing between services. These possibilities are greater if different technical criteria are applied to terrestrial and space links. In the case of exclusive Amateur/Amateur-Satellite bands the difference is irrelevant, because sharing arrangements are worked out by the amateurs themselves.

Next month we will let you get acquainted with the members of the team which will represent the International Amateur Radio Union in Geneva this fall. EST-1

# Correspondence

The publishers of QST assume no responsibility for statements made herein by correspondents.

## PRAISE FROM PROFESSIONALS

□ The National Weather Service Offices at Brownsville and San Antonio, Texas, extend a hearty Thank You and congratulations for a job well done to several south Texas Amateur Radio operators.

On Monday, March 26, all land-line communications into and out of the Brownsville International Airport were disrupted when construction equipment severed a large cable. As they have done so often in the past, Amateur Radio operators offered their services. Within minutes of the outage, operators in Brownsville, including Art Ross, W5KR; Doug Christensen, W5OOG; David Lathance, WD5CI and Phil Bloom, W5DX, had begun relaying hourly aviation weather reports from the airport to other parts of the Lower Rio Grande Valley where long-distance phone service was used to forward the reports on to San Antonio. Soon afterward, W5KR at the Brownsville Weather Service office established direct communications with the San Antonio Radio Club. Dean Davis, W5BGE, received the data in San Antonio and forwarded it to the San Antonio Weather Service Forecast Office where it was entered on the nationwide weather teleprinter circuits.

For Art Ross and Dean Davis this experience probably brought back old memories. In 1967, when Hurricane Beulah hit the lower Texas coast, these two operators spent the greater part of a week passing weather information between Brownsville and San Antonio.

Without communications, most weather information would be nonexistent. We are very glad to know that Amateur Radio can step in when our routine communications fail. — E. A. DiLoreto, meteorologist in charge, San Antonio and Richard R. Hagan, meteorologist in charge, Brownsville, TX

□ Thanks for your letter of congratulations. I am extremely proud to have been elected to the Florida House of Representatives and as an active ham radio operator, I am proud to represent our interest in Florida.

I have toured the Crestview derailment site here in north Florida and am proud to report to you that Amateur Radio operators have pitched in as always and are doing a splendid job on the scene. I was able to fly to the scene with Governor Bob Graham, during which time he and I discussed Amateur Radio operators and their roles during emergency situations such as this.

Please do not hesitate to contact me at any time if I might be of further assistance to you. — Ron Johnson, WB4LJJ, Representative, Eighth District, Panama City, FL

## WRAPPING UP RAPP

□ W7YF and W5OYP ("Correspondence," June QST) are so right. We all used to look forward to the April issue.

Might suggest an update on some of the old Larson E. Rapp, W1OU, papers. One of the best, a generation or so back, was on operation in the Negacyck spectrum down past zero beat, where antennas have to be underground and vacuum tubes have to be run under high pressure. — Dave Hardacker, W7TO, Sheridan, WY

□ Put Rapp back in the act — he is about the only thing there at HQ that I approve of! Put him up front and about four pages deep! — John L. Mohn, W5MEU, San Antonio, TX

□ Bring back a major effort by Larson E. Rapp each April issue! Not only have I consistently enjoyed his outrageous innovations, but he represents one of the few easily maintained traditions Amateur Radio was once so proud of. — Morris Hornik, WB9JHW, Milwaukee, WI

□ Please bring Larson E. Rapp, W1OU, out from under the wraps. Without my going into a lot of superfluous verbiage, I do miss the old boy, especially since I have known him from 1935 on. I have followed his instructions meticulously and they have worked every time. There are not many writers in your magazine, I dare say, that have that claim to fame.

Since QST has gone to the big time, surely there is room for some of the serious stuff that Mr. Rapp exudes. I cannot understand some of this childish biocentric cosmos truncated flip flop stuff that has superseded double-spaced variable condensers and vacuum tubes. However, Larson may be just the one to reinstate some understanding in our hobby. — A. George Young, Jacksonville Beach, FL

□ Regarding April in general and Larson E. Rapp specifically, I am reminded of the following:

"A little nonsense now and then is relished by the wisest men."

Bring back the water troughs, the conversion charts from cycles per second to hertz, the plate tanks on the roof and all those other delightful projects and operating aids we always looked forward to each April. — Stan Coutant, AA6SC, Pasadena, CA

□ My attention has been called to a libelous "Editor's Note" in *Correspondence* for June 1979. After presenting three letters of approbation for my client and long-time personal friend, the extinguished Mr. L. E. Rapp, you had the audacity to suggest that QST staff opinion is *divided* on the worth of Mr. Rapp's contributions to Amateur Radio!

Before hauling QST into court and winning damages the League can ill afford to pay, I offer you an easy settlement. Post QST's readers (the customers, you know) and determine if there is a current continuing (monthly) feature they could or would relinquish (do without) once a year for a quasi-technical aborted diatribe by my client.

As a great philosopher once said, "Ham radio is a sometimes fun thing — or is it?" — Carlyle Q. Blackstone, Washington, AC

[Editor's Note: How about it, gang? Should there be an April-toot quasi-technical story each year? Can anything be omitted to make room, if necessary? How much warning is necessary to protect the innocent?]

## THE REAL AMATEUR RADIO

□ One week before Ted, W3DGX, died I offered his son Denny some advice.

"Tell Ted it's only a hobby . . . something for relaxing. Tell him not to take ham radio so seriously." Earlier that afternoon a nameless station some 150 miles away beamed full-quitting inanities into Ted's repeater and several other repeaters simultaneously. His one-sided QSOs pushed W3DGX's patience to the limit. Ted called the interloper a turkey and the station replied with taunts that filled the repeater for the rest of the day.

One week passed and Ted was dead.

Now, lost somewhere in the long line of cars with headlights on in the bright summer morning, I thought of the hams in front and behind me with radios and antennas and call-letter license plates all following the car that carried the Silent Key to the cemetery.

We passed Swatara Creek. Weeks before, it kept us awake with flooding through the night as hams reported to civil defense. A few miles up river and some years earlier, Wilkes-Barre and the Wyoming Valley were ravaged during the Agnes flood. There, W3DGX and his son Denny, K3SLG, sent health and welfare reports from unknown flooded people to their relatives.

Later in 1975, another kind of flood hit the area. Some 16,000 Vietnam refugees all without a friend came to Indiantown Gap to wait out the dusty summer

heat and the long assimilation process of our country. Ted was there setting up 75-meter dipoles and helping relay traffic through the repeater and to the Pennsylvania Phone Net with the help of his wife Katie, K3BHU.

Up ahead the cars, like kids following the leader, came to their respective stops outside the church. Car doors opened and hams walked slowly to the church in the early summer sun. We waited outside on the steps. Pressing forward we heard the beginning of the Mass of Christian Burial. Entering the church we thought our respective thoughts about what had come before.

Many of us had given thanks here, after the searing fear of Three Mile Island. TMI had changed the Hershey Sports Arena into a mass-care center, where families, instead of hockey players, were housed. TMI emptied area nursing homes into hospitals outside the critical area as hams rode ambulances charting the evacuation's progress.

TMI, like Wilkes-Barre and the Vietnam refugee situation, was unreal. W3DGX was there in all of this with the repeater, doing his part and telling us to call for his help if we needed him.

Walking back to the car I watched Katie and Denny. The taunts of a week before, my advice, came back to me and made no sense in all of this. My advice sounded hollow.

To Ted, ham radio was *more than a hobby*. To call it something less was to lie. Ted never believed that lie. — Thomas B. Bowman, Jr., WA3REY, Palmyra, PA

## COMMENTS COUNT

□ In the "Happenings" column of the April issue of QST you made mention of the termination of the FCC Docket 20672 which would have required amateurs to submit the original of their license when renewing.

Amateurs protesting the proposed rule change were effective in defeating it. However, I think it appropriate to mention that only eight amateurs filed comments with the Commission and of these, seven were against the change. It is encouraging to me, one of the seven, that such a small number of comments can prove effective in influencing the Commission's decisions. — Norman B. Keon, WABAEG, St. Louis, MI

## HAMTOWN, USA

□ In reply to the Hamtown, USA Stray [page 72, June QST, in which the town of Colebrook, CT, boasted of four hams in a population of 1100, a ratio of 1:275] the town of Wilsonville, Alabama, has four hams in a population of 847, an Extra, an Advanced, a General and a Novice, for a ratio of 1:211. Did anyone check to see what the ratio was for Newington, CT? — Charles E. Dillard, KA4GPZ, Wilsonville, AL

[Editor's Note: With 29,000 people and perhaps 48 hams, Newington, CT, checks in at 1:610. If you add another 41 Hq. hams here in the daytime, it improves to 1:329! The national ratio is 1:594. But read on.]

□ Your office will probably be deluged with claims. [Editor's Note: Yes, somewhat.] Here in Harrah, Washington, total population 384, there are two licensed amateurs, for a ratio of 1:192. — The Rev. Charles H. Winter, N7AAG . . . Newington, New Hampshire, sure can beat that! It's a very small town, 670 people, but we have five hams, a ratio of 1:134. — Albert T. Libby, WB1EPK, Newington, NH . . . Hillsboro, Illinois, population 4,300; we have 38 hams, ratio 1:113. — Emily Compton, WD9CZJ . . . Glide, Oregon, five amateurs, population 486, ratio 1:97. — Jack Nicholas, W7LNE . . . Sextonville, Wisconsin, two amateurs, population 158, ratio 1:79. — Joe Mavensheim, WB9SBD . . . Rapid River, Michigan, 12 hams, 950 people, 1:79. — Paul Roberts, WD8IXX . . . Martin, Michigan, population 502, amateurs eight (not counting one who chooses to get his mail in Allegan), ratio 1:62. — Jay Maley, W0RMET . . . Seaton, Illinois, a town of 235 people, six amateurs, ratio 1:39. — Janis Strom, WD9JKO

□ I received my license this morning and counted the hams in town. There are now five in Mellette, SD, with a population of 180, which makes a ratio of one ham for every 36 people. — David Johnson, KA6FIE, Mellette, SD

## ARRL Testifies at House and Senate Hearings

Three bills have been introduced in the present session of Congress seeking to amend the Communications Act of 1934. The entire communications policy of the United States is based on this law.

In the U.S. House of Representatives, H.R. 3333, introduced by Representative Van Deerlin (Dem.-CA), proposes a major top-to-bottom rewrite. This effort has been the subject of input and testimony from industry and spectrum users for nearly two years. On the Senate side are two bills: S.611, introduced by Senator Hollings (Dem.-SC), and S.622, introduced by Senator Goldwater (Rep.-AZ). These bills are not as encompassing as the House bill; they propose only a few specific amendments to the Communications Act of 1934.

The Amateur Radio Service is one of the many radio spectrum users that would be affected by these bills, should they become law. On behalf of the Amateur Radio Service, ARRL General Counsel Robert M. Booth, Jr., W3PS, appeared before the House Communications Subcommittee June 18, 1979, to recommend changes beneficial to Amateur

Radio. The League expressed approval of H.R. 3333's provisions to extend maximum license terms from five to 10 years, to allow the FCC to accept the service of volunteers, to give the proposed Communications Regulatory Commission (CRC) authority to regulate the susceptibility of equipment to rf interference as well as interference-causing potential of devices that radiate rf energy, and to give the CRC authority to require that radio gear be sold only to people who present a valid authorization to operate said equipment.

The League also asked that H.R. 3333 explicitly exempt the Amateur Radio Service from any spectrum-use fee based on the scarcity value of the spectrum subject to "marketplace forces." (Earlier this year, Representative Van Deerlin gave verbal assurances that the proposed spectrum-use fee would not apply to amateurs. See January 1979 QST, page 64.) The League also recommended changes to the secrecy provisions of the bill to make it clear that Amateur and CB Services are exempt. Though it is generally held that amateurs and CBers are exempt from the secrecy provisions of the present communica-

tions act, most people agree the wording is not explicit.<sup>1</sup>

The Senate bills contained only two provisions of direct interest to Amateur Radio: spectrum fees and license terms. The League recommended, however, that the Subcommittee give serious attention to including in the final Senate bill the suggestions of the League, many of which had already been incorporated in the House bill.

These appearances by ARRL were not the first time the League has appeared before Congress to present testimony on the Rewrite of the Communications Act. Previous appearances were in September 1977 and again in September 1978. For more details see the article, "Amateurs Have Their Say on the Communications Act of 1978" (December 1978 QST, page 56).

<sup>1</sup>The present amateur exemption from the secrecy provisions is found in Section 605 of the Communications Act of 1934: "... This section shall not apply to the receiving, divulging, publishing or utilizing the contents of any radio communication, which is broadcast or transmitted by amateurs or others for the use of the general public, or which relates to ships in distress."

### SECOND NOTICE — ARRL ELECTIONS

Attention all ARRL members! Nominations are now open for candidates for ARRL director and vice director in each of the following divisions: Atlantic, Canadian, Dakota, Delta, Great Lakes, Midwest, Pacific and South-eastern. It is time for all ARRL full members in these divisions to begin making their choices for these offices for the two-year term which will begin January 1, 1980.

#### What do ARRL directors and vice directors do?

The ARRL Board of Directors is the governing body of the nonprofit, educational and scientific corporation chartered under the laws of Connecticut as the *American Radio Relay League, Incorporated*. The Board of Directors is ultimately responsible for all League matters, including deciding ARRL priorities and services that will be made available to the membership. There are 16 directors, who are elected by the membership on a geographical basis. Half of the directors stand for election in the even-numbered years, half in the odd. At the same time directors are elected, vice directors are also chosen, who can fill in when directors are unable to serve. For this reason, candidates for vice director must meet the same requirements as the candidates for director.

#### Who is eligible to run for director or vice director?

In order for a candidate to be eligible for the office of director or vice director, he or she must submit a nominating petition bearing the signatures of 10 (or more) full members of a division naming him or her as a candidate for director or vice director. This petition must be received by League headquarters no later than noon on September 10, 1979.

The nominee must reside in the ARRL division he or she seeks to represent. He or she must also be the holder of at least a General class amateur license, or a Canadian Advanced Amateur Certificate, must be at least 21 years of age, and must have been licensed and a full member of the League for a continuous term of at least four years at the time of the election. No person is eligible who is commercially engaged in the manufacture, sale or rental of radio apparatus capable of being used in radio communication. Neither is a person eligible who is commercially or governmentally engaged in frequency allocation planning or implementation. Finally, no one can run who is commercially engaged in the publication of radio literature intended in whole or in part for radio amateurs. The idea behind these rules is to ensure that candidates have a true interest in Amateur Radio and the League, legal capacity to make decisions for ARRL, and freedom from conflicts of interest.

#### Nominating Form

The following form for nomination is suggested; it may be copied onto any paper, or a blank following this form may be obtained

from Headquarters on request:  
*Executive Committee*  
*The American Radio Relay League*  
*Newington, CT 06111*

*We, the undersigned Full Members of the ARRL residing in the . . . Division, hereby nominate . . . of . . . as a candidate for director; and we also nominate . . . of . . . as a candidate for vice director from this division for the 1980-1981 term.*

*(Signature . . . Call . . . City . . . ZIP . . . Date)*

#### Who is eligible to vote?

Whenever there is more than one candidate for either office, ballots will be sent to all full members of the League in that division who were in good standing on September 10. The ballots will be mailed no later than October 1 and, to be valid, must be returned to Headquarters by noon, November 20. A group of nominators can name a candidate for director, for vice director, or for both, but there are no "slates" as such. Each candidate appears on the ballot in alphabetical order.

#### Absentee Ballots

All ARRL members who are licensed by FCC or DOC but temporarily residing outside the U.S. or Canada are now eligible for full membership. These members overseas who arrange to be listed as full members in an appropriate division prior to September 10 will be able to vote this year where elections are being held.

Even within the U.S., full members temporarily residing outside the ARRL division they consider home may now notify the

\*Deputy Manager, Membership Services, ARRL

Secretary of the League prior to September 10, giving the current QST address and the reason why another division is considered home (as for instance, holding an amateur call appropriate to the division). So if your home division is the Atlantic, Canadian, Dakota, Delta, Great Lakes, Midwest, Pacific or Southeastern Division, but your QST goes elsewhere, please let the ARRL Secretary know, as soon as possible but no later than September 10, so you will receive a ballot for your home division.

#### **What if one person is nominated for both director and vice director?**

If a person is nominated for both director and vice director, the nomination for director will stand and that for vice director will be void. A person nominated for both offices does have the option, however, of declining the higher nomination and running for vice director if he or she wishes.

Since all the powers of the director are transferred to the vice director in the event of the director's death, resignation, removal outside the division, or inability to serve, careful selection of candidates for vice director is just as important as for director.

#### **The Incumbents**

Presently these persons hold the office of director and vice director in the divisions conducting the elections this year: *Atlantic* — Harry A. McConaghy, W3SW and Jesse Bieberman, W3TK; *Canadian* — Ronald J. Hesler, VE1SH and William W. Loucks, VE3AR; *Dakota* — Garfield A. Anderson, K0GA and Tod A. Olson, K0TO; *Delta* — Max Arnold, W4WHN and John H. Sanders, WB4ANX; *Great Lakes* — Richard A. Egbert, W8ETU and George H. Goldstone, W8AP; *Midwest* — Paul Grauer, W0FIR and Claire Richard Dyas, W0JCP; *Pacific* — William J. Stevens, W6ZM and Robert C. Smithwick, W6JZU; and *Southeastern* — Larry E. Price, W4RA and Frank M. Butler, Jr., W4RH

#### **In Summary**

Petitions need 10 or more signatures of full members and are due at League headquarters by noon, September 10. If there is only one candidate for an office, he or she will be declared elected by the Executive Committee; otherwise, ballots will be mailed not later than October 1 to full members of record September 10. To be valid, ballots must reach Headquarters before noon, November 20. The new term will begin at noon, January 1, 1980.

#### **Additional Information**

Nominees or, indeed, any member, may obtain a copy of the ARRL Articles of Association and Bylaws, along with a pamphlet outlining the duties and responsibilities of elected League officials. Interested persons should write or call ARRL Headquarters, 225 Main Street, Newington, CT 06111. Telephone: 203-666-1541.

For the Board of Directors:  
July 1, 1979

R. L. Baldwin, W1RU  
Secretary

### **FCC ISSUES INQUIRY ON NEW 900-MHZ PERSONAL RADIO SERVICE**

The FCC has recently adopted a Notice of Inquiry on the subject of creating a new "per-

sonal radio service" in the 900-MHz band. This service is intended for citizens with more serious needs than the casual CBER, and for people who need greater reliability generally for commercial needs over a 15- to 20-mile range. The Inquiry, PR Docket 79-140, asks interested parties to address such questions as the number of channels that should be allocated to this service, the relative desirability of a-m, ssb, or fm emission types, the allocation of certain channels for exclusive purposes, spectrum-saving techniques, interconnection with the public switched telephone network, and the use of automatic relay stations (repeaters). Comments on the Inquiry are due at the Commission by November 30; reply comments are due December 31, 1979.

At one time this new service represented a very real threat to the amateur 220-MHz band. That threat was dismissed, however, on October 12, 1978, when the FCC voted to establish the service in the 900-MHz band. See "The Band We Almost Lost," January 1979 QST, page 54, for the full story.

### **FCC ISSUES INQUIRY ON THE BIOLOGICAL EFFECTS OF RF RADIATION**

Although details were not available at presstime, the Commission has adopted a Notice of Inquiry on the effects of rf radiation on the health and safety of individuals. The Commission said that to the best of its knowledge available experimental data have not shown that there is now a danger to the public at large from rf radiation. However, the Commission noted there is substantial controversy about the effects of low-level and long-term exposure to rf radiation. Increasing public awareness and interest in the health and safety effects of facilities and equipment the FCC regulates have, according to the Commission, made it necessary to seek information and opinions on how the FCC's regulatory responsibilities should be executed in this matter.

As this subject is of concern to all amateurs, QST will carry more details on the Commission's Inquiry next month, which will allow sufficient time to file comments by the deadline of December 15, 1979; it's Gen Docket 79-144.

### **FCC BEGINS PHASE I OF REFUNDING PROGRAM**

The FCC has started Phase I of its fee-refunding program. Radio amateurs who paid more than \$20 in fees to the FCC between August 1, 1970 and December 31, 1976, are eligible for a refund. This includes Extra Class amateurs who paid a \$25 fee for a special call sign. Eligible persons must obtain a copy of the Phase I Refund Program instruction and form booklet.

These booklets are available from FCC field offices and from Federal Information Centers. Booklets may also be obtained by writing directly to FCC Fee Refund Program, P. O. Box 1788, Hyattsville, MD 20788. The type of license for which a refund is requested should be noted. After completing the request form, it should be mailed to the address provided in the instructions. Refund requests should not be presented to any other FCC office.

The refund program has been developed in

response to a number of decisions in 1976 by the U.S. Court of Appeals for the District of Columbia Circuit, which held that the fees collected by the FCC from August 1, 1970 to December 31, 1976 were unlawful. The court held that the fees were excessive and directed the Commission to recalculate the fees and to make appropriate refunds. For more background information, see June 1979 QST, page 58. — Tom Matus, WBIACZ

### **OREGON ELECTROMAGNETIC RADIATION EXPOSURE BILL DIES**

Earlier this year, a bill, S.423, was introduced into the Oregon Senate which would have prohibited operation of "electrical equipment" in any manner which would expose residential areas to electromagnetic radiation above a certain level (to be determined later). "Electrical equipment" would have included radio and television transmitters, electric power transformers and transmission lines, and other electrical devices. The bill has died in committee.

The Senate Committee on Environment and Energy held two hearings on the bill. According to a member of the committee staff, no one spoke in favor of the bill at either hearing. However, the same staff member said there were many opponents of the bill at both Senate hearings. Representatives of broadcast, land-mobile, telephone transmission, power transmission, amateur and equipment manufacturing interests jointly contributed to the defeat of the bill. For more information on this bill, see May 1979 QST, page 59.

### **NJ SCANNER LAW REPEALED ANYWAY**

Last month this column reported New Jersey Governor Byrne's veto of Senate Bill 729. (See July 1979 QST, page 61.) This bill, had it not been vetoed, would have exempted licensed radio amateurs from the state's "scanner law." Now it turns out that the question was moot anyway, because the "scanner law," itself, will be repealed September 1, 1979.

Last year the Governor signed legislation\* which repeals laws considered frivolous or obsolete. Among the laws scheduled to be repealed September 1 is 2A:127-4, the law hams sought to be exempted from by Senate Bill 729.

However, until September 1, all persons in New Jersey must comply with the following law:

"2A:127-4. *Installing shortwave radios in automobiles without permit; police excepted.* Any person who installs or has in any automobile a shortwave radio receiver operative on frequencies assigned by the federal communications commission (sic) for fire, police, municipal or other governmental uses, is guilty of a misdemeanor, unless a permit therefor has first been obtained from the chief of the county police, or from the chief of police of the municipality, wherein such person resides.

\*This section does not apply to any fire,

\*New Jersey Statutes Annotated, 2C:98-2.



Governor Richard W. Riley of South Carolina presents his signed proclamation making June 17-23, 1979, Amateur Radio Week. Shown here, from left to right, are Charles Rogers, K4LNO; Winfield Simons, WA4SJS; Richard McAbee, W4MTK; Al Link, K4ICL; Bill Phillips, WD4HBX; Earl Brannon, W4HCZ; Governor Riley; Dan Mobley, KA4BGA; and Ray Caulder, WA4YAF.

police or other governmental official of the state or of any county or municipality thereof."

#### IVAN H. LOUCKS, W3GD/K4GD

*QST* reports the passing of Ivan H. Loucks, W3GD/K4GD. He had over 33 years of service with the FCC, retiring in 1965 as chief of the Amateur and Citizens' Division. Ivan began his career in 1931 as a radio inspector for the U.S. Department of Commerce, the licensing bureau that preceded the FCC. He was an active radio amateur for over 50 years. In 1928, as 4GD, Ivan was a pioneer in populating the new 20-meter band with simple homebrew gear, working most of the world — the choicest DX of the time.

His years with the FCC involved him with the establishment of the Novice, Technician and Amateur Extra Class licenses and examinations, as well as the formation of the Radio Amateur Civil Emergency Service (RACES) and the Disaster Communications Service rules. Ivan was a former director of the Maryland Emergency Phone Net, and was a past secretary of the Washington Chapter of the Veteran Wireless Association. He was very active in the Frederick and Montgomery County (MD) RACES programs.

Ivan Loucks' passing marks the loss of one of the few remaining "old-timers" in the ranks of FCC retirees who really knew and understood the traditions as well as the foibles of the Amateur Radio Service. We'll all miss him. — *Alexander N. Gerli, AC1Y*

#### LORENTZ A. MORROW, W1VG

*QST* sadly announces the passing of Lorentz

A. "Pete" Morrow, W1VG. He was on the ARRL staff for over 21 years, retiring from the post of advertising manager in 1968. Pete was an active amateur since the early days; he was first on the air in 1913 from his native Springfield, OH, with a spark set and the call WI (before licenses were officially granted). Early in his career, he owned station WLAM in Springfield. Outside of League headquarters, Pete pursued widely varying interests. He was fascinated by cryptography because of his work on codes and ciphers in the U.S. Navy as a communications officer. His knowledge in this area led him to contributing cryptograms to the *Hartford Courant* newspaper for many years. He was also a regular contributor to the *Baker Street Journal*, a magazine devoted to the works of Sir Arthur Conan Doyle, and was a member of the English faculty of Tunxis Community College in Farmington, CT. Pete was the first employee of the C. D. Tuska Company, formed by a co-founder of the ARRL, Clarence D. Tuska, in 1920. Before joining the ARRL staff, Pete held seven different amateur calls; he was an avid DX enthusiast and cw operator. Our condolences to Pete's wife, Florence and to his son, John. — *Alexander N. Gerli, AC1Y*

#### AMATEUR RADIO OBSERVANCES

Governors in several states have proclaimed official observances in honor of Amateur Radio. Wisconsin's Governor, Lee Dreyfus, made the entire month of June Amateur Radio Month. New York Governor Hugh Carey's proclamation noted that 1979 is the year of the World Administrative Radio Conference, an appropriate time for New Yorkers to recognize the public service contributions of the more than 25,000 licensed Amateur Radio operators

in New York State. Governor Ella Grasso of Connecticut designated June 23-30 as Amateur Radio week in that state, and mentioned the Field Day activities that would be taking place that weekend. Governor Richard W. Riley of South Carolina urged his state's citizens to join him in observing June 17-23 as Amateur Radio Week. Governor Riley called this observance "a worthwhile endeavor."

In addition to the governors, the mayor-president of the City of Baton Rouge and the Parish of East Baton Rouge, Louisiana, proclaimed the week of July 15-22 as Amateur Radio Week. Mayor-President W. W. "Woody" Dumas recognized amateurs for their "civil responsibility in times of disaster." He also noted that ARRL had chosen Baton Rouge as the site of the 1979 ARRL National Convention. [Thanks to those who sent Hq. this information. — Ed.]

#### HAMS CAN PARTICIPATE IN IONOSPHERIC HOLES EXPERIMENT

An opportunity exists for Amateur Radio operators to participate in observations of radio propagation effects through an ionospheric hole expected to be produced by the launch of an Atlas-Centaur rocket from the Kennedy Space Center (KSC) in late August or September 1979. The scientific community is interested in the temporal and geographic extent of the effects on radio propagation which may be produced by this large hole in the F region. This interest is more than academic because of the feasibility studies that the Department of Energy and NASA are currently doing on the Solar Power Satellite, which would require daily launchings of large rockets to place all the necessary material into orbit. The exhausts from such large rockets, mainly unburned hydrogen gas and water vapor, cause the electrons in the ionospheric F region to combine with ions at a rate of 100 to 1000 times faster than the normal reaction rates. This rapid loss of the F region can persist for several hours, particularly during the nighttime when no solar ionizing flux is available to recreate the ionization.

The Atlas-Centaur rocket will burn in the F region roughly eastward of KSC. What will be the effects on hf propagation of a large hole in ionization extending perhaps 500 kilometers in width along the launch trajectory? In order to study the possible effects, the aid of the amateur community is solicited to make signal strength measurements along hf paths where the path midpoint is nearly along the rocket trajectory. The path from Puerto Rico, the Virgin Islands and surrounding islands to the U.S. eastern seaboard as well as to Bermuda appear to be the most promising for hf observations. Participants in all these areas are solicited. Also, the possibilities of vhf reflections from any irregularities that may be produced should be considered.

More specific details, such as dates, times, frequencies, log sheets, and so on, concerning the observations Amateur Radio operators could make can be obtained by writing either Joe Reisert, W1JR, 17 Mansfield Dr., Chelmsford, MA 01824, or Jack Klobuchar, W1BZT, Conant Rd., Lincoln, MA 01773. A special certificate will be issued to all participants with quantitative observations of this ionospheric event. — *Joe Reisert, W1JR*

# The New Frontier

The World Above 1 Gig

Conducted By Bob Cooper Jr., \*W5KHT

## Finding/Working with Microwave Parts

Microwave component parts are sometimes difficult to locate and this stops many amateurs from proceeding with microwave projects. If you have grown accustomed to constructing gear in the vhf or even uhf region, you have probably learned that unless exact parts are employed exactly as the original circuit designer used them, you may end up with less than satisfactory results.

Surprise. This may not always be true in the centimeter bands!

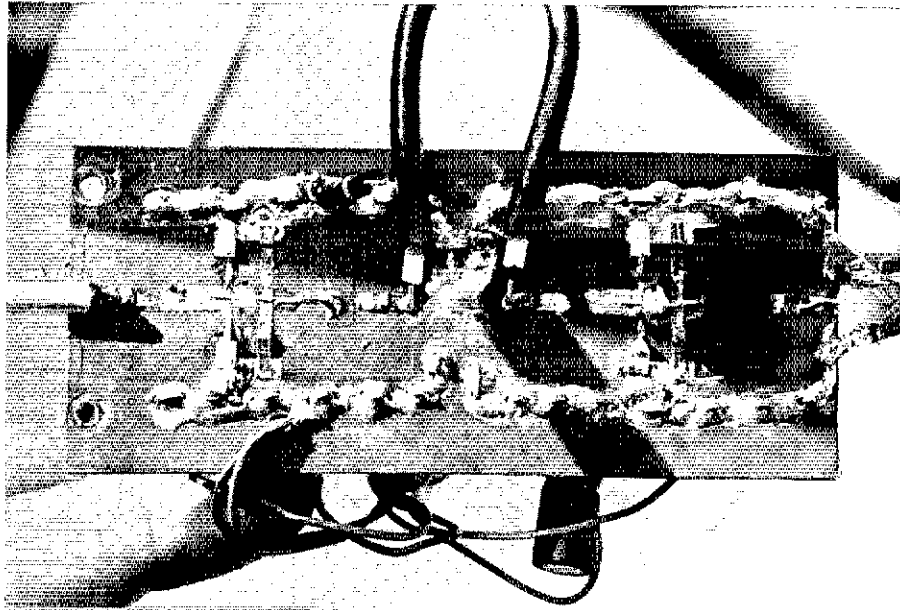
Microwave hardware for the regions above approximately 2 GHz is often closer to plumbing parts than it is to off-the-shelf electronic parts. This says that you are often looking in the wrong place when your local electronic distributor cannot hand you an SMA fitting or chip capacitor off the shelf.

For amateurs the best source of microwave parts is surplus microwave equipment. And that means surplus telephone microwave equipment in particular. A prime example of this is the now nearly 30-year-old 4-GHz-region microwave receivers and transmitters that Bell and other telephone companies began installing in the early 50s at repeater sites across North America. These TD-2 systems are frequently available at hamfests and surplus yards for between \$5 and \$25 a set. And a set, as often as not, includes both a 4-GHz receiver and a 4-GHz transmitter.

The basic TD-2 receiver has a pair of diodes in a mixer front end, preceded by a set of waveguide fittings (or flanges, as they are often known) that also act as input bandpass filters. The diodes are driven by a local oscillator, which is taken out of the TD-2 transmitter deck at an injection frequency only 70 MHz removed from the input frequency. This gets you down to the (70 MHz) i-f in a big hurry; the telephone engineers who designed this equipment in the late 40s wanted to get down to a "low frequency" as quickly as possible!

As the TD-2 sits, it is a 7.5-cm package that cannot operate on any amateur (microwave) band. However, the transmitter starts off in the 17/18-MHz region and multiplies more than 200 times to arrive at the 4-GHz range and it will convert to either 3.3/3.5 or 5.65/5.925 GHz without major surgery.

The value of the package, however, may not be in getting it converted to either the 3.3- or 5.9-GHz amateur bands but may be in the parts you acquire for small change. High-quality fittings, flanges, mechanical adapters, diodes and capacitors (bypass of the type employed prior to our present ultrasmall chip capacitors)



The microwave region (4 GHz) low-noise receiving preamp built by K4AWB boasts gain of over 25 dB and noise figure of under 1.6 dB. Coax loop is inter-stage coupling in two-stage device using Hewlett-Packard HFET 2201 and 1102 devices.

abound in these packages.

Similar bargains are found with Collins, Motorola, General Electric, RCA (etc.) nameplates on them; although not usually in the quantity of the Western Electric equipment. The telephone companies are presently ripping out tons of tube-type microwave equipment as part of a major modernization program of "trunk line" microwave routes. In a nutshell, there has never been a better or more opportune time to get close to the local telephone company engineer charged with the responsibility of disposing of this "surplus" old-style microwave gear.

### Not Such a Big Deal

Once you get it, what do you do with it? Even if you are short on expertise at the moment, if you have any plans to get involved in amateur microwaves in the future, the few dollars you tie up in the equipment now will return to you manifold in the years ahead. At least when you do get bitten by the microwave bug you won't be stopped by a lack of parts!

Microwave technology has always been a kind of "black-art"; people who practice it are reported to have special powers and unusual training and skills. That may be true, but it also

may not be necessary. Last month we touched on the achievements with 4-GHz microwave gear receiving systems at K4AWB in South Carolina. Bob Coleman is one of the people who have discovered that the kitchen table makes a fine laboratory for building up high-quality microwave systems. One of his recent projects was a 3.7- to 4.2-GHz low-noise amplifier. Starting off with a circuit detailed in Hewlett-Packard Application Note 967, Coleman first attempted to build up a 2.7-dB noise figure amplifier using the HP HXTR series bipolar transistors. Not satisfied with the results, he decided to jump ahead to the present state-of-the-art transistors known as GaAs FETs which can exhibit 12 to 16 dB of gain and noise figures in the 1.2- to 1.5-dB region at 4 GHz. Printing the circuit directly out of the HP App note on Duroid board (Rogers Corporation, P. O. Box 700, Chandler, AZ 85224), Coleman found that duplicating the circuit performance claimed for multi-K buck commercial low-noise amplifiers was not such a big deal after all.

One of the surprising things about building up microwave gear is that it may actually turn out to be simpler to make play than 7-MHz gear!

\*Rte. 5, Box 364, Guthrie, OK 73044





## The Cold War Continues

*The following "President's Message" of the Radio Society of Ontario, appearing in the June issue of The Ontario Amateur, is reprinted here (by permission) without editorial comment expressed or implied. Our only comment is that the CRRL, without reservation, subscribes to the agreement, in addition to the general sentiment expressed in this message.*

I feel it is time to inform you of the situation regarding the agreements reached at the meeting between the two senior Officers of CARF and of CRRL last November, as was reported in *The Ontario Amateur* in December last (page 18). In that article I stated that in addition to certain other agreements reached "there was agreement that similar future meetings would be held quarterly under arrangements to be made by the President (of

CARF) and the Director (of CRRL)."

It is to my great disappointment that I have to report to you that at the time of this writing, May 4, six months have elapsed since the November meeting and no evidence has come to light of a single follow-up meeting having yet been arranged. It makes one wonder what value can be put in a document signed by the leaders of the two societies.

It is not that a meeting per se is important but certain matters were to be referred back to the CARF Board for decision, and what better place to discuss them than the agreed meeting? Also, this would be an excellent place for the two parties to review the implementation of the agreements already reached, such as to have only one CARF/CRRL formal channel of

communication, which was to be from CRRL Director to CARF President, and that other channels would be discouraged and made invalid.

In my view, the apparent unwillingness of at least one of the societies to work with the other does not provide one with confidence in the future for Canadian Amateurs. Let us all who are members of either or both societies demand that they follow through the agreements reached last November. For your information, a copy of the Summary Minutes of that meeting is published elsewhere in this issue of *The Ontario Amateur*.

Wouldn't it be great if the parties would live up to their signed agreements? Perhaps not "great," but at least a step in the right direction. — Eric Hott, VE3XE, President

### VO1/VO2 QSL BUREAU

On this page, May 1979 issue, an error was contained insofar as the VE1 and VO QSL bureaus were concerned. It was incorrectly stated that VE1FQ was the QSL manager for these districts. The correct address for the VO QSL Bureau is as follows: Frank Davis, VO1HP, P. O. Box 6, St. Johns, NF A1C 5H5.

### CARF 1979 NATIONAL SYMPOSIUM

The CARF Symposium, this year, will be sponsored by Radio Amateur du Quebec Inc. (RAQI) sometime in the fall. Since CARF has not obliged the League, in any respect, concerning these symposiums, it is the decision of the CRRL Board of Directors that the CRRL shall not be represented at the 1979 Symposium in any capacity. (Last year the League was present in an observer role only.)

### THE 1979 MANITOBA FLOOD

The Manitoba Amateur Radio Emergency Service sponsored by ARRL has made its presence felt during the '79 Manitoba Flood. These amateurs volunteered their time, equipment, systems and, in many cases, money from their own pockets to provide a much needed and valuable link to the flooded communities. There were four satellite stations located at Emerson, St. Jean Baptiste, Letellier and Morris which had, as their main communications, the 2-meter network and 2-meter back-up systems. Two amateurs were on duty at each of these sites, 24 hours per day, seven days per

week. The control station VE4BB, was located on the third floor of the old Fort Osborne barracks in Winnipeg. The result of this vital communications network greatly assisted Federal and Provincial government departments in carrying out their duties and responsibilities. Both the Provincial and Federal emergency organizations provided support and assistance to this organization. Brian Lenius, VE4TR, section emergency coordinator and his assistant, Doug Fysh, VE4JP, provided full-time efforts toward the emergency.

The above report, from the Federal Response Group Operations Center (Winnipeg) was furnished by VE3YE. Congratulations, Manitoba ARES, for a job exceedingly well done!

### DOC PROPOSED REGULATION CHANGES

As previously advised, early in April, the DOC proposed seven future regulation changes affecting the Amateur Service. After deliberation by the CRRL Board of Directors, the League has filed comment as follows: The League supports all the proposals *except* the proposal to expand the Canadian 40-meter phone band. At this point in time, the League strongly opposes any phone expansion to the 40-meter band. If desired, a copy of the League filing may be obtained from CRRL headquarters. S.a.s.e. please.

### INTERNATIONAL ROBBIE SOCCER TOURNAMENT

On Dominion Day weekend, the Scarborough ARC (ARRL/CRRL affiliated — 100 percent League membership) handled the communications for this international event. Teams from

the USA, England, Scotland, Mexico and Canada, plus other countries, played in this event. Age groups of the participants were from eight years of age to senior citizens and all proceeds were donated to the cystic fibrosis fund. The tournament is held in two sections. The boys, during the July weekend with the girls over Labor Day weekend. Last year proved to be very successful for Amateur Radio and it is expected that similar results shall be achieved this year.

### POTPOURRI

□ After an absence of several years, it appears as if the ever-popular Maritime Amateur Radio Convention will be hosted, next year, by the Sydney Amateur Radio Club. Although not yet official, a convention executive committee, with VE1QD as chairman, has been established, together with an *official* convention address (P. O. Box 1051, Sydney, NS B1P 6J7). So, how official does one have to get? Ex-maritimers, *across the nation*, will be gratified by this news.

□ VE1IG, the ARES Cape Breton emergency coordinator, furnishes the following interesting report. "A new public service activity has been added to the list of endeavors of the Sydney ARC and the area emergency corps . . . the request received from the Cape Breton Ground Search and Rescue Team. The first step was taken in May when 13 dedicated members agreed to go on a night exercise in the woods at Irish Cove, Cape Breton . . . this area is believed to be the worst place for communications. The exercise proved to be so successful that a course was offered the group on Map and Compass." Tnx — The Cape Breton Amateur. [RECEIVED]

\*Director, Canadian Division

# Washington Mailbox

Conducted By Michele Bartlett,\* N1AGD

## Sundries

Down through the ages, poets and philosophers have been inspired by such universal themes as love, war, honor and taxes. In the same manner, hams will eternally ponder the legalities of third-party traffic and proper logging procedures, and will no doubt always wonder how to fill out a Form 610. As long as there are new amateurs, there will always be the same questions, which have been answered in this column many times in the three years of its existence. Here are some questions that don't come up very often.

### INSTANT REPLAY

*Q. Recently a DX ham asked me to tape our QSO and play it back for him so he could hear what he sounded like. I did, but later wondered if that was legal.*

A. There is nothing in part 97 that prohibits amateurs from taping their conversations with other hams and then replaying them over the air. On occasion, go ahead, especially when the DX station has a specific reason for the request. But too much of this might raise a question of wise spectrum use.

### BANNED LIST BANNED

*Q. Help! I was cited recently for talking to a ham in southeast Asia. I thought there were no more "banned countries" for U.S. amateurs.*

A. At one time, it was forbidden for U.S. amateurs to talk with hams in certain other countries that were published in a "banned list." Several years ago, the FCC Treaty Branch discarded the list, but it occasionally finds its way into the hands of less experienced field officials. You must respond to the citation in the manner outlined in 97.137. In your letter, include the name of the person who signed the citation, the office of origin, and the date it was sent; point out the fact that there is no "banned countries" list anymore for U.S. hams. You may want to enclose a copy of this column. Be sure to send the letter via registered or certified mail.

### SALE OF CONVERTED CB

*Q. I won a 23-channel CB as a door prize and converted it to 10 meters. Am I still prohibited from selling it under the CB marketing ban that went into effect last year?*

A. As long as the set no longer functions on 11 meters, you are free to sell, trade or give it away — but ethically, only to another amateur.

### PHOTOCOPY OK

*Q. Do I have to send my original license with my 610 form when I renew or modify?*

A. No. At one time the Commission was considering requiring amateurs to submit their original license with their Form 610, so the FCC could readily determine whether a license had been tampered with. But now amateur

licenses are printed on paper stock that shows erasures and alterations, even on photocopies. So you have the option of enclosing either your original license or a photocopy, and we recommend the latter.

### WHAT DID YOU SAY YOUR CALL SIGN WAS?

*Q. The other day, I was talking with a fellow on 10 meters who I am now sure was a bootlegger. He actually sent me a phoney-looking QSL, and his card said he was a member of some kind of "hf" club. If I send this card to the FCC, will I be cited for communicating with someone who was not authorized to operate in the Amateur Service?*

A. Since you did not know this person was operating illegally until after you received the QSL card, it is unlikely that you would be cited. However, there's not much the FCC can do with a QSL card. In order to make a case against an illegal operator, the Commission usually has to hear the person on the air.

### I-D REQUIREMENTS

*Q. When signing out of a roundtable QSO, must the amateur I sign with come back and sign with me, using both of our calls, even if he's not leaving the air?*

A. No. 97.84a states: "... at the end of an exchange of telegraphy (other than teleprinter) or telephony transmissions between amateur stations, the call sign (or the generally accepted network identifier) shall be given for the station, or for at least one of the group of stations, with which communication was established." So your exchange would sound something like, "W7XXX and the group, from KA7ZZZ. 73!" "OK, Bill, see you later."

*Q. How about when I answer someone's CQ — must they come back to me with both of our call signs?*

A. Although this is not required by the amateur regulations, it seems to be the accepted practice on the "low bands." Things are a little more relaxed on the vhf bands, especially on fm, and you're more likely to hear an exchange like this: "K3AAA listening." "K3AAA this is W3XXX. Hi, Phil!" "Oh, hello, Nancy! How've you been . . . etc."

*Q. May I identify using phonetics, or must I use phonetics only in addition to my call sign?*

A. You may identify your station using phonetics. The FCC encourages the use of nationally or internationally recognized standard phonetics. Phonetics like Xanadu, Gnat, Knit and Herbivorous are not helpful.

### TAKE A GIANT STEP

*Q. I am presently unlicensed and plan to go for my Amateur Extra Class license in a couple of months. Will I still have to take all the other exams?*

A. Depending on the situation at the field of-

fice or testing site, you may be able to take the 20-wpm code test right away, or you may have to take the 13-wpm test first. Either way, once you pass the 20-wpm test, you will be given a combined General/Technician/Novice 80-question exam, followed by the Advanced class written test, finishing with the written Extra Class exam. If you pass the code test but not the corresponding written exam, you will be given a code credit certificate that is valid at any FCC field office or testing site for a period of one year. So, be sure to study all the elements below the one you expect to take!

### POWER-LINE NOISE

*Q. The local power company has some lines running near my shack that cause electromagnetic interference to both my radio and television. There ought to be a law!*

A. There is. It is covered in Title 47, CFR 15.25, "Operating Requirements: Incidental Radiation Device." This says, "An incidental radiation device shall be operated so that the radio frequency energy that is emitted does not cause harmful interference. In the event that harmful interference is caused, the operator of the device shall promptly take steps to eliminate the harmful interference."

You should inform the power company of its obligation in a registered, return-receipt-requested letter. Keep several copies of that letter. If you do not receive an acknowledgement within a reasonable amount of time, send a copy, along with any other information you may have, including complaints from neighbors, to the local FCC engineer-in-charge of your district explaining the steps you have taken to solve the problem locally.

### CROSSPLEX?

*Q. What is the difference between crossband and duplex operation?*

A. Let's say that you're a Novice and I'm an Amateur Extra Class operator. You may listen to me on 20 meters, and send on 21.150 MHz, where I will listen to your transmissions, and respond on 14.325 MHz. Neither of us leaves our carrier on while listening to the other. This is crossband. (This also can be done on different frequencies in the same band.)

Duplex operation results when two or more stations are communicating on different frequencies (or in different bands), and each operator leaves the transmitter carrier on during periods of reception. This is permitted only on those frequencies above 51 MHz where A0 emissions are allowed. The effect of this operation is similar to talking on a telephone — the ultimate in "full break-in." The amateurs can put a brick on the "push-to-talk" button and have their hands free for soldering, drawing schematics, etc. [EET-1]

[Note: Questions appearing in this column are typical of those frequently asked of the FCC and other agencies. Answers, prepared at ARRL, have been reviewed by FCC staff. Numbers in parentheses refer to specific sections of the FCC rules.]

\*Membership Services Assistant, ARRL

## Even Frequency Coordinators Get the Blues

I am a frequency coordinator. To some people, that and a dime lets me call Dial-a-Prayer. To others the first thought that enters their minds is — So what? Well, perhaps some explanation as to what exactly I do might lend some credibility to the widely expounded theory of self-policing by amateurs.

First of all, the frequency coordinator has no power granted to him by the FCC. The FCC designates a band of frequencies where repeater operation is permitted and turns away. Any type of band plan or coordination is conducted by interested amateurs who hope to make some order of the situation.

In most cases, the frequency coordinator is an offshoot of the local repeater council. A repeater council is a group of repeater operators who have banded together to assure their place in the sun. In other words, it tends to be a group of people united for self-protection of their machines. The repeater council, in looking for a coordinator, searches for someone with the wisdom of Solomon, the diplomacy of Henry Kissinger, the genius of Albert Einstein, the oratory skills of William Jennings Bryan, the independence of John Wayne and the pen of William Shakespeare. Unfortunately, there aren't too many people who fit that description, so the council usually chooses someone who is looking for some way to contribute and who is easily talked into doing almost anything.

Problems are foremost, and there are no easy solutions. For example, what would you say to a group that had announced its intention to operate on a frequency a year ago, had not been told that they could not operate on that frequency, had an operating repeater on site, but did not have a call sign? Another group, 25 miles away, had been allocated the same frequency three years ago, but had done nothing with it, had no equipment or site, but had a call sign. To top it off, the groups were in different states. Interesting?

Basically, a coordinator is a record keeper and advisor. I try to keep abreast of any activity in and around my area and to keep other hapless individuals in the surrounding areas informed. If someone takes the time to come and ask me if anything is available (remember, there is nothing that makes them do so), I will try to find something acceptable. I will write to adjacent coordinators to clear with them in case they may be coordinating an installation on the same frequency in the same area (it has happened).

If I receive a positive response, I will inform the individual that he may establish a coordinated system. In reality, he may establish the system whether I say so or not. On several occasions, individuals have told me that they merely were informing me as to what they were going to do because it did not matter to them what I said or did. (Any wonder that coord-

inators spill so much of their booze!)

The most humorous thing that happens is when an uncoordinated system shows up on the air. I'll bet I get 100 calls asking what I am going to do about it. Well, let me answer that right now . . . Nothing, period. Each amateur has the responsibility to police the hobby. I am not going to do it for you (neither will a repeater council or the ARRL). The only way a pirate machine is going to depart is by peer pressure. The infantile tactics of jamming, keying up or whatever is only going to entrench the pirate more firmly. Maybe the best solution is to ignore the pirate. He may go away; he may not. Illegal shenanigans don't make him wrong and you right. If you are jamming and interfering with an uncoordinated repeater, you are wrong. Nothing says he can't operate wherever he wishes as long as he holds a license. We can use all of our diplomacy to get him to move, but we are not going to force him to do so.

Well, that is a brief description of what I try to do for the repeater scene. Call it madness, but it is my way of putting back into Amateur Radio after I have taken so much out. Ham radio is fun, and I hope that in my own way, I have helped it to endure. — *Tom Kulas, KØTK, Minnesota frequency coordinator*

[Editor's Note: The preceding originally appeared in the Twin City FM Club's *Quarter Wave*.]

### FEATURE REPEATER

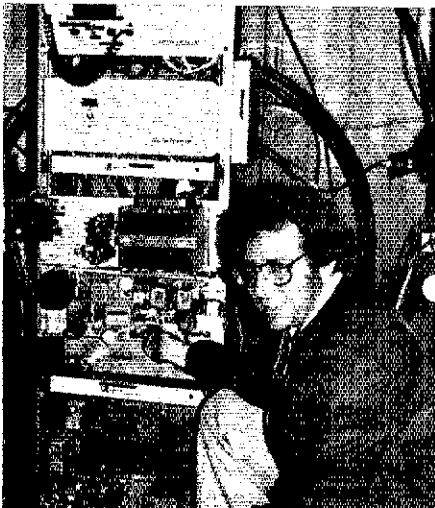
It's had a number of call signs . . . WA1NQP, WA1PXN, WR1ADM, WR1ADP and now (again), WA1NQP/R. What started out in 1971 as a 450 repeater on a fair-size hill with a half-dozen users, is now a three-band system on one of the highest hills in the county with hundreds of users in two states. Better known as the "Naugatuck repeater" or simply "Naugy," WA1NQP/R is located atop a 950-foot hill which looks across the state line into New York.

Coverage from the site is excellent. Hams throughout Connecticut, Long Island and eastern New York are regular users of both the 2-meter and 450 repeaters. A 220 repeater is the newest addition to the system; when its new gain antenna is installed, it is expected that the coverage will be in the same league as the other two repeaters.

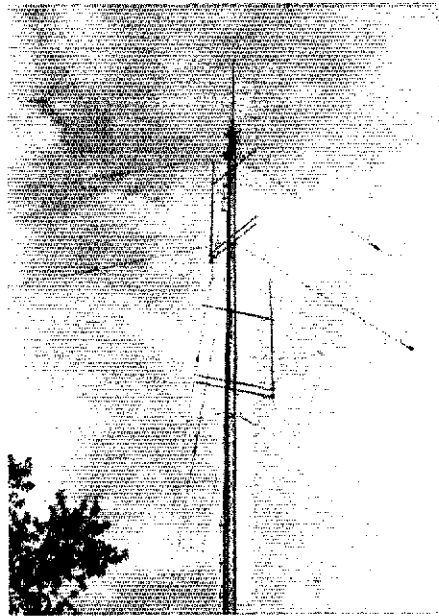
WA1NQP/R is a public-service-oriented machine. There is a nightly traffic and emergency net, and a late afternoon weather net; both have a large number of regular participants. Throughout the two devastating blizzards of 1978, the repeater was the hub of activity for western Connecticut; its users provided traveler information and coordinated the delivery of blood to area hospitals.

If the commercial power lines should fail, a heavy-duty battery system automatically comes on line to keep the repeater on the air. An autopatch is available in times of emergencies. Naugy is part of the Pioneer Valley Repeater Association; everyone is welcome to come on board and take advantage of its features.

[Editor's Note: Occasionally, this column will feature individual repeaters of note, as WA1NQP/R is featured here. If your repeater is exceptional, send us its story along with some photos.]



WA1NQP adjusts the 6-meter equipment which can be linked to the Aerotron 450-MHz repeater to transceive on 52.525.



A 150-foot tower atop a 950-foot hill is the key to the interstate coverage of WA1NQP/R in Naugatuck, CT. The antenna farm includes arrays for 52 through 450 MHz.

\*Hq. liaison, VRAC

# YL News and Views

Conducted By Jean Peacor,\* K1JUV

## Leading Ladies — Part 1

In the theater, it's who gets top billing; the star of the show; someone who makes you sit up and take notice. Amateur Radio has some leading ladies all its own. They are all stars in their own right and have been treading the boards as presidents of many of our general radio clubs across the continent during the past year.

When the idea to write about presidents first originated, thanks to Rosalie White at ARRL, it was thought that there were only five such ladies. Since then, the number has continued to grow and the surface may barely be scratched with this report.

### Communications Held Greatest Fascination

First to be introduced is Ontario's Joan Powell, VE3FVO, president of Nortown Amateur Radio Club. At age 14, Joan knew that communications was the area in life that held the greatest fascination for her. It took some convincing, but she was allowed to acquire her Commercial license. DOC commercial exams could not be written until age 18, but at 16 she was offered a position by a local broadcasting station which she accepted. She was on her way. Later, Canada's most powerful radio station invited her to join their staff where she gained valuable experience and knowledge, including IV theory.



Joan Powell, VE3FVO, president, Nortown ARC (ON)

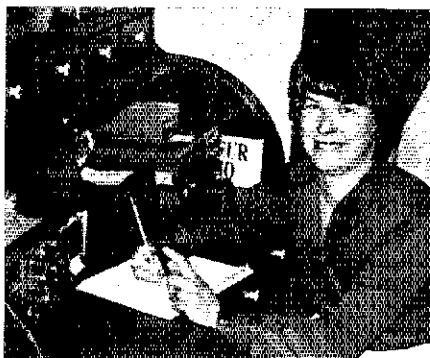
Raising three children became the most important part of her life for a few years. It wasn't until they were grown that her thoughts again wandered to communications. She earned her Amateur Radio license in 1972 (followed a year later with an Advanced ticket).

The recipient of Toronto's Nortown Amateur Radio Club's Albert Yates award, presented annually by Nortown to the member who they feel has done the most for Amateur Radio, Joan now serves as president. She has found working with the 175 club members to be a most interesting learning experience.

In addition, Joan is chairman of Affiliate Clubs for the Radio Society of Ontario; on the national level, she is executive secretary for the Canadian Amateur Radio Federation (CARF) as well as production manager for an advertising agency full time. In her words: "I'm busy, but communicating."

### A Refreshing Change

The western Massachusetts section of One land recognized the capabilities of their leading lady in electing Heather Hall, WB1ABF, president of the Mt. Tom Repeater Association this year. What changes five years can make, for in 1974, before Heather became licensed, she attended their radio club meetings because of her (later to be) husband's interest; KIRPB then, now W1JP. As she was usually the only woman at those early meetings, they elected her — what else? — refreshment chairman.



Heather Hall, WB1ABF, president, Mt. Tom Repeater Assn. (MA)

Her interest in radio grew through listening and she became an eager student when Doc Riley, WA1VHU, convinced some local hams that his dental office would make an ideal study hall for radio theory classes in the evening. Heather graduated from Technician to General class in 1977.

The Mt. Tom club is very active during Field Day, and has almost monthly fox hunts, a weekly information net, Friday luncheons for their brown baggers and a summer picnic — as well as excellent programming for their meetings. Has she received preferential treatment because of being a YL? Not at all. She has been treated with the respect of all other presidents and loves it that way.

Heather serves as hospitality chairman of WRONE and is a member of YLRL. As VP2MCU, she tasted her first DXpedition in March. Look for her next year on some faraway island — one taste results in DXpeditionitis.

### Off and Running

"The greatest result of becoming a radio

amateur is in the feeling of sharing so much with so many others, be they male or female." That expresses the thoughts of Rosemary Raynal, WD4JHE, the first woman and fifth president of the Trident Amateur Radio Club in Charleston, SC.



Rosemary Raynal, WD4JHE, president, Trident ARC (SC)

While dating KK4B, Rosemary became interested in radio since the mobile rig in his car and the people he talked with were unlike anything she had heard before. Since then, she has been off and running with ideas for the tremendous uses for Amateur Radio. First licensed as a Novice in 1977, upgrading to Technician in 1978, she hopes to earn her General license this year.

Rosemary, a registered nurse, is occupational health nurse at Robert Bosch Corporation, while studying toward a degree in occupational health nursing and personnel. She has had occasion to assist in an emergency situation at the plant via radio communication. As she was traveling to work one morning, a gas leak developed at the plant. A fellow amateur at the plant allowed one of the vice presidents to contact her via 2 meters, thus providing instant communication for the organizing of evacuation. This helped to avert what could have been a major disaster. As a result, consideration is being given to using the plant as a possible staging area for ARES.

Trident ARC, with its 80 members, has been extremely active under her leadership. Members have sponsored Novice and General training classes, provided communications for the Coastal Carolina Boy Scout Jamboree and are out to better their fine 1978 score on Field Day. Plans are underway for the provision of radio communications at Middleton Gardens in Charleston in September during the Scottish Games that are held each year.

Next month's column will feature several other YL presidents. There are probably others I have yet to learn about — please drop me a line.

\*Country Club Drive, Monson, MA 01057

# Silent Keys

It is with deep regret that we record the passing of these amateurs:

KA1BBP, John Krasnavage, Norwalk, CT  
 W1FZH, George F. Crocker, Jr., Hyannis, MA  
 ex-W1KWD, Dr. Irving L. Shaw, Jr., Weymouth, MA  
 W1NZR, Richard A. Cordin, S. Yarmouth, MA  
 R1RP, Franklin M. Doolittle, Hamden, CT  
 W1SU, Augustus R. Bentley, Nantucket, MA  
 W1TEC, Aaron S. Cook, Medford, MA  
 K1UNW, Russell P. Hager, Edgewood, RI  
 W1VG, Lorentz A. Morrow, West Hartford, CT  
 W2ATU, Joseph E. Iorio, Richmond Hills, NY  
 K2BCX, John H. Vivian, Hartsdale, NY  
 W2BKO, Emil J. Sibi, Hillsdale, NJ  
 W2BOE, Albert E. Lane, Westfield, NJ  
 WB2BST, James F. O'Connor, Saddle Brook, NJ  
 W2CAZ, Henry M. Mitchell, Rotterdam, NY  
 W2DOZ, Horace A. Johnson, Princeton, NJ  
 KB2DR, Arthur B. Fox, Fairport, NY  
 W2EL/W1AHW, Henry A. Whitehead, Islesboro, ME  
 WA2IVB, Jacob Bender, Bayside, NY  
 W2MFO, Alfred Davis, Little Silver, NJ  
 WB2NSS, Ralph Cheesman, Vineland, NJ  
 W2RZH, Forrest E. Weber, Hicksville, NY  
 W2UG, Harold M. Eskin, Rochester, NY  
 WB2YFR, Lukas A. Decavallas, Plattsburgh, NY  
 K3APD, Frederick M. Michelson, Harleysville, PA  
 W3BSV, Cyrus L. Dirickson, Salisbury, MD  
 W3DGH, Theodore R. Gibson, Pine Grove, PA  
 W3GXL, Thomas LaSlavic, Pittsburgh, PA  
 W3KPI, Carlton L. Williams, Glenwillard, PA  
 W3LMA, Edward J. Dillmeier, Jr., York, PA  
 W3OR, Alan S. Vincent, Gradyville, PA

\*Life Member, ARRL

W3UE/ex-W3KQD, George P. Conklin, Altoona, PA  
 WA3UNN, James W. Kruse, Schnecksville, PA  
 \*W3JNF, Arthur E. Henson, Rising Sun, DE  
 \*W4API, ex-W6FZQ, Charles E. Spitz, Arlington, VA  
 W4DEP, B. G. Lowrey Smith, Old Hickory, TN  
 WD4FPF, Ernest S. Barbee, Sophia, NC  
 W4GHY, Clarence G. Young, Mebane, NC  
 WA4GMD, Glenn R. Bivins, High Point, NC  
 ex-W4JJI, George W. Jerguson, Miami, FL  
 AA4JP, J. Paul Scott, Dothan, AL  
 K4KBC, Herbert A. Frost, Albany, GA  
 W4KRU, George Hambacher, Miami, FL  
 WA4KUW, William Van-Alen Loukin, High Point, NC  
 W4LUI, Robert L. Williams, Franklin, VA  
 K4LXW, Aloys E. Zelubowski, Norfolk, VA  
 W4MKR, Walter B. Lang, Roanoke, VA  
 K4CZ/W3ANJ, Walter I. Godwin, Melbourne, FL  
 W4SNW, Raymond S. Ranes, Deerfield Beach, FL  
 W4ZH, Lyndon K. Beckett, St. Augustine, FL  
 W4ZLH, H. Yates Holleman, Alexandria, VA  
 WA5AOB, B. Wayne Hogan, Midwest City, OK  
 K5DLP, William B. Pierce, Lawton, OK  
 WASGYQ, Floyd P. Parker, Orange, TX  
 W5PVT, Thurman J. "Whitey" Maupin, Odessa, TX  
 W5YAJ, Eleanor S. Wehrli, Crane, TX  
 W6GMO, Gerald O. Essex, Santa Monica, CA  
 W6HJX, Jack W. Downard, San Diego, CA  
 K6JBX, Kenneth C. Martens, West Covina, CA  
 W6HIN, Willard J. Richeson, Sacramento, CA  
 W6KAU, H. Winston Bull, Sacramento, CA  
 W6KGI, Lloyd R. Ward, Marina, CA  
 K6KZZ, Howard Huntley, Campbell, CA  
 W6L VV, Edward Nunes, Vallejo, CA  
 W6NEW/W41-WI, John M. Hicks, Goldsboro, NC

W6ORN, Walter J. Francorn, San Francisco, CA  
 W6PGK, Donald G. Jenkins, Morro Bay, CA  
 K6THW, Wendell E. Stacy, Vista, CA  
 W6VER, John B. Naugle, Jr., Los Altos, CA  
 W6VYA, Richard L. Paige, Santa Rosa, CA  
 W6YAM, Ernest M. Allan, Placerville, CA  
 K7ANP, Marvin M. Mihulka, Seattle, WA  
 W7FB/W9IVE, Everett W. Fiegel, Phoenix, AZ  
 W7HOV, William A. Youngblood, Emmett, ID  
 W7HX, Herbert B. Guekel, Las Vegas, NV  
 W7ITA, Marion E. Tracy, Portland, OR  
 W7RLE, Leroy W. Lenwell, Mesa, AZ  
 WA8BTR, Arthur A. Ward, Cincinnati, OH  
 WB8DUX, Frank G. Schmidt, Dayton, OH  
 W8LFT, E. Dana Reed, Zanesville, OH  
 WA8NII, Lyle E. DePuy, Cleveland, OH  
 ex-K8OMZ, William White, Beaverton, MI  
 KA9BTN, Henry G. Carlson, Sycamore, IL  
 WD9DFC, James H. Peter, Taylor, WI  
 W9FKZ, Gordon E. Bensen, Northlake, IL  
 ex-W9HES, Lin S. Gordon, Des Moines, IA  
 WA9JZK, G. Holms Hallock, Beloit, WI  
 K9WRQ, Robert H. Gilson, Portage, WI  
 W9YXN, George P. Hinkes, Chicago, IL  
 W0AW, John A. Doremus, Milpitas, CA  
 WA0GAT, Fred A. Wright, N. Platte, NE  
 K0YH, George H. Rozum, Watertown, SD  
 WB0RZM, Wilson G. Hunter, Topeka, KS  
 W0UTJ, Bert R. Geise, Jr., Grand Mound, IA  
 KH6DA, Harold E. Warren, Honolulu, HI  
 VE3BGL, David W. Williams, Burlington, ON  
 VE3BNW, William Cooke, Scarborough, ON  
 VO1LO, A. J. "Sandy" Christian, St. John's, NF  
 DK3RB, Peter Bauer, Regensburg, Germany  
 G3EIL, Dr. John Evans, London, England  
 YV5A, H. Miguel A. Delgado, Caracas, Venezuela

# Club Notes

In June, this column covered elected or appointed ARRL officials who would make excellent speakers for club programs. We left out one group — ARRL Technical Advisors. There are 13 of these amateurs across the United States. If your club is interested, we'll let you know if there's a TA in your area.

Yankee RC (ME) planned a different type of program. A member's occupation, such as plumber, was read. Other members guessed the name and call of the

person in question. (This would make a good program for all small clubs.)

Shortly after the Murray State ARC (KY) club meeting was adjourned, the vice president announced that the program for the evening was a simulated emergency drill. Commercial power was shut off, and members divided into groups to see how long it would take to get the club station on the air. An excellent exercise.

How to get more people to attend the club's hamfest or convention? Mobile (AL) ARC and Rochester (NY) ARA are subsidizing the cost of child care for their hamfest and convention. With so many female hams now, why not? If the woman is not licensed, but journeys to the location of the event, she and her mate are both free to enjoy the weekend. Congratulations to these progressive and considerate clubs. And when word of this gets around, we hope their attendance record will reward them!

Members of the Utah ARC are organizing for antenna parties. But not the usual kind. They are removing unwanted or unneeded CB antennas for free. In return, they receive such items as towers, guy wires, masts and antennas to convert to 10 meters for free. Good idea — and a project your club may want to try.

Chelmsford (MA) ARA members are considering the idea of compiling a Novice directory. The list would contain the name, call, address, telephone number and band capabilities of Novice club members. It would be given to new Novice members as a means of introduction, and would encourage these new people to contact other club members. It might help overcome "key fright," says WB1GFX, by having a friend to talk to for the first QSO. Club members could set up skeds more easily with each other.

A suggestion for clubs might be to designate a member to attend the ARRL forum at conventions and hamfests and report back to the rest of the club at the next meeting. The club could formulate questions in advance, and identify major concerns of the members which need to be aired. It also would aid insightful discussion at these forums.

Now is the time to nominate your top instructor(s) for the Herb S. Brier, W9AD, Memorial Award (see February 1979 QST, page 52, for details). This is a chance for your club or club's licensing classes to give recognition to dedicated instructors. Send all nominations to the Club and Training Department by October 31, 1979. The entries will be judged in November, and the winners announced after the first of the new year. — *Rosalie White, WA1STO*

# Strays



I would like to get in touch with . . .

□ California hams interested in joining a Novice traffic net which meets on 80 meters Monday, Wednesday and Friday at 7:30 P.M. (PST/PDS1) on 3708 kHz. Check in, or contact Andy Chang, N6BDF, 441 Linbrook Dr., Pacifica, CA 94044.

□ anyone who has modified the Heathkit SB-303 receiver to include RTT. Contact Don Gottingham, VE3HXV, 4417 Antrim Ct., Burlington, ON L7L 2S3.

□ any ham who would like to have a pen pal. Benny Alder, WD2AIW, 112-39 68th Ave., Forest Hills, NY 11375.

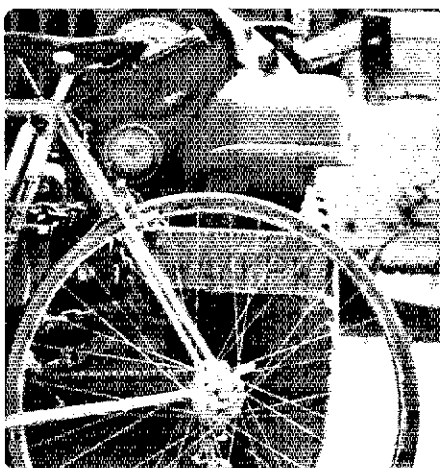
□ amateurs interested in using 6 meters, wide- or narrow-band fm, in the Nassau County area. Contact Gregory Danzker, WA2ORO, 4000 Old Post Rd., Seaford, NY 11783.

QST congratulates . . .

□ Nancy Battle, WA4WQH, a senior nursing student at the University of Alabama in Huntsville, who has been nominated to *Who's Who in American Universities and Colleges*.

□ Laurel K. Bertolozzi, WB8YYY, who has been nominated "Outstanding Woman of the Year" for 1978 by the Schaumburg (IL) ARC.

□ Don Carton, W4YVV, who won the code proficiency test at the Vienna (VA) Wireless Society's Winterfest with a speed of 30 wpm. Dave Nebon, WD4AXM; Jim March, WB4FJJ; and William Long, W3NT, tied for second place at 25 wpm.



"Different spokes for different folks," writes N6NO. The Jet Propulsion Laboratory ARC (CA) photographically captures for posterity their joint venture in a bikeathon with a biking club!

## To Book or Not to Book

The "book" form of message may be used to advantage when transmitting a large number of messages which are basically similar. For example, if 10 messages have the same text and signature but go to 10 different addresses, they may be transmitted as a book of 10, provided they are all sent to the same station for relay. If the messages are to be sent to a number of different operators, the book of 10 must be broken down into several smaller books, or into single, complete messages. Contrary to popular misconception, booked messages need not be identical. For example, the book of 10 could still be booked even if some of the signatures or groups were different.

The book format may be used when two or more messages have identical parts. The principle involved is very simple. Those parts which are identical, the *fixed* parts, are sent first; then those parts which are different, the *variable* parts, are transmitted. Instead of starting with a message number (which is always one of the variable parts), first indicate the number of messages in the book. For example, say this time WA6YBT has four messages which are all identical, except the number and the address, to send to K6EA. These can be transmitted as

one book on cw/RTTY as follows:

BOOK OF 4 R WA6YBT 19 LOS ANGELES CA SEPTEMBER 1 BT

HOPE YOU WILL FIND AN OPPORTUNITY TO HANDLE SOME TRAFFIC DURING THE SIMULATED EMERGENCY TEST IN OCTOBER X 73 BT ERIC WA6YBT BT

NR 1 JOE STOFKO WBIAIU AA 7 ORCHARD TERRACE AA NAUGATUCK CT 06770 AA 888 1436 BT

NR 2 PAUL LINDGREN WA2UWA AA COOPER LANE AA EAST HAMPTON NY 11937 AA 796 4344 BT

NR 3 NICK ELIAS N3AIU AA 1454 MAIN ST AA BETHLEHEM PA AA 656 3322 BT

NR 4 RICK CENTER K4BKX AA 3707 BONMARK DR AA RICHMOND VA AA 791 6524 AR

END BOOK AR N

On phone, of course, the cw abbreviations in the above examples are not used. Pauses in speech can be substituted for AA and the separative BT is replaced by the proword *break*.

When transmitting or receiving messages in book form, count one point for every three messages in the book, plus another point for

any over a multiple of three. So WA6YBT counts two points in the *sent* category for the book of four, while K6EA gets two points in the *receive* category. If K6EA relays the book of four to another station, he also gets two points in the *sent* category. But if he has to send the traffic as four individual messages, he would get four points in the *sent* column.

When listing traffic on a net, advise the net control of the raw total of messages. For example, WA6YBT checks in to his local net in LA and indicates to the NCS that he has 2 thru or for the sixth region net. It is not proper for YBT to tell the net control that he has a book of four or a book of anything.

One could probably write a book on booking. Essentially, handling traffic in books is a time-saving device for those who want to use it in the interest of efficiency. But it is optional, not mandatory. It is perfectly proper for booked messages to be separated if desired, as long as the content is not changed. Each and every message can be handled separately. So, if you are uncomfortable with either the origination or relaying of book traffic, it is quite proper to stage your own "meltdown" and handle the stuff individually.

## NEW YORK CITY VHF TRAFFIC NET

The Big Apple VHF Traffic Net — *BAVTN* — has just gotten underway with sessions Monday through Friday at 2100 local time on WR2ACD, 146.40/147.00. For more information, please contact Alan, WB2BNA, Sandra, KA2DBW or Dwight, KA2CNN, via radiogram or at 212-243-7519.

## PEOPLE TO PEOPLE

During the antinuclear-power rally in Washington, DC, on May 6, Amateur Radio provided communications for crowd control and public safety for the over 100,000 people gathered there. Hams enabled lost children to be reunited with their parents, provided a link for any health problems that developed and relayed bus location information for the masses, since people and buses turned out not to be at their announced locations. Among those participating were K5LSH, WB2POB, WA2KOU and the undersigned. Regardless of anyone's stand on the issue, this event featured Amateur Radio serving in the public interest. — *WB2MIC*

## THE LOCAL NET

It has been said that the local net is the foundation upon which the entire National Traffic System is based. Just how crucial the local net really is becomes apparent if one just listens to a typical session of the Old Ridge Traffic and Trash Net — *GRTTN*. This net meets each night at 8 P.M. on a 2-meter repeater

chosen each month by drawing lots. . . .

"Calling the Old Ridge Traffic and Trash Net. This is net control, yours truly, Alfa-Fox-Two-Lima. My name is Mike and I'm located in Matawan. Are there any stations with emergency or priority traffic? This is yours truly, AF2L."

"AF2L, this is WB2RMI with priority traffic for Howell. Over."

"The Trash Net acknowledges WB2RMI. Good evening, Rich, is that *really* a piece of priority traffic that you have?"

"What are you, crazy? I wouldn't have listed it as priority if it wasn't."

"Just checking, HI. And thank you so much for signing in to ORTTN with your priority traffic. Please stand by. Calling the ORTTN, calling the ORTTN, this is Alfa-Fox-Two-Lima. The net meets nightly at 8 P.M. on the Old Ridge repeater, or whichever repeater has the misfortune of hosting it. Calling the ORTTN. Are there any stations with or without traffic for the net? This is AF2L."

"This is W2XD, no traffic, no comments, no trash, out in 3."

"The Trash Net acknowledges W2XD. Did you say out in three seconds or three minutes?" (silence)

"W2XD, are you still with us?" (silence)

"This is WB2RMI. He's gone. Now what about my priority traffic?"

"Keep your shirt on, Richard. Are there additional check-ins for the net? Please call, yours truly, AF2L."

"This is N2NS, with a net announcement."

"K2PH, no traffic."

"WA2VBJ, no traffic."

"WB2LCC, QRU QRV."

"WB2-Nasty-Old-Man. Good evening, Mike and everybody on the net. Beautiful day in Secaucus today. Negative traffic."

"K2VX, no traffic."

"This is AF2L, recognize N2NS, K2PH, WA2VBJ, WB2LCC, WB2NOM and K2VX. K2PH, you're in Howell. Can you take a piece of priority traffic?"

"Negative."

"Why not?"

"Because it's Wednesday."

"So?"

"Wednesday is Prince Spaghetti night."

"Roger. You're excused."

"This is WA2VBJ. I'll take Howell."

"Fine Business. WB2RMI, call WA2VBJ with your traffic, this is yours truly, AF2L, out."

"Ready to copy?"

"WB2RMI from WA2VBJ. Good evening, uh uh forgot the name there. Let me get some radiogram forms . . . where's my pencil? Nuts the point is broken. Wait one . . . okay, ready to copy, uh uh OM."

"You can call me Rich. Or you can call me Richard. Or you can call me Richie. But ya doesn't have to call me Old Man. Copy number 1 priority WB2RMI check of 5 (etc.) signature Raoul. Over."

"Wait. I get a check of four."

"Oh. Let's see. One, two, three, four, five. I still get five."

"No, it's four."

"No, five."

"Four; I will not QSL your message until the check checks. I say it's four, F-U-U-R, 4!"

"K2VX info."

"Go ahead VX."

"This is getting ridiculous. We have to settle this somehow. Let's take a vote."

"You mean right here on net frequency?"

"Yes."

"Well, alright. How many thought the check was four, call AF2L." (silence)

"Nothing heard. How many thought five?" (silence)

"Okay, let's split the difference. Change the check to 4-1/2."

"This is WA2VBJ. Tell you what. I'll QSL 80 percent of the message."

"Which 80 percent?"

"You get to choose."

"Roger. Thank you very much. WA2VBJ from WB2RMI, back to net."

"BREAK!"

"Who is the breaking station?"

"KA2CHM, on top of the World Trade Center."

\*Asst. Communications Manager, ARRL

How is my HT making the repeater?"

"DFQ."

"Roger. KA2CHM clear."

"Very fine. N2NS from AF2L. Please make your informal for the net. Over."

"This is N2NS, with a few very brief comments. A golden opportunity now exists for us to provide emergency communications for a large agency. A representative from the Mafia has contacted me, expressing interest in our operation. They often send their people out into the field in areas that lack public telecommunications facilities; like garbage dumps, loading docks, rivers, abandoned mines and quarries and what have you. Now, if we could have key stations with hand-helds accompany them, their activities would be coordinated more effectively. How can we refuse? Also, another item. . . (long pause)

"This is AF2L. Paul, you timed out the repeater. But your Mafia idea sounds super. Are there any additional stations for the net before we close? This is AF2L." (silence)

"Nothing heard. This is AF2L closing this session of the Old Ridge Traffic and Trash Net and returning the repeater to normal use. This is yours truly, AF2L, clear, and gonna put some clothes on." — Doug Zuckerman, W2XD

## PUBLIC SERVICE DIARY

□ Grand Forks, ND — April 9. The Forx ARC was contacted by the Red Cross requesting emergency communications for flood relief operations. Response was immediate and the club provided 2-meter links between Red Cross headquarters, a care center, the police department and mobile canteens. (WD0DAM)

□ Norwalk, OH — May 14. While mobile, WD8DCK saw a patient in a bathrobe walk away from a local hospital. Realizing that this could be a potential problem, he called WD8DTG on 2 meters who telephoned the hospital. The police were notified and the patient was cited for disorderly conduct; he had walked out of the hospital against doctor's orders. (WBRVZX)

□ St. Martin — May 27. ON7AP called into the Pacific-Caribbean DX Net seeking assistance for his party aboard a sinking sailboat. The Coast Guard was alerted and radio direction-finding equipment was used to pinpoint the distressed craft's location. The three were rescued in short order. (KV4FZ)

□ Hesperia, CA — June 14. A small brush fire erupted near the center of this community of 20,000. With a wind of approximately 20 mi/h, it was only a matter of minutes before the fire spread northeasterly, sweeping a path through a residential section, converging on homes without warning. The Victor Valley ARC was alerted by resident hams, and mobile units moved to the scene to handle communications for emergency vehicles whose radio frequencies were overloaded. (WB6QFU)

## AMATEUR RADIO EMERGENCY SERVICE REPORTS

□ Deland, FL — April 25. W4OTS was conversing with W3KVG when a sinking fishing boat broke the QSO with a call for assistance. W4OTS received the pertinent information and called the Coast Guard. A plane was dispatched but was unable to communicate with the vessel via the Coast Guard frequencies because of miscalibration of the fishing boat's radio. They moved to the Amateur Radio frequencies, established communications and completed the rescue. (WB4GHU, EC W. Volusia Co.)

□ Embarass, MN — April 26-May 9. An infant was in need of frozen mother's milk to ensure its well-being. The child was consuming approximately 30 ounces per day and had run the milk banks in the Twin Cities area dry. WB0ZAJ, whose wife is a leader in the local chapter of an international organization of nursing mothers (the La Leche League), brought the problem to the attention of the MN STM, AD00, and together they worked out a system of monitoring the Minnesota Section Phone Net. Whenever a station checked in from a city where there was a La Leche League chapter, they would contact that ham and ask him/her to contact the chapter to arrange for a frozen milk supply for the youngster. Results were far beyond expectation and the infant's appetite was satisfied. (AD00 STM MN)

□ Florida — May 8. Severe weather swept across the state, bringing tornadoes and 19 inches of rain in some areas of the state. Hams were involved in a number of emergency-related activities; these included providing communications for various evacuation shelters and emergency operation centers, on-the-scene communications in the midst of tornado and flood



K0GND passes information received from the Lincoln Marathon net to the public-address announcer at the University of Nebraska outdoor track where the marathon's finish line was located.

devastation, and relaying data to the National Weather Service. (K4SCL EC Pinellas Co., KB4T EC E. Volusia Co., AA4WJ EC Hillsborough Co.)

□ Pinellas County, FL — May 24. WA4ESX received a phone call from the County Sheriff's Office requesting ARES members to provide the office with back-up emergency communications as two of their three repeaters were out of service due to a lightning strike. An Amateur Radio network of stations located throughout the county was set up and in operation in less than 30 minutes to provide communications until the sheriff's equipment was back in service. (K4SCL EC Pinellas Co.)

□ ARRL Section Emergency Coordinator Reports. For May, 32 SEC reports were received denoting a total ARES membership of 15,599. This is a 6-percent decrease as compared with reports received last May (34), but a 5 percent increase in ARES membership (14,854). Sections reporting were Alta, Ariz, Ark, Conn, ENY, EMass, EPa, Ind, Iowa, Kans, Mich, Mo, NFla, NTex, Ohio, Okla, Ont, Oreg, RI, SV, SDgo, SF, SJV, SBar, SCV, SFla, SNJ, Va, Wash, WVa, WMass, WPa.

## COMMUNICATIONS SERVICE OF THE MONTH

Lincoln, NE — May 13. Communications for the second annual Lincoln Marathon were provided by the Lincoln ARC. Over 600 competitors finished the certified course and four qualified for Olympic tryouts. Two marathon nets started 30 minutes prior to the 7 A.M. start of the race. One, on WR0AEV, linked first-aid stations, police, ambulance and press with the runners. A second net on 146.52 simplex linked race officials, the public address announcer and others near the finish line at the University of Nebraska outdoor track stadium. K0GND and WA0ASM were net controllers for the event.

Two Lincoln ARC members, K0DI and WB0QLH, operated bicycle mobile and traveled with the runners, one at the head and other at the tail, for the entire race. Information from these operators assisted Lincoln Police in traffic control.

Race officials were pleased with the quality of communications and the ability of the nets to immediately generate answers to questions and forward critical decisions. Police and ambulance officials depended on the two nets for all necessary information. — K0GND, EC Lancaster Co.

## REPEATER LOG

According to reports received between May 20 and June 20, the following repeaters and simplex frequencies were involved in the delineated public service events.

	Weather Emergency	Medical Activity	Vehicular Emergency	Search and Rescue	Fire	Miscellaneous	Total
WR1ABU	1						1
WR1ADF			1				1
WR2ADL				1			1
WR2ADM				22	2		25
K3PSP/R				2			2
WR4AAH	1						1
WR4ACV	1						1
WR4ACY	2			28		3	33
WR4AIQ						1	1
WR4AJI	1						1
WR4AKV	1						1
WR4ALM	1						1
WR4AUT	1						1
WR4AVI	1						1
WB4HHN/R				1			1
WR5ABA	1		12	1			14
WR5ABE			1				1
WR5ABY	3		39			3	45
WR5AJG			1				1
WR5ALY			1				1
WR5APK			1				1
WR5ARH	2						2
N5DD/R				2			2
WR6AOX				7			7
WB6XN/R						1	1
WA6VNV/R					1		1
WR7AEI				3			3
W7AIA/R						1	1
K7CG/R			1				1
WR8ABC			1				1
WR8AGA			1				1
WR8WUX/R			1				1
K8ZIS/R	1			2			3
WR9RO/R			1				1
K9TKF/R			1				1
WR0ADD				1			1
WR0AGE				1			1
WR0AUC				1			1
Simplex/FM	1			1	1		3
TOTAL	13	6	1	128	9	1	167

# NATIONAL TRAFFIC SYSTEM

August 11 is the date to mark on your calendar; the NTS picnic at the QTH of W2MTA. Traffic handlers from all points in the East will converge in Newark Valley, NY, for some sun and fun and provocative discussions.

Just as it's the responsibility of net managers to submit reports to Hq. that are listed below, it is the responsibility of the net controls to submit the session into to the net manager. The net manager cannot file a report unless the net controls provide the info. Be a hero and give the net manager the reports he/she needs.

Quoting from the *Public Service Communications Manual*, page 16: "The National Traffic System is not dedicated specifically either to phone or cw, or any other type of emission, nor to the exclusion of any of them, but to the use of the best mode for whatever purpose is involved. The aim is to handle formal written traffic systematically, by whatever mode best suits the purpose at hand. Whether phone, cw or radioteletype is used for any specific purpose is up to the net manager or managers concerned and the dictates of logic. There is only one National Traffic System, not separate ones for each mode. Modes used should be in accordance with their respective merits, personnel availabilities and liaison practicalities. Whatever mode or modes are used, we all work together in a single and thoroughly integrated National Traffic System."

Certificates earned by: VF1BSE VE1CR VF1RI VE1WT VE1ST VE3AWF VE3CYR VE3GFN VE3GOL VE3HJG VE3SW VE3KK (ECN). K8SAI K8D1G WD8KZX WD8LRT WB8LWY WB8MRL WB8SIO AF8V W8VPW WB8ZNS (8RN-D). K2GCE W2GWS WB2HSG K2LIE WB2RMI WB2TOM W2XD (2RN-E). AF4T WSAC AA5J K5OAF N5RB WB9IHH WB9UYU WD0ACG AE0R (CAN-E).

Ed Malecki, W2SWE, a fine traffic man, who personified the tradition of excellence on NJN (New Jersey Net), became a silent key May 4.

BEN BWN WIN WNN WSBN (WI), WVN WVNN WVPN (WV).

1 - NET	5 - RATE
2 - SESSIONS	6 - % REP
3 - TRAFFIC	7 - % REP TO AREA NET
4 - AVERAGE	

## Transcontinental Corps

VE3GOL, VE3SB and K8KMO received TCC-E(E) certificates

1	2	3	4	5
TCC Eastern	185	93.0	2186	792
TCC Central	217	94.9	1636	828
TCC Pacific	123	91.1	1779	906
Summary	525	93.0	5801	2526

1 - AREA	4 - TRAFFIC
2 - FUNCTIONS	5 - OUT-OF-NET TRAFFIC
3 - % SUCCESSFUL	

## TCC Roster

The TCC Roster (May): Eastern Area (N2YL/K3KW, Directors) — W1S KX NJM OD, WA1s VEI ZAZ, K1s BA EIR GN SSH XA, W2s CS FR GKZ MTA HQ, WA2s ICB SPL, WB2KDC, N2YL, W3s FAF PO YO, WA3WOP, K3s KW NGN, WA4s JK MFE SQJ UQ, WA4CCK, WB4PNY, WD4QVH, K4s BXX KNP, N4KB, WB4MJ, WB4WTS, K8KMO, VE3s GOL SB, Central Area (W5GHP/W8JLJ, Directors) — WD4HF, WN4KKN, N4MD, W5s KLV RB, WA5s BHF INJ IOU RLU, WB5s FDP MVR NKL CXE SDD, K5s GM MC, N5s TG TS YL, W9s CXY DND JIJ JIJ NXG, N9TN, W9s AM HI, WA6s TNM YVT, K0s EVH EZ, AF00 Pacific Area (W5KH, Director) — N5s MR NG, W5s JQV KH, K5MAT, N6s GW PZ WP, W6s EOT OA VZI, WA6UAZ, W7s AK DZX EP GHT LYA, V5E, K7HLR, AD0A, W0KON, K0BN, WB0TAQ, VE7ZK.

56	WA1UUA	WA4CCK	WD9CIS	43
	K2GCE	AA5J		W1TM
	W2SQ	W7JMH	46	WB3JGP
	WB2TOM	WB8PAV	46	K84OZ
	WA2UWA	WB8YDZ	46	WAUC
	K4BKX	WA9EBQ	46	WB0TF
	N4NK	51	45	WB5MVR
	AA4TT	WA1TBY	45	WB9JSR
	N4WA	AA3S	42	W4JIK
	K4ZN	WB0HOX	42	WB5LBR
	W5GHP	50	44	W4HON
	WB5LAT	AF1L	44	WD5AHH
	WB5NKC	N2CR	44	WA5VBM
	K5OWK	K2VX	44	WB6FFN
	WD6LRT	WA2ZJP	44	WB6FR
	WB0A	WD4HF	41	N8CW
	W6RNL	W6AFH	41	W9XD
	N0AHA	K4KDJ	41	W2APB
		N5RB	41	WB2MCO
		55	49	W2ZOJ
		WB1CPF	49	W3DP
		WB2KDC	49	N3EE
		WA2MFV	49	K3ORW
		WD4LUG	49	WA6BJI
		VE5HG	49	K4EV
		WA5RVT	49	K4JGW
		VE5WM	49	WA4PFK
		W0OYH	49	W4PIM
		54	47	WB4QBB
		WA5RKU	47	K4E
		53	47	WA4ZPZ
		WA1MJE	47	N5ES
		WB2PJJ	47	AES1
		W2XD	47	WB5MMI
		WB3JZA	47	N6GW
		VE5AE	47	WB6PVH
		WB8MTD	47	KL7HSF
		WB9VPW	47	WB7PSP
		52	47	N8ABA
		WA3NAZ	47	WB3BRY
			47	WB9XG
			47	WB0SND
			47	KA7AWHIN
			47	WB7UQJT

## Brass Pounders League May 1979

BPL Medallions (see April 1979 QST, page 77) have been awarded to the following amateurs since last month's listing: WB3GZU, WB5MVR, WA6UAZ, WB0IBS.

The BPL is open to all amateurs in the United States, Canada and U.S. possessions who report to their SCM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL form.

1	2	3	4	5	6
K3NSN	2099	945	2891	200	8135
W3CUL	638	1259	1522	61	3478
W0WYX	51	1568	407	1161	3187
WA4JDH	1	728	722	4	1453
WA2SPL	9	614	593	42	1258
W7AK	25	543	554	15	1137
W7VSE	5	516	481	38	1040
W9JLJ	9	496	424	8	937
W7DZX	23	414	427	4	868
W4MEI	4	435	400	22	861
K1BCS	202	177	361	10	745
W3VR	281	180	290	14	765
WA0HJZ	12	404	25	290	731
W5KLV	3	386	293	19	701
WA3WQP	16	308	313	33	670
W511	15	289	275	49	628
KL7C	10	310	273	33	616
KL7P	10	293	218	75	596
W4JK	291	295			586
WB5MVR	108	164	288	26	586
W0BMA	47	246	224	69	586
W5GHP	6	308	215	24	553
WB0IBS	30	270	245		545
N4MD	2	283	271	8	544
WA8UAZ	14	265	252	12	543
N2CR	25	263	249	53	530
WA0UAZ	26	396	104	4	530
WD4HF	5	251	222	50	528
K4TH	19	245	149	115	528
WA1MJE	22	264	236	3	525
WA4CCK	1	263	244	3	511
K7KVV	8	285	216	1	510
K17JE	39	214	227	25	505
WB3JZA	17	220	249	16	502
WD5COE (April)		322	322	322	966
W7VSE (April)	15	392	383	20	810
WA2OTC (April)	71	228	253	16	568

Multipoperator station: KL7AA 2648 2648 5296

BPL for 100 or more originations plus deliveries:		
WA3ATQ	274	WA4GHI
WD4COL	143	N3AJI
W3BBN	133	WB0HZL
K7NTS	129	K5OWK (April)
WA3NAZ	111	K7NTS (April)

Multipoperator station: K4KDJ 112

1 - CALL	4 - SENT
2 - ORIG.	5 - DEL.
3 - RCVD.	6 - TOTAL

## May Reports

### Area Nets

1	2	3	4	5	6	7
EAN	83	2719	32.8	1051	79.2	
CAN	93	1668	17.9	535	99.2	
PAN	62	2097	33.8	779	98.4	

### Region Nets

1RN	114	762	6.7	432	85.5	80.6
2RN	132	1014	7.7	523	91.3	81.7
3RN	93	549	5.9	476	99.2	87.1
4RN	124	1465	11.8	450	73.4	87.1
RN5*	31	432	13.9	403	89.1	99.2
RN6*	62	803	12.9	466	97.4	98.4
RN7	124	1285	10.4	789	96.6	98.4
8RN	93	632	6.8	413	93.2	88.2
9RN	91	638	7.0	428	89.0	99.2
TEN*	60	551	9.2	345	77.2	99.2
ECN	62	305	4.9	364	71.5	50.5
IWN	91	632	6.9	277	88.4	98.4

TCC		
TCC Eastern	172 <sup>1</sup>	792
TCC Central	205 <sup>1</sup>	828
TCC Pacific	112 <sup>1</sup>	906
Sections <sup>2</sup>	5829	27,048
Summary	7144	45,126
Record	6304	34,170
	18.4	

<sup>1</sup>Incomplete report

<sup>1</sup>TCC functions not counted as net sessions.  
<sup>2</sup>Section and local nets reporting (166): ASN (AK), AENB AEND AFNJ AENM AENS (AL), OZK (AR), ACON ATEN HARC SWN (AZ), SDNN WCN (CA), CN CPN NVIN RTN WENCON (CT), AENV EBN FAST FMNT FPON FPTN PEN QFN SPARC (FL), GASSBN GSN G1N WGN (GA), I75MN IGN TLGN (IA), IMN (ID/MT), ILN IPN (IL), IGN ITN QIN (IN), KPN KSN QKS OKS-SS (KS), KNTN KTN KYN SEKEN (KY), LAN LRN LSN LTN (LA), EM2MN EMRI EMRIPN HHTN RIEM2MN WMPN (MA/RI), MEPN MMN MSN MTN WRN (MB), WYN MP5N PTN SGN SP5N (ME), MACS MITN MNN QMN UPN (MI), MSN MSPN MWX PAW (MN), HBN MEOW METN MON (MO), APN (MR/NF), MSBN MSN MTN (MS), NCSSBN THEN (NC), WNN (NE), G5FM (NH), MGN NJN NJPN NJSN OBTN SPARTN UCEN (NJ), NMRRN (NM), NSPN WDN (NY), BN BNR O6MN ONN OSN OSSBN (OH), NWOSN QAN OLZ ONON OPEN OTWN STN (OK), CMN LN ODN OLN OFN OSN (ON), 16/76 ARES ARES1 ARES2 BSN JGARES WCN (OR), EPA EPAEPN LVN PFN PTTN WP2MTN WPA WPAETN (PA), SCSSBN (SC), NJQ SMMN SDN SSSSBN TSEN (SD), BATN (SK), MCRN TN TNN WTVHFN (TN), TEX TTN (TX), BUN UCN (UT), SVEN VFN VN VNTN V5BN V5N (VA), NWSSBN WSN (WA).

## Independent Nets (May 1979)

1	2	3	4
Amateur Radio Telegraph Society	31	1541	211
Central Gulf Coast Hurricane Clearing House	31	162	2199
Empire Slow Speed	29	80	349
Hit and Bounce	31	242	447
Hit and Bounce Slow	26	60	148
IMRA	27	385	985
New England Novice	31	102	191
North American SSB	26	269	199
Washington Region PON	17	22	295
West Coast Slow Speed	31	174	361
20 Meter ISSB	27	373	48
75 Meter ISSB	31	565	986
7290 Traffic	48	537	2698

1 - NET	3 - TRAFFIC
2 - SESSIONS	4 - CHECK-INS

## Public Service Honor Roll May 1979

This listing is available to amateurs whose public service performance during the month indicated qualifies for 40 or more total points in the following nine categories (as reported to their SCM). Please note maximum points for each category: (1) Checking into cw nets, 1 point each, max. 10; (2) Checking into phoner HTTY nets, 1 point each, max. 10; (3) NCS cw nets, 3 points each, max. 12; (4) NCS phoner HTTY nets, 3 points each, max. 12; (5) Performing assigned liaison, 3 points each, max. 12; (6) Phone patches, 1 point each, max. 20; (7) Making BPL, 2 points regardless of traffic total; (8) Handling emergency traffic directly with a disaster area, 1 point each message; (9) Serving as net manager for entire month, 5 points. This listing is available to Novices and Technicians who achieve a total of 20 or more points

81	W7VSE	W2MTA	WB4ZOJ
WD4COL	W9JLJ	WB2RMI	
77	82	WA3PXA	59
K4DZM	WA4CNY	WD4ISN	WA4JDH
66	WA0GJ	WB5PNY	K5TL
W5VMP	W9JLJ	WB5NKD	WA4YIU
W7GHT		WDBNKA	N5TC
65	61	AF00	K0PIZ
AF2L	W1RWG		
64	W1TN	50	57
WA6UAZ	AA2H	WA2SPL	VE3GT
			W5KLV





## Confessions of a Green-Stamp Licker

When I was a sophomore in high school, my afternoons were either spent chasing DX or sitting at the orthodontist's. Getting my teeth straightened was quite a learning experience. The doctor would lean over me, gaping into my mouth. Then he would quietly reach over to his tool table and pick up a pair of chrome-plated pliers suitable, I thought, for cutting guy cable. Soon I could feel the highly skilled hands of my orthodontist, honed through years of experience, tightening the living daylight out of my teeth. "Tell me when it hurts," he'd say. Well, believe me, it's tough to say anything when someone has got both his hands in your mouth. The only consolation was that he had the best-looking receptionist in town.

The afternoons spent chasing DX were often painful, too. Don't let anyone tell you that you can work the world with a trap vertical antenna. (To be fair, I should mention that the ground system consisted of an old four-foot ground rod). For a few months it seemed like all I did was call CR6GA on 15-meter sideband. To make the agony worse, the few stations who did hear me never seemed to QSL. Sometimes I waited as long as two weeks before sending a second card. Still nothing.

Quite a few guys in the local radio club chased DX. One of them, WICKA, had worked every country at least six times, plus Jupiter once, I think. Paul overheard my moaning about the lack of QSL success.

"A lot of these DX stations won't QSL if ya don't send 'em a green stamp. You've got to be a lot more patient, too. By the way, did you work the . . ." He was interrupted by the crowd asking him to start the meeting.

Green stamps. Hmm. Throughout the entire meeting I sat there with the smug feeling that the secret to QSL success had just been bestowed upon me.

The next day, on the way to the orthodontist, I asked my mother about green stamps. I knew she saved them. When we arrived home after my weekly trip to Dr. Torturetooth, my mother dug deeply into a kitchen drawer and pulled out about half a dozen green stamps.

"That ought to hold ya."

"But, Ma, I've got 36 QSLs to send. Can't you spare some more?"

"No, I'm saving them."

"Aw, come on . . ."

"NO!" Her expression suggested that I retreat to the radio shack.

A thorough investigation of the green-stamp business was in order. I asked one of my older friends who bagged groceries at the supermarket up the street how the system worked. The scoop was that you got one green stamp for every 14 cents of purchase. But, on Wednesdays the booty doubled. Back then it seemed like everyone, especially gas stations, gave out green stamps to boost business.

A plan slowly developed. If I mowed the lawn about four times a week with the gasoline lawn mower, I could fill the gas tank up about every second week. If planned properly, the fill-up day would be Wednesday, for double stamps. This plan worked for about a week until my father caught up with me. It seems he had spent three summers trying to make the lawn green and thick, as on the fairway of a golf course. In one week I had turned his carpet of green into something resembling the infield on the softball diamond at school. Maybe the dust storms got to him.

In any case, a new scheme to garner green stamps was needed. The hobby that filled up my cellar just prior to the advent of ham radio at my house was chemistry. My mother had asked me to remove the glass-works contraption from the cellar long before then (I tried to tell her it was only for distilling water). Since radio was now my consuming interest, the chemistry lab slowly got dismantled. While packing the mess away, a new plan hit me. Actually, it spilled on me when I kicked it over.

In the process of stocking the chem lab, I'd found that a lot of fancy-sounding chemicals had some very common names. Sodium bicarbonate is baking soda, acetic acid is known as vinegar. When the two mix they bubble and foam and generally make a mess. As a junior scientist I had harnessed this incredible energy with some glassware and some toilet paper to make a fire extinguisher. Just turn the bottle upside down and out the water squirted. Obviously, the world would never be safe without a fire extinguisher anywhere a fire could start. Besides, all the ingredients were available at the green-stamp-giving supermarket.

The poor checkout girl at the supermarket

must have really wondered why a 15-year-old kid came in every week and bought eight or 10 bottles of vinegar, a roll of toilet paper and two boxes of baking soda. Always on Wednesday. She later transferred to bottle return.

Every relative I had and every one of our neighbors had at least one fire extinguisher in their house. Sometimes more. Every month they all had their extinguishers recharged. To the best of my knowledge, not a single one of their houses burned down. A living testimony to my fire extinguishers. (None of them ever caught fire, which helped.)

For months I was busy working DX, buying fire-extinguisher supplies and QSLing. All that time I wondered why the DX stations wanted those green stamps so badly. The green-stamp catalogue didn't list any ham gear. At first I thought that the green-stamp redemption centers in remote places like Laccadives or the Fiji Islands used a different catalogue which might include Collins or Hallcrafters gear. Later I learned the truth when I saw a photo in "How's DX?" of a Rhodesian ham sitting on what appeared to be a folding lawn chair. It was obvious that folding lawn chairs were most sought after by remote DX stations as operating chairs. The gas-powered lanterns probably were a second choice.

Unfortunately, my operating time was reduced significantly by my junior year in high school, so the DXing slowed down. Two things had happened. My English teacher was bent on having us read such epics as *Moby Dick* and *Heart of Darkness*. The second and perhaps more severe handicap was that I really couldn't operate sideband very well any more. Ole Dr. Straightjaw had added so many hazards to navigation in my mouth that my lips would get hung up on my front teeth. I had tried to operate a phone sweepstakes, but my mouth got so beaten up that by the end of the first hour I was bleeding on the dupe sheet.

Oh, how times have changed. While preparing this column a month or two ago, I got a letter from a ham in Pakistan asking me to ask everyone not to send him green stamps. Apparently the government frowns on such things. Perhaps they're trying to develop a local folding-lawn-chair industry and want to prevent imports from ruining their trade.

### DX PORTFOLIO

Three letters came in this month describing activity in some pretty rare DX spots. Here are some excerpts:

From K8SVW — "We would like to announce a Pacific DXpedition. *Participants:* Jim Blackburn, K8EVE; Alan Cresswell, ZK1DR; Tom Lindgren, W0WP; and Steve Towle, K8SVW. *Time:* August 10 through September 3, 1979 (3+ weeks). *Place:* We have been planning on the Northern Cook Group (Manihiki) for over six months and have transportation lined up. If the New Zealanders don't put it on or don't run up a big total, we will! Our alternate plans include: ZK1 South Cook, YJ8 New Hebrides, FK8 New Caledonia, KS6 American Samoa, 3D2 Fiji, A35 Tonga, ZK2 Niue and SW1 Western Samoa. QSL.

\*7815 Mandan Rd., Apt. 102, Greenbelt, MD 20770

W0WP (old call WA0WCR) address OK in *Callbook*. *Freqs.:* 80-10 cw 25 up, ssb usual."

From NSUS — "Paul, VK2NDL, told me on the air today to pass the word that he is on his way to Papua New Guinea for a three-year stay beginning the first week in June. He plans to operate cw weekends and evenings signing the call P29NDX on the following frequencies: 3525 to 3530, 21,125 to 21,130 and 28,100 to 28,110 kHz. He welcomes QSOs with anyone needing P29 on cw."

And finally from WB5CSO, also known as VQ9MR — "I am writing to you with regard to the current activities of the Diego Garcia hams. There are at present, three very active hams on the island. These hams are Bill Hatcher, VQ9KK (KP4KK); Jim Jones, VQ9JJ; and Mike Russell, VQ9MR (WB5CSO). Our operations are very active, but owing to military intervention (we are all former-duty Navy), somewhat erratic at times.

Bill Hatcher, VQ9KK, and well known in DX circles as KP4KK, is quite active, and intends to concentrate heavily on the lower bands, 160 through 40, and to make a Diego Garcia to United States contact on 6 meters. He uses Kenwood series equipment, covers 160 through 6. One can usually find Bill on cw on 40 meters at 7003 kHz regularly around the hours of 1330 and 2300 UTC. Bill is still awaiting his antenna systems, which are somewhere in the unknown depths of the Military Transport System. Currently he is using some dipoles in the coconut trees. More information will be put out on Bill when his antenna system is up, and he becomes fairly regular. At present, Bill will be on the island until March, 1980; he will hit all the big contests. QSL requests should go to WA3HUP in Pennsylvania for processing.

Jim Jones, VQ9JJ, is active on 20 through 10 ssb on a fairly regular basis. Look for Jim weekends around 14,275 or so, anytime after about 1400 UTC. Jim band

hops on the weekends, looking for the best bands to the states. Try 21,310 and 28,540 as well as the 20-meter frequency. Long path is apparently the best choice right now, so try the long path first unless we indicate short-path transmissions. Jim will be active through November 1979. QSL requests are handled by W5RU in Louisiana.

Mike Russell, VQ9MR (WB5CSO stateside), is active primarily on cw on various bands. He can generally be found on weekdays around 1330 UTC at 14,035. Also, activities on weekends include 80 and 40, around 7008 at the same approximate hours as VQ9KK. Activity on 80 has netted some European contacts, along with Africa and Japan. No stateside activity has been noted, but improved antennas may help. Times are a half hour later, around 1400 UTC on 3505 and 2245 UTC on 3503. Ten- and 15-meter activity is fairly consistent on weekends, try 21,035 at around 1900 UTC, and 28,035 at about the same time. VQ9MR operates a Signal/One CX7B from the MARS station, utilizing a 7-element log-periodic antenna at 75 feet. Activities must not interfere with MARS phone patches, so abrupt QRT or QSY requests may happen occasionally. VQ9MR also has RTTY capabilities at either 100 wpm or more conventional 60 wpm, transmit narrow shift only, receive any shift. Please write to him for schedules on RTTY if interested. All QSL requests to go through NSGU in New Mexico. Mike will be on the island until January 1980.

These three stations are active. I personally, since arriving in January, have made about 4000 contacts. I know that Jim and Bill each do equally well, and with us available until the early 1980 time frame, there is no excuse for not getting a VQ9 if you want it.

Additionally, the following two stations have QSY'd off island, but both were pretty active, so their names and QSL information are included: VQ9RL, Bob Langewin, via 1126-A 34th St., Port Huene, CA 93043; VQ9TC, Tom Hadden, via W3HMK.

Please do not send QSL cards to the MARS station on the island. This practice can not guarantee delivery to the operator concerned. Please QSL only to the designated manager of address.

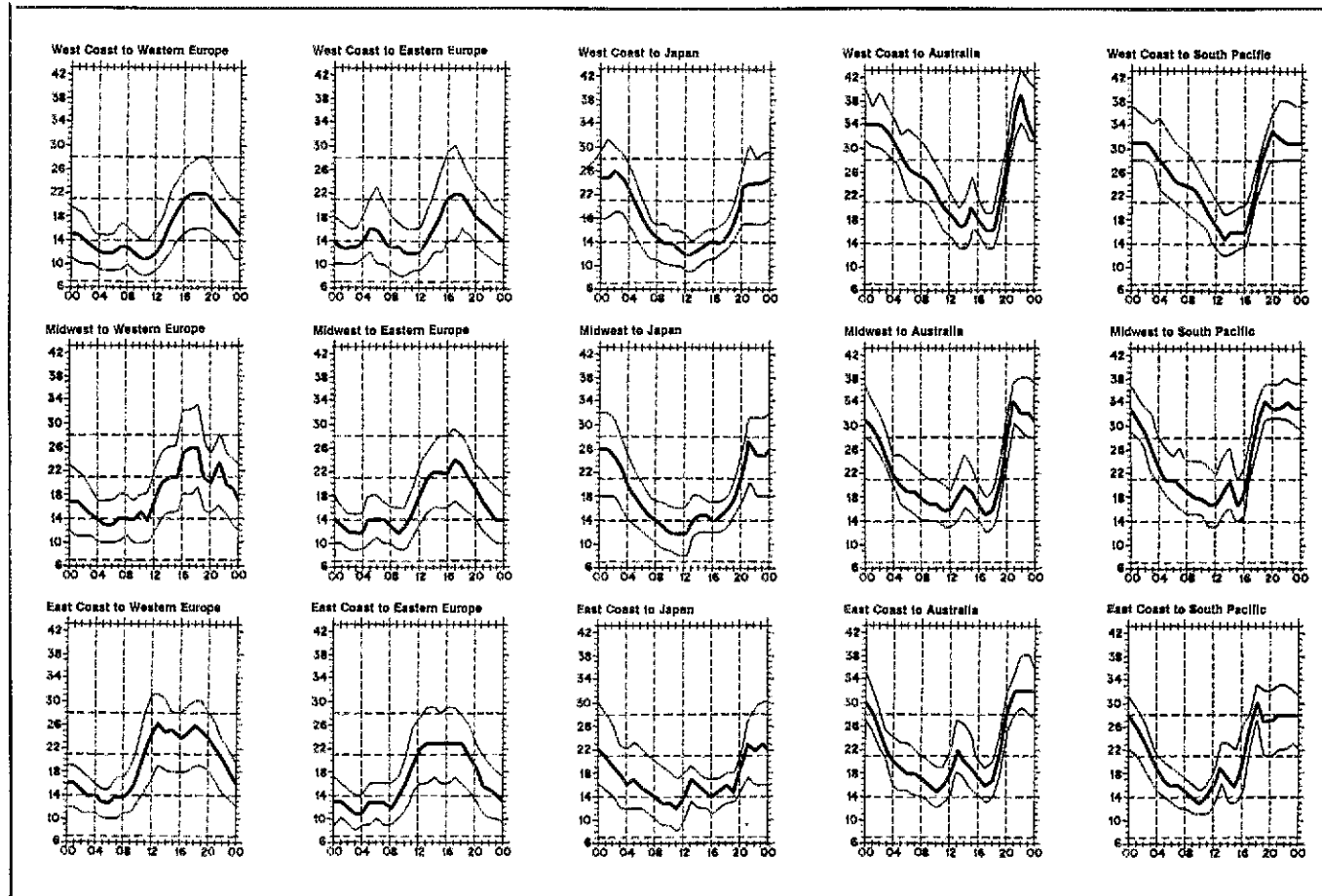


Giampaolo Forti, I2FGP, handed out all the cw contacts from the recent expedition to Abu Ail. Here he is at the operating position of OE6XG/A. Many of you have also worked Giampaolo as 6O1FG and J20BS.

### QSL MANAGERS

- A6XJA, Box 2536, Abu Dhabi, United Arab Emirates
- AP2ASM, Box 8925, Karachi, Pakistan
- CE9AT, CE2BI, Antarctica Dept., Naval Post Office, Valparaiso, Chile
- CM7FM, Box 247, Ciego de Avila, Cuba
- CO8RA, P. O. Box 8, Santiago, Cuba
- CP6HQ, Box 977, Santa Cruz, Bolivia
- CSAAA, Box 273, Banjul, Gambia

- DAIISA/HB0, DAIEA, Jerry Block, Box 7063, APO, New York 09633
- DF6SL/KC6, K. Muller, Box 9, Truk, E. Caroline Islands 96942
- EA9GK, Box 103, Ceuta, Northern Africa
- EL2AC, Box 380, Monrovia, Liberia
- FG7AM, Box 857, Point-a-Pitre, Guadeloupe
- FR7BU, Box 32, Saint Paul, Reunion
- H18IH, P. O. Box 2488, Santo Domingo, Dominican Republic
- HK0BBD, P. O. Box 484, San Andres
- HPIACJ, P. O. Box 8781, Panama City 5, Panama
- HPIACK, Box 8481, Panama City, Panama
- HP3EC, Box 674, David, Chiriqui, Panama
- HP3XKB, P. O. Box 1056, Concepcion, Panama
- H7H, P. O. Box 2616, Managua, Nicaragua
- JTIAN, Box 540, Ulan Bator, Mongolia
- J28AG, SP 85038/GET, Djibouti
- KG4XX, P. O. Box 584, FPO, New York, NY 09593
- KG6JJH, Code 930, SRF, Guam Island 96630
- KJ6BZ, Box 289, APO, San Francisco, CA 96305
- K5OFO/TC9, Box 2452, Guatemala City, Guatemala
- K7CA/HCI, Paris 1107, Quito, Ecuador
- OA4DI, P. O. Box 538, Lima, Peru
- OA4JR, P. O. Box 3473, Lima, Peru
- PY0APS, PYIAPS, Gerson Bissin, P. O. Box 12178 Copacabana 20000 Rio de Janeiro, RJ, Brasil
- PY0MAG, PY1MAG, Paulo Rabelo, Rua Albino Pereira 355, 24250 Niteroi, RJ, Brasil
- SV4GP, Box 43, Larissa, Greece
- SV0AA, Jack Jackson, Box 722R, APO, NY 09223
- SV0AE, P. O. Box 564, Athens, Greece
- S8AAA, Box 821, Umatata, Transkei
- TG5NW, Golden Gate, 7233 Surrey, San Francisco, CA 94131
- TG9GL, Box 62, Guatemala City, Guatemala
- TN8BL, P. O. Box 55, M'Binda, Congo People's Rep.
- TU2FH, P. O. Box 40, Oume, Ivory Coast
- VK2VGV/VK9N, Box 214, Norfolk Island, 2899 Australia
- VK9XL, Box 10, Christmas Island, Australia



When are the bands open? These charts predict this month's average propagation conditions for high-frequency circuits between the U.S. and various overseas points. One chart for East Coast to West Coast is also included. On 10 percent of the days of the month, the highest frequency propagated will be at least as high as the uppermost curve (highest possible frequency, or hpt). On 50 percent of the days of the month, it will be at least as high as the middle curve (maximum usable frequency, or mu). On 90 percent of the days of the month, it will be at least as high as the

VP2SC, Box 251, Kingston, St. Vincent, BWI  
 VQ9RL, 1126-A 34th St., Port Hueneme, CA 93043  
 VS3CW, P. O. Box 398, Bandar Seri Begawan,  
 Brunei  
 VS6DA, Box 541, Hong Kong  
 VS6EN, Box 541, Hong Kong  
 VU2GAA, U.S. Embassy, New Delhi, India  
 W1LFF/DU2, PSC 2, Box 18442, APO, San  
 Francisco, CA 96311  
 WA2WYR/CX, American Embassy, APO, Miami,  
 FL

34035  
 WD8QIQ/KH7, EM2 Y.P. Aldrich, Kure Island,  
 c/o FPO, San Francisco, CA 96614  
 WP2AAM, Bill Munoz, P. O. Box 815, St. Croix,  
 V.I., 00850  
 XJ3TBC, Bancroft ARC, P. O. Box 631, Bancroft,  
 Ontario, Canada K0L 3C0  
 YB7ACZ, J. W. Moore, Jr., W51MJ/4, Box 3870  
 D.U.M.C., Durham, NC 27710  
 YC1HW, Aris M., Purnawarman 30, Bandung,  
 Indonesia  
 YI4SC, Y11BGD, Box 5864, Baghdad, Iraq  
 YJ8KB, K. Barlow, Box 730, Port Vila, New  
 Hebrides  
 YN1FMQ, Box 4272, Managua, Nicaragua  
 YV0AA, Box 2285, Caracas, Venezuela  
 ZD7PL, Box 4, St. Helena, South Atlantic  
 ZS3KC, Box 1232, Swakopmund 9180, Southwest  
 Africa  
 3B8CF, S. Mandary, Ave. de L'Avenir A-1, Cite  
 Kennedy, Quatre Bornes  
 3V8ND, Box 16, Tunis, Tunisia  
 3X1X, Box 477, Conakry, Rep. Guinea  
 4S7DJ, Box 907, Colombo, Sri Lanka  
 6T1YP, Radio Club, Youth Palace, P. O. Box 80,  
 El Morada, Omdurman, Dem. Rep. of Sudan  
 6W8AA, Box 971, Dakar, Senegal  
 6Y5MR, P. O. Box 1061, Kingston 8, Jamaica  
 7X2AJ, Box 2, Alger, Algeria  
 7X2MB, M. Bourkiche, 13 rue F. Gastu, Clos  
 Salembier, Algiers  
 9G1LL/9G1LK, c/o WA4ZRS, Wycliffe Bible Trans-  
 lators, JAARS Radio, P. O. Box 248, Waxhaw,

NC 28173  
 912JN, Box 222, Lusaka, Zambia  
 9K2MQ, Box 24987, Kuwait  
 9X5PM, Box 863, Kigali, Rwanda  
 9X5PP, Peter Pike, Box 1035, Kigali, Rwanda  
 9X5SM, M. Saegerman, B. P. 72, Kigali, Rwanda

### ARRL DX QSL BUREAU SYSTEM

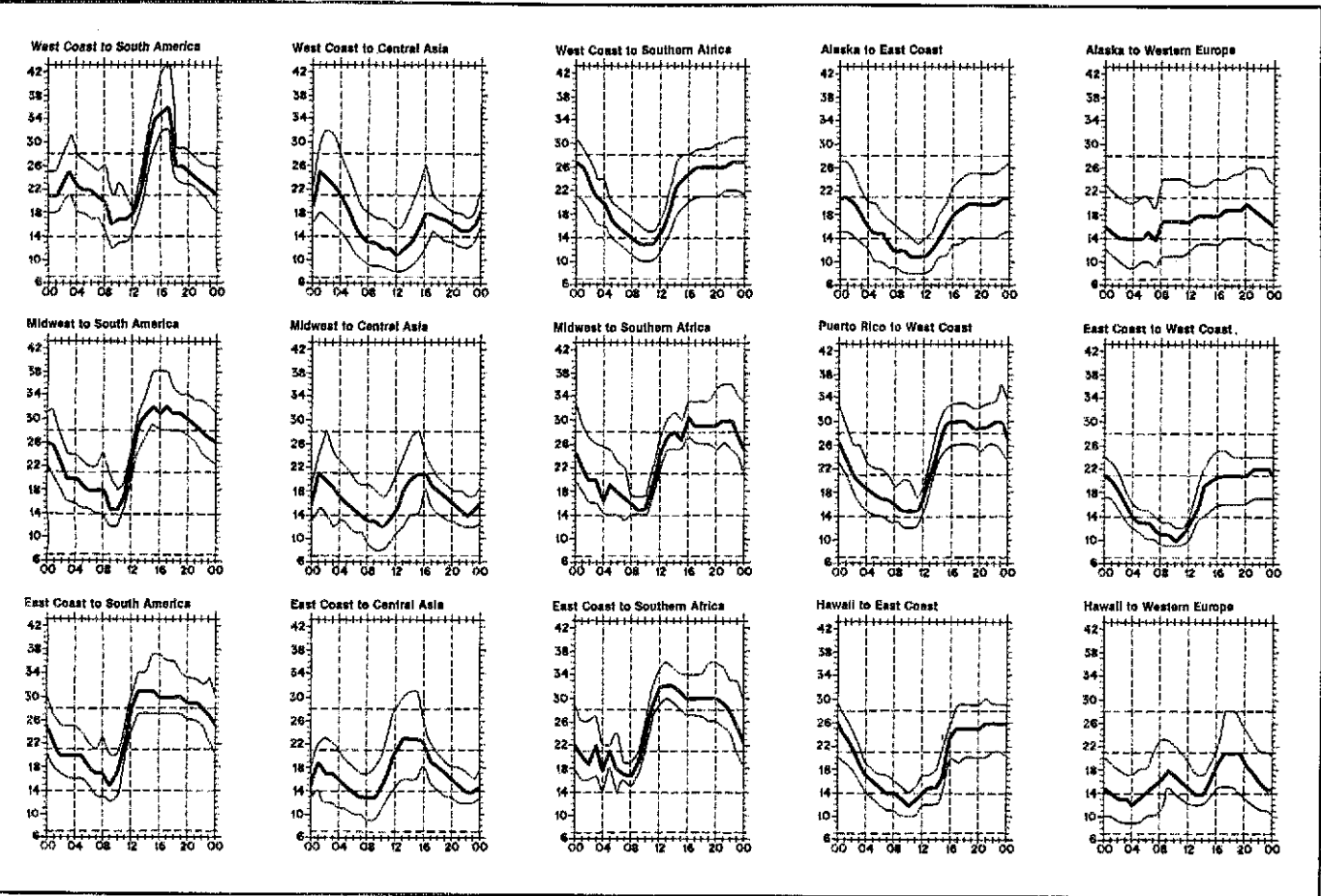
The ARRL DX QSL bureau system distributes cards free of charge from DX stations to amateurs within the League membership area (see page 8). Every active DXer should keep several 5 x 7-1/2-inch envelopes on file with the bureau of his home district. Place your call sign in large block letters in the upper left corner, and attach a single first-class stamp, unless you normally receive more cards. Unclaimed cards are discarded after one year. For more details on the bureau system, write ARRL hq.

Please note that there are *two* bureaus for the fourth call area. The bureau in Boyce, VA, handles cards for single-letter prefixes only, while the bureau in Sterling Park handles cards for all other four-land stations.

- First Call Area: all calls\* — Hampden County Radio Association, Box 216, Forest Park Station, Springfield, MA 01108.
- Second Call Area: all calls\* — North Jersey DX Assn., P. O. Box 8160, Haledon, NJ 07508.
- Third Call Area: all calls\* — Jesse Bieberman, W3KT, RD 1, Box 66, Valley Hill Rd., Malvern, PA 19355.
- Fourth Call Area: K4, N4, W4 — National Capitol DX Assn., Box DX, Boyce, VA 22620. (Single-letter prefixes only.)
- Fourth Call Area: AA4, WA4, WB4, WD4, WN4 — Sterling Park Amateur Radio Club, P. O. Box 599, Sterling Park, VA 22170.
- Fifth Call Area: all calls\* — ARRL W5 QSL Bureau, Box 1690, Sherman, TX 75090.
- Sixth Call Area: all calls\* — ARRL Sixth (6th)

District DX QSL Bureau, P. O. Box 1460, Sun Valley, CA 91352.

- Seventh Call Area: all calls — Willamette Valley DX Club, Inc., P. O. Box 555, Portland, OR 97207.
- Eighth Call Area: all calls — Columbus Amateur Radio Assn., Radio Room, 280 E. Broad St., Columbus, OH 43215.
- Ninth Call Area: all calls — Northern Illinois DX Assn., Box 519, Elmhurst, IL 60126.
- Zero Call Area: all calls\* — W0 QSL Bureau, Ak-Sar-Ben Radio Club, P. O. Box 291, Omaha, NE 68101.
- Puerto Rico: all calls\* — Radio Club de Puerto Rico, P. O. Box 1061, San Juan, PR 00902.
- U.S. Virgin Islands: all calls — Graciano Berlaro, KV4CP, P. O. Box 572, Christiansted, St. Croix, VI 00820.
- Canal Zone: all calls\* — KZ5 QSL Bureau, Box 407, Balboa, CZ.
- Hawaiian Islands: all calls\* — John H. Oka, KH6DQ, P. O. Box 101, Aiea, Oahu, HI 96701.
- Alaska: all calls — Alaska QSL Bureau, 4304 Garfield St., Anchorage, AK 99503.
- SWL — Leroy Waite, 39 Hannum St., Ballston Spa, NY 12020.
- QSL Cards for Canada (VE and VO) may be sent to: CRRL Central QSL Bureau, P. O. Box 663, Halifax, NS B3J 2T3. Or, QSL cards may be sent to the individual bureaus.
- VE1\* — L. J. Fader, VE1FQ, P. O. Box 663, Halifax, NS B3J 2T3.
- VE2 — A. G. Daemen, VE2IJ, 2960 Douglas Ave., Montreal, PQ H3R 2E3.
- VE3 — The Ontario Trilliums, P. O. Box 157, Downsview, ON M3M 3A3.
- VE4\* — W. A. Stunden, VE4BJ, 578 Oxford St., Winnipeg, MB R3M 3J9.
- VE5 — A. Lloyd Jones, VE5JI, 2328 Grant Rd., Regina, SK S4S 5E3.



lowest curve (optimum traffic frequency, or OTF). See January 1977 QST, page 58, September 1977 QST, page 35 and January 1979 QST, page 11, for a complete explanation. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. Asterisk indicates long-path circuits. Data are provided by the Institute for Telecommunication Sciences, Boulder, CO. These predictions for August 15 to September 15, 1979, assume a sunspot number of 152, which corresponds to a 2800-MHz solar flux of 195.

□ VE6\* — G. D. Holeton, VE6AGV, 4003 1st St., N.W., Calgary, AB T2K 0X2.

□ VE7\* — Howard Martin, VE7AFY, No. 45-9960 Wilson Road, Ruskin, BC V0M 1R0.

□ VE8\* — Al Sturko, VE8NS, P. O. Box 72, Fort Smith, NWT X0E 0P0.

□ VO1, VO2 — CRR1 VO QST, Bureau, P. O. Box 6, St. John's, NF A1C 5H5.

\*These bureaus sell envelopes of postage credits. Send an s.a.s.e. to the bureau for further information.

## DXCC NOTES

### New Country

Upon the recommendation of the DXAC, the island of Desecheo is hereby accepted for country status. This action precedes the changes in the DXCC rules concerning separate administrations and entities. All contacts with Desecheo made after March 1, 1979, will be credited beginning September 1, 1979.

### Honor Roll

Henceforth, the DXCC Honor Roll will be listed in QST once per year. The month for Honor Roll submissions will be the month of June with expected publication in September QST dependent upon backlog.

### DXCC Stickers

The 100 sticker for the DXCC pin has been discontinued. Since the basic award is for 100, the pin alone represents 100 credits. Endorsement stickers awarded for the DXCC are changed to the following levels: 125, 150, 175, 200, 225, 250, 260, 270, 280, 290, 300, 305, and increasing increments of five. Old stickers in increments of 10 will continue to be issued until the present supply is exhausted.

### New DXCC Application Form

There is a new initial application form (CD-253) for first-time applicants for the DXCC award. This form is essentially the DXCC countries list and, upon verification by Headquarters, becomes the permanent record for the DXCC member. This form must be accompanied by application form CD-164, which is also used for endorsements. The new form is not used for endorsements.

## Strays



"Now I can tell my grandchildren that I've really seen *the* NP junction," writes Dave Watson, WD5DSW/Ø. The intersection is located near Cabool, MO.

## QST congratulates . . .

□ Don F. DeGroot, WA8CLM, retired vice president, Broadcasting Division of the Evening News Association, whose autobiography, *Living On Air*, has been published by Oakmore Publishing Co.

# DX Century Club Awards

Administered By Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmation for contacts with 100 or more countries on the official ARRL DXCC List. You may also submit cards to endorse your award in 20-country increments through 240, 10-country increments through 300, and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from March 1 through March 31, 1979. An s.a.s.e. will bring you the full rules for participation in the DXCC, the DXCC list and application forms.

## New Members

### Mixed

CT3BX/105  
DL7SY/252  
DL7WL/104  
DM4RDA/212  
F6CVI/111  
G3VHW/141  
HA6HW/133  
HB9KT/108  
HK3AX/110  
ISJFG/140  
JA1CZG/117  
JA2DOU/105  
JA9ESZ/279  
JT1AN/222

OH5LP/107  
SM1FPE/4U/100  
VE2FGO/106  
VE3IV/113  
YK9XX/102  
YV2SM/W2/115  
YU1NZW/176  
YU2RON/158  
YU4FTJ/166  
YU4VBR/160  
K1MAL/100  
K1VJH/100  
KA1DJ/109  
N1ACW/203

W1EWC/102  
W1FK/100  
W1JA/100  
W1OTQ/100  
WA1LOU/100  
WA1YWH/103  
WB1DGG/100  
WB1GOO/105  
WB1HX/110  
N2AID/103  
WA2JLA/102  
K3ONW/102  
W3HRD/101  
WB3ERY/106

KB4BH/118  
N4XG/112  
WA4ELW/101  
WA4RL/105  
WA4ZMM/103  
WB4KSO/111  
W4AZQ/104  
K5GUU/107  
WB5VCI/107  
K6ARE/106  
K6OKW/132  
K6ZOR/139  
N6ADI/101  
N6ANN/156

N6BB/300  
N6PV/101  
W6KPU/114  
W6SMD/106  
WA6DZM/100  
AF7F/119  
K7AZG/102  
WA7SVV/102  
WB7TXV/109  
K8IC/104  
K8VFW/109  
N8AGY/109  
W8YX/100  
WA8QEF/104

WB8JYX/102  
WB8TRW/105  
K9BIL/104  
K9HNF/100  
K9IHM/190  
W9NZI/101  
WD9IC/100  
ACØM/105  
KØDEW/111  
KØQQ/216  
WØQZ/110  
WØRYW/108  
WBØWAD/101

### Radiotelephone

CT2BU/107  
CT2CE/107  
DJ5EJ/105  
DL7SY/176  
EA8PP/149  
F2GA/119  
FO8DF/164  
ISØUSU/151  
JH2VNY/105  
JA9ESZ/274  
KL7ITW/100  
LA3XJ/210  
LA4HH/110

OZ8YP/109  
SMØEYX/114  
VE2DZT/118  
VE3ET/117  
VE7DFW/114  
YV2SM/W2/113  
YU1NZW/122  
Z55YA/102  
K1MIZ/101  
K1UDW/108  
KA1DJ/109  
N1ACW/196  
WA1HHS/101

WA2ETA/110  
W3FJY/107  
W3HCE/114  
W3LPN/104  
WA3BIW/103  
WA3GX/101  
KB4IS/101  
N4XG/104  
W4JTH/100  
WA4ZMM/101  
WA4RLL/100  
WB4KSQ/110  
WB4YXA/104

WD4AAQ/110  
WD4HVZ/100  
WD4DK/101  
WD4NZC/101  
K5GUL/104  
K5ZH/270  
KB5AX/106  
W5BPT/133  
WA5WKO/100  
WB5KSU/100  
WD5BKO/100  
WD5DIV/103  
K6OKW/131

KB6CO/103  
N6JN/106  
W6AML/110  
W6ST/108  
WA6OXZ/VQ9/101  
WA6PTM/100  
WA6SSG/104  
KA7AUH/110  
W7KTH/109  
WA7PMW/101  
WB7BBO/222  
WB7BQP/100

WB7FAT/105  
K8IC/104  
K8VFW/109  
WB8YUO/103  
W8DEM/1138  
K9BIL/100  
K9IHM/188  
K9KWL/103  
K9DUL/100  
W9IY/163  
WB9YJW/102  
WBØTQW/100

### CW

DJ4XA/103  
DJ7R/100  
I3MQ/128  
JA1SGU/141

OE1KJW/100  
YU1NZW/118  
YV1OB/107  
ZS3BT/100

W2PV/143  
WB2MVS/102  
W3FLA/110  
AA4AK/100

AA4JS/105  
AF6Y/109  
N6PV/100

W6SMD/101  
WA7RQS/103  
K8VM/119

W8CD/104  
AB9E/115  
K9LV/123

## 5BDXCC

K3UA  
F8BFH

K3MO

N4YD

AA4VK

I1HAG

SM3EVR

## Endorsements

### Mixed

DJ4XA/280  
DJ5EJ/122  
DK2XX/206  
DL1KS/300  
DL7RT/221  
F2IU/325  
F6CLH/160  
G3GIG/292  
HB9AI/200  
HB9AZO/244  
I3MQ/218  
JA1SGU/205  
JA2KVD/250  
JA8AYN/289  
JA8ZO/328  
JA9AQE/170  
KA6RR/250  
KH6CF/270  
KH6DL/220  
LA3XJ/233  
LA8KD/144  
LA8LF/318  
OE1KJW/120  
OH2BCV/311  
OH8SR/318  
OZ3PO/332  
PY1DH/328  
SK4BX/124  
SM5AKT/192  
SM5BMB/220

SM7BOL/210  
UVØEX/201  
VE3CPU/199  
VE3ECP/206  
VE3GFN/200  
VE4IU/160  
VE4SN/201  
VE6CV/201  
VO1FB/316  
VE7IG/316  
W2PSU/295  
XE1FR/270  
YU1OCV/251  
YU2CDO/199  
YU3TKT/170  
AA1K/201  
K1KNM/204  
K1RH/183  
K1SA/251  
K1WJ/240  
K1YHM/216  
KA1BU/152  
KA1UN/216  
N1ZZ/238  
W1CDO/143  
W1DMD/160  
W1ERW/177  
W1GDD/305  
W1GUW/183  
W1PV/200

W1QD/130  
W1QV/289  
WA1TPR/231  
WB1DGD/183  
AE2A/226  
K2GAT/219  
K2GBC/302  
K2HVN/265  
N2JA/185  
W2GND/177  
W2PSU/295  
W2UJE/348  
W2VYX/290  
W2XN/346  
WA2ECA/139  
WB2HPP/201  
AA3E/139  
N3GW/160  
N3KZ/202  
W3CRG/160  
W3FAE/180  
W3KH/240  
W3LMZ/276  
W3NFD/220  
W3SRK/141  
AA4SC/260  
AA4TP/220  
AB4H/312  
K4AUL/326  
K4BIY/214

K4GFH/200  
K4GFI/310  
K4KBL/251  
K4WSB/240  
K4ZYU/290  
KD4M/140  
N4BH/183  
N4HH/270  
W4DHz/320  
W4HLY/144  
W4ML/355  
W4TJC/182  
WA4DAN/161  
WA4HDD/239  
WA4OBO/328  
WA4OUP/246  
WA4UBM/141  
WA4WIP/332  
WA4WPN/141  
WA4WYN/251  
WB4FTU/165  
K5GH/300  
N5FG/283  
N5UD/301  
N5ZZ/120  
W5GEL/305  
W5HNS/180  
W5KFN/280  
W5NUT/348  
W5UFF/169

WA5EQZ/270  
K8AO/331  
K6DG/265  
K6DZT/142  
WB4TO/263  
W8KUT/350  
W8KYJ/328  
W6PMT/242  
W6YMH/198  
WA6QND/129  
WA6TOO/200  
K7AA/290  
K7EQM/202  
K7SPN/221  
N7MW/248  
W7BJ/256  
W7FLD/140  
W7XA/305  
W7ZH/281  
WA7RKJ/172  
WB7ABK/334  
WB7DKV/242  
K8AQM/121  
K8CMO/250  
K8DYZ/338  
K8PO/244  
W8AP/203  
W8CC/274  
W8CD/137  
W8KPL/350

W8LZV/250  
W8NJC/250  
WA8QY/1250  
WB8EYL/140  
WB8FOG/292  
WB8ZRL/182  
AB9E/252  
KØEVB/250  
K9IUF/290  
K9KBW/4162  
K9MBQ/140  
W9AND/279  
W9BB/140  
W9NA/335  
W9NB/290  
W9NFC/336  
W9ZVH/295  
WA9USE/200  
WB9MFC/169  
WB9POH/209  
WB9JW/199  
KØLD/177  
KØLIR/121  
KØMOL/201  
KØRTH/281  
NØAT/220  
WØBK/340  
WØUBT/140  
WØBIY/140

### Radiotelephone

A6XB/180  
DJ3EJ/202  
DK2XX/195  
DL9DY/312  
EA3AEA/251  
EA3ALD/254  
EA4LH/325  
EA7IR/315  
EA8LD/244  
F6BPF/307  
F8ACB/260  
IBIH/152  
IØNZA/180  
JA1SGU/126  
JA2KVJ/224  
JA8ZO/318  
LA8LF/308  
KØ6GF/118  
OZ2YE/206  
SM5BMD/159

SM7BOL/207  
VE3ECP/201  
VK3OT/184  
K1KNM/202  
K1TO/163  
K1WH/151  
K1YHM/205  
KA1BU/146  
N1ZZ/176  
W1CRL/120  
W1GDD/120  
W1JZ/299  
W5HNS/229  
W2BHK/241  
W2CKR/192  
W2FGD/337  
W4NYN/292  
W2PSU/286  
W2XN/335  
WB2DND/158

WB2HPP/201  
WB2KWY/210  
WB2RLK/VE/276  
WB2SZH/160  
N3KZ/167  
W3FAE/161  
W3CIV/172  
K4GFI/310  
K4KZZ/241  
K4RSB/259  
KA4D/263  
KØ4M/140  
N4BAK/143  
N4HB/172  
W4HLY/141  
W4LLV/239  
W4NYN/292  
W4NYN/149  
W4TJC/183  
WA4DAN/140

WA4FDF/200  
WA4HDD/237  
WA4HSE/260  
WA4INQ/139  
WA4OBO/313  
WA4UVG/140  
W4WIP/332  
WB4KZG/310  
W4QGI/271  
K5OVG/320  
N5FG/270  
N5UD/285  
W5HNS/156  
W5KZ/197  
W5EZO/263  
WA5IEV/325  
WA5MLT/138  
WB5ZCS/140  
WD5GFI/152

K6AQ/271  
K6DG/265  
W6GTL/300  
W6KUT/314  
W6KYJ/310  
W6MFC/239  
W6PMT/240  
W6VZ/160  
W6PEFF/141  
W7BJ/251  
W7YG/140  
W7YR/277  
WA7KNK/200  
WA7UVO/270  
WA7ZJQ/161  
WB7ABK/310  
K8CMO/245  
K8DYZ/338  
K8SD/262

K8VIR/220  
WA8PWF/199  
WA8QY/195  
WB8KLC/143  
WB8ZRL/175  
AB9E/235  
K9ZO/220  
W9ABA/270  
W9BEK/325  
W9NB/288  
W9NWE/309  
W9ZVH/285  
WD9CLQ/130  
KØLD/165  
KØQQ/215  
KØRTH/251  
NØAT/215  
WØJKM/159  
WØPSH/124

### CW

HP1AC/159  
JA2KVD/132  
JA8ZO/242

SM5AKT/183  
SM8AJU/165  
K1RH/176

K1SA/188  
N2JA/180  
W3TVB/140

KE4I/200  
WA4DAN/160  
N7MW/201

K8DYZ/243  
K8VM/195  
WB8JY/212

NØHY/120  
NØRR/189

# Coming Conventions

- August 4-5**  
Arkansas State, Little Rock, AR
- August 4-5**  
North Florida Section, Jacksonville, FL
- August 11-12**  
Pacific Division, Reno, NV
- September 9**  
Illinois State, Rockford, IL
- September 28-30**  
New England Division, Hartford, CT
- September 29-30**  
Kentucky State, Louisville, KY
- October 5-7**  
Dakota Division, Sioux Falls, SD
- October 5-7**  
West Gulf Division, Houston, TX
- October 13-14**  
Tennessee State, Memphis, TN
- October 19-21**  
Midwest Division, Cedar Rapids, IA
- October 19-21**  
Southwestern Division, Anaheim, CA
- October 20-21**  
Roanoke Division, Norfolk, VA
- November 17-18**  
Florida State, Clearwater, FL

## ARRL NATIONAL CONVENTIONS

- July 25-27, 1980**  
Seattle, WA
- March 13-15, 1981**  
Orlando, FL

## ILLINOIS STATE CONVENTION

**September 9, 1979, Rockford, IL**

The Rockford Amateur Radio Association will sponsor the Illinois State Radio Convention to be held at the Winnebago County Fairgrounds at Pecatonica, IL, 10 miles west of Rockford on U.S. Highway 20. Display area of 40,000 square feet under roof will house dealers and flea markets.

Seminars include two speakers from the ARRL: Jay Rusgrove, W1VD, senior assistant technical editor and Don Search, W3AZD, DXCC branch of the Communications Department. ARRL Director Don C. Miller, W9NTP, will present a medium-scan ATV program. Also, Vito Fiore, K9UCL and Gene Streitmatter (associate professors in electronic technology at Rock Valley College) will put on two seminars on "Microprocessors and Ham Radio;" one for beginners and one advanced.

Doors open at 8 A.M. Sunday. Camping available (fee). Tables \$3 each, snack bar, ladies events, talk-in on 01/61 and 52. Registration, \$2 advanced, \$2.50 at the door. Send s.a.s.e. to Rockford Amateur Radio Association, P. O. Box 1744, Rockford, IL 61110.



# Hamfest Calendar

**Alabama:** The North Alabama Ham Assn. will hold its annual hamfest on Aug. 18-19, at the Calhoun Community College gym, Decatur. Exams will be administered by the FCC. Prizes. Camping available nearby. Talk-in on 40/00, 34/94 and 52. Info available from NAHA, Box 9, Decatur, AL 35602.

**Arkansas:** The Queen Wilhelmina Hamfest Committee is sponsoring its 10th Anniversary hamfest Sept. 8-9 at Queen Wilhelmina State Park lodge, atop Rich Mountain, just north of Mena. Displays, free flea market, banquet, live band, church services, activities for YLs and harmonics, prizes. Look for WBSMFI/5 operating from the lodge. Admission \$2. Talk-in on 3.995, 19/79 and 52. Additional info from Steve Myers, WBSMFI, SS103 Carlson Terrace, Fayetteville, AR 72701, tel. 501-443-3489.

**California:** Santa Barbara ARC Hamfest and Bar-B-Q will be held Aug. 19 at Tucker's Grove. Contest, prizes. Talk-in on 19/79. Contact Richard L. Johnson, WB6DNN, P. O. Box 3232, Santa Barbara, CA 93105, tel. 805-965-2663.

**Connecticut:** The Third Annual WELI ARC flea market will be held from 10 to 5 on Aug. 25 at Radio Towers Park, Benham St., Hamden. Food. Dealers: \$5 at the gate, preregistration \$4. 50-cents admission (under 12 free). Rain date Sept. 1. Send preregistration to WELI ARC, P. O. Box 85, New Haven, CT.

**Delaware:** The Fourth Annual New Delmarva Hamfest will be held Sunday, Aug. 19 at Gloryland Park, Bear. Donations \$2 in advance, \$2.50 at the gate. Table \$3. Prizes, food and drinks. Talk-in on 52 and 13/73. For more info, send s.a.s.e. to Stephen Momot, K3HBP, 14 Balsam Rd., Wilmington, DE 19804. Checks payable to Delmarva Hamfest, Inc.

**Florida:** The Five Flags ARA will hold its 1979 Ham-A-Rama on Sept. 2, from 9 to 4, at the Pensacola Municipal Auditorium. Flea market, prizes, commercial exhibits, homebrew contest, forums, swap tables, and more, \$1 at the door. For more info, write FFARA, P. O. Box 17343, Pensacola, FL 32522.

**Florida:** The 14th Annual Melbourne Hamfest will be held Friday, Sept. 7, from 6 to 11 P.M. and Saturday and Sunday, Sept. 8-9, from 9 to 5, in the Melbourne Civic Auditorium, Hibiscus Blvd. Donation \$3.50 per person. Full program includes forums, meetings, swap tables, commercial exhibits, prizes and more. Talk-in on 25/85 and 52. Sponsored by Platinum Coast ARS, P. O. Box 1004, Melbourne, FL 32901.

**Georgia:** The Cedar Valley ARC hamfest will be held Aug. 12 from 8 to 4 at the Polk Co. Fairgrounds, two miles east of Cedartown on Rte. 278. Talk-in on 72/12. Food, drinks, prizes. Contact Jim T. Schlietert, W4IMQ, CVARC, P. O. Box 93, Cedartown, GA 31025, tel. 404-748-5968.

**Illinois:** The Centralia Wireless Assn. will hold its hamfest Aug. 19 from 9 to 4 at Central City Lion's Club Park, Centralia. Prizes. Talk-in on 87/27 and 52. Contact WB9QEG for more information.

**Illinois:** The Fox River Radio League will hold its annual hamfest on Sunday, Aug. 26, at the Kane Co. Fairgrounds, St. Charles. Exhibitors inside, free outside flea market, hot lunch available. Admission \$1.50 in advance, \$2 at gate. Talk-in on 94. Contact Martin Schwamberger, WB9TNC, 1051 Northfield Dr., Aurora, IL 60505.

**Illinois:** The 46th consecutive Hamfesters Radio Club Hamfest will be held Sunday, Aug. 12, at Santa Fe Park, 91st and Wolf Rd., Willow Springs.

**Illinois:** The Illiana Repeater System, Inc., will hold its 10th annual Danville Area Hamfest Sunday, Sept. 2, at the Georgetown Fairgrounds, eight miles south of Danville. Gates open at 6 A.M. Donation \$2 (14 and older). Further information from IRS, Inc., P. O. Box "G," Catlin, IL 61817. Vendor indoor space available.

**Indiana:** The Second Annual Delaware ARA hamfest will be held Saturday, Aug. 11, from 7 A.M., at Springwater Park, Country Club Rd. Reserved covered table space \$1; no extra charge for outside space. Tickets \$1.50 in advance, \$2 at the gate, from any club member or with s.a.s.e. to DARA, P. O. Box 3021, Muncie, IN 47302. Talk-in on 25-85 and 52.

**Indiana:** The Second Annual Housier Back Yard Hamfest will be held Sunday, Sept. 9 at Hensonburg School, just east of U.S. 37 and Vernal Pike, Bloomington. Sponsored by WR9AFY and Community

Broadcasting Corp., Inc. Local ATV, ATV repeater and SSTV demos, home computer show, food and prizes. Tickets \$1 (over 12 years of age). Talk-in on 78/18. Inquiries to HBYH, 7391 W. Hwy. 46, Ellettsville, IN 47429.

**Indiana:** The Lafayette Hamfest will be held Sunday, Aug. 19 at the Tippecanoe Co. 4-H Fairgrounds, located on Rte. 25, Lafayette. Advance tickets available by mail (by Aug. 10) at \$2 from Carl Vinyard, KB9DV, 10012 SR 26 E., Lafayette, IN 47905. Enclose s.a.s.e. Tickets also available at the gate. Prizes, flea market, forums and refreshments all day. Camping on grounds (extra fee). Gates open 6 A.M. Games for YLs and children. Talk-in on 13/73 and 52.

**Indiana:** The annual LaPorte County Hamfest will be held rain or shine on Sunday, Aug. 26, at the County Fairgrounds on Hwy. 2, west of LaPorte (50 miles S.E. of Chicago). Outdoor flea market, plenty of indoor display space. Tables available for \$1. Advance tickets \$2 with s.a.s.e. to P. O. Box 30, LaPorte, IN 46350.

**Indiana:** The Porter Co. ARC will hold its annual hamfest at the Porter Co. Fairgrounds on Sept. 9. Flea market, prizes, technical sessions. Admission \$2, no charge for table space (bring your own). Talk-in on 96/36 and 52. Advance tickets and information from Art Cushman, N9FB, 944 N. 200 W., Valparaiso, IN 46383.

**Iowa:** The Iowa 75-Meter Net Picnic will be held Aug. 26 at Hickory Hills, south of Waterloo. Further info from WB0JFF.

**Kansas:** The Boot Hill ARC will hold a hamfest Sept. 2 in the 4-H Building west of the race track in Wright Park, Dodge City, KS. Covered dish dinner, swap tables, ladies and children's activities. Sales space \$1.50 each. Talk-in on 01/61 and 52. Write Foster W. Smith, Minneola, KS 67865.

**Kansas:** The Kansas-Nebraska RC will host its 28th annual Hamfest/Flea Market at the Cloud Co. Community College, Concordia, Aug. 11-12. Registration starts 11 A.M. Saturday. ARRL forum Aug. 12, technical talks on OSCAR, MARS, DX, antennas, computers and SSTV. Banquet Saturday evening at 7 (reservations in a week beforehand). Luau at noon Sunday. Write W0UQD, Box 404, Beloit, KS 67420.

**Kentucky:** The Bluegrass ARC will host its annual Central Kentucky ARRL Bluegrass Hamfest Aug. 12 starting at 8 A.M. at the Fasig-Tipton Sales Paddock, Newton Pike, Lexington. Prizes, forums, indoor exhibits and distributors, outside flea market. Admission \$2.50 in advance, \$3 at the door. Food available. Talk-in on 16/76. For details, write Bluegrass Hamfest, Edward Bono, WA4ONE, 2077 Dogwood Dr., Lexington, KY 40504.

**Maine:** The annual Abbot Hamfest, Abbot Village, will be held Aug. 12 at Irvens' Eden.

**Massachusetts:** The South Eastern Massachusetts ARA annual picnic and flea market will be held from 9 to 4 Sunday, Sept. 9, at Stackhouse Fair Ground, Donald and Faith Streets, South Dartmouth. Talk-in on 60/00. For table space, write SEMARA, P. O. Box P-105, South Dartmouth, MA 02748.

**Michigan:** The Straits Area Radio Club, Petoskey, will present its annual swap-in shop and hamfest Aug. 18-19 at the Petoskey Middle School, State and Howard Streets. Banquet tickets limited to 200, in advance only. Speaker will be WA8MOA with movies and slides from 1978 DXpedition to Mellish Reef, VK9ZR. Full info for s.a.s.e. to Bill Moss, WA8AXF, 715 Harvey St., Petoskey, MI 49770, tel. 616-347-4734.

**Mississippi:** The Delta ARA will hold a hamfest Aug. 11-12 at the Greenville Mall Civic Center, Greenville.

**Missouri:** The St. Charles ARC will hold Hamfest '79 on Aug. 26 at the Wentzville Community Club. Prizes, food, flea market, cw contest, many more activities for YLs and children. Admission \$1 per car. Talk-in on 34/94 and 07/67. Info from SCARC, P. O. Box 1429, St. Charles, MO 63301.

**New Jersey:** The DeVry Tech ARC will hold its third annual flea market Saturday, Aug. 11, in the rear parking lot at DeVry Technical Institute, 479 Green St. (between Rtes. 1 and 9), Woodbridge. Space \$2; admission free.

**New Jersey:** The 530 ARC and Oakland Repeater Inc. will hold their annual flea market on Aug. 18 at the American Legion Hall, Oak Street, Oakland. Indoor tables \$5; tailgating \$3. No admission fee. Refreshments available. Talk-in on 49/49 and 52. For advance reservations and info, call Bud Hauser, WA2JUO, 201-797-8471 or 201-791-0589.

**New Jersey:** The Gloucester Co. ARC will hold its first annual hamfest on Aug. 26 from 8 to 3 at the Gloucester County College, Tanyard Road, Sewell. Indoor and outdoor spaces available. Food and prizes. Tickets \$2 in advance, \$2.50 at the door. Dealers and tailgaters \$5. Talk-in on 52 and 78/18. For info and tickets, contact Bob Grimmer, KN2QWO, 229 William Ave., Barrington, NJ 08007.

\*ARRL Hamfest

**New Jersey:** The Sussex County ARC Hamfest will be held Saturday, Sept. 8, from 9 to 5, rain or shine, at Sussex Co. Farm and Horse Show Grounds off Rte. 206, Augusta. Free admission. Indoor sellers \$6 at door, \$5 in advance. Tailgaters \$5 at the door, \$4 in advance. Talk-in on 90/30 and 52. Info from Sussex County ARC, P. O. Box 11, Newton, NJ 07860. Or call Ed Wozniak, AC2A, 201-852-3268.

**New Jersey:** The West Jersey Radio Amateurs, Inc., hamfest will be held on Aug. 19, from 10 to 5 at McGuire AFB, Wrightstown. Admission \$2 at the door, \$1.50 in advance (YLs and children free). Tailgate or table space \$2 additional (bring your own table). Refreshments, prizes, activities. Talk-in on 52 and 75/15. Advance tickets from club members or s.a.s.e. to Sam Shontz, WB2GEX, 107 Spruce Ln., Rte. 16, Mt. Holly, NJ 08060. Info from Larry Cohen, WA2TRJ, at 609-871-5852, or Mary Lou Shontz, WR2QIU, 609-267-3063.

**New York:** The 2nd annual electronic flea market and swapiest sponsored by Suffolk County ARC, Inc., will be held Sept. 9 (rain date Sept. 16) at the Oddfellows Hall, Jayne Boulevard, Port Jefferson Station, L.I. NY. Buyers \$1.50; sellers \$2. Prizes, refreshments. Talk-in on 52, 94 and 223.5. Tickets and info from Floyd Davis, WA2SDI, 25 Hemlock St., Central Islip, NY 11722.

**North Carolina:** The Cabarrus ARS First Annual Hamfest will be held Sunday, Aug. 12 from 9 to 5 at the Boy's Club, Spring Street N.W., Concord. Table \$3, (dealers \$10). Covered area, ladies' activities. Info from W. Vann Polk, WB4AGH, P. O. Box 1290, Concord, NC 28025.

**North Carolina:** The Shelby Hamfest will be held Sept. 1-2 at the Cleveland County Fairground, half mile from Shelby on Rte. 74 business east. Dealers, flea market. Info from Dale Magney, WA4BBN, 704-482-4951.

**Ohio:** The 37th Annual Findlay Hamfest, sponsored by the Findlay RC, will be held Sept. 9 at Riverside Park, Findlay. Tickets \$1.50 in advance, \$2 at the site. Info from Findlay ARC, c/o Randy Peterson, 6016 Marion TWP 243, Findlay, OH 45840.

**Ohio:** The Union County ARC will present its annual hamfest on Aug. 26 at the Marysville Fairground. Tickets \$1.50 in advance, \$2 at the gate.

**Ohio:** The Warren Hamfest will be held Sunday, Aug. 19, at the Trumbull KSU campus, Rte. 45 at Warren Outerbelt. Registration \$2. Prizes. Talk-in on 37/97. Clipperton DXpeditioner Hugh Vandergrift, WA4WME, will speak. Map, details, send QSL to Hamfest, Box 809, Warren, OH 44482.

**Pennsylvania:** The Butler County ARA will hold Ye Olde Fashioned Hamfest on Sept. 9 from 10 to 4 at the Butler County Farm Show Grounds, adjacent to Roe Airport on Rte. 68. Admission \$1 (under 12 free). Indoor flea-market tables \$3 (our table) and \$2 (yours). Food and refreshments. Talk-in on 90/30 and 52. Prizes. Info from Fred Young, WB3HGC, 195 Robbie Way, Portersville, PA 16051, 412-368-3386.

**Pennsylvania:** The Mid-Atlantic RC of Philadelphia will hold its annual J.B.M. Hamfest on Aug. 19 from 9 to 4 at the Budco 309 Drive-In, 309 Expy. and Rte. 63, Montgomeryville. Admission \$2.50; \$1 additional for tailgating. Nonhams free. Talk-in on 45, 52 and 66/06. Contact Gene Hoenig, WB3FTJ, 717 Amherst Circle, Newton Square, PA 19073, 215-221-3666 days or 215-353-3281 evenings and weekends.

**Pennsylvania:** The Perkiomen Valley ARC's 3rd annual hamfest is Aug. 26 at the Perkiomen Sale Grounds, Perkiomenville. Admission \$2, additional \$2 for a table. Free parking, refreshments, prizes. Talk-in on 28/88, 52 and 52.525. Info from Tom, WB3JEJ, RD 1, East Greenville, PA 18041.

**Pennsylvania:** The Tioga County ARC will hold its third annual hamfest on Aug. 25 from 9 to 5 at the Tioga County Fairgrounds, Rte. 660. Flea markets, dealers, technical forums, ARRL news, FCC info, SSTV demo, craft show and radio control models. Snack bar. Talk-in on 19/79, 52 and CB channel 5. Admission \$1 (under 16 free). Info from Wells Farr, WB3CUF, 101 Sherwood St., Mansfield, PA 16933, or Don Kimble, AE3Z, Box 109, 210 Maple St., Knoxville, PA 16928.

**Pennsylvania:** The 24th Annual York County Hamfest will be held Sept. 2, rain or shine, from 8 to 4:30, at U.S. 30 Drag-A-Way, 10 miles west of York. Talk-in on 37/97, 93/33, 87/27 and 52. Cafeteria. Registration \$3, YLs and children free. Tailgaters \$1, tables under roof with power, \$5 (in advance). Contact LeRoy Frey, K3POR, 170 South Albemarle St., York, PA 17403, tel. 717-854-1203.

**Quebec:** The annual R.A.Q.I. convention will be held Aug. 17-19 at Le Chateau Montebello, Montebello, PQ. Flea market, exhibits, ladies program and technical workshops. Registration begins Friday afternoon. For more info, contact Charles Savard, VF2FKC, tel. 819-770-1315.

**Tennessee:** The 21st Cedars of Lebanon hamfest is scheduled for August 26 at Cedars of Lebanon State Park, 10 miles south of Lebanon on Rte. 231. Bring food; drinks, camping available. Talk-in on 3980 and 2 meters. Call Richard Brown, W4VJW, on Tennessee net 3.980, for info.

**Texas:** The 1979 Golden Spread Hamfest and Convention will be held Aug. 10-12 (beginning Friday evening) at the Inn of Amarillo, 6111 Amarillo Blvd. West, Amarillo, TX 79107. Preregistration \$4, \$6 at the door. Swapfest, technical sessions, commercial displays, Navy and Army MARS meetings, ARES meeting, demonstration stations, ladies programs, prizes, ARRL forum. Sponsored by the Panhandle ARC, Amarillo.

**Texas:** The Tideland ARS will host Hamfest '79 on Sept. 1-2 at the Nesler Civic Center, 5th St., Texas City. Talks, seminars, family events, bar-b-cue, prizes. Further info from Hamfest '79, P. O. Box 73, Texas City, TX 77590.

**Vermont:** The Burlington ARC International Field Days will be held Aug. 11 and 12 at the Old Lantern, Charlotte. Outdoor flea market, model air show. Admission \$3, U.S. currency. Info from BARC, Box 312, Burlington, VT 05402.

**Virginia:** The annual Bluefield Hamfest will be held Sunday, Aug. 26, in Bluefield. Indoor and outdoor flea-market space available, prizes. Talk-in on 16/76 and 52. Info from Bill Fisher, 420 Union St., Bluefield, WV 24701.

**Virginia:** The Bristol ARC will hold a hamfest Aug. 18-19 at the Washington County Fairgrounds Complex, Abingdon. Admission \$1, \$2 additional for flea market.

**Virginia:** The Shenandoah Valley ARC will hold a hamfest at the Ruritan-Clarke County Fair Grounds, Berryville, on Aug. 5. \$2 admission fee.

**Washington:** The Radio Club of Tacoma will hold its annual Hamfair on Saturday and Sunday, Aug. 18-19, beginning at 9 each day, at Camp Murray, 10 miles south of Tacoma on I-5. Prizes, seminars, contests, commercial exhibits, food bar and flea market. Talk-in on 96/36. Banquet Saturday night. Contact Dave Ransier, WB7SDB, 10315 63rd Ave. Ct East, Puyallup, WA 98371, tel. 206-845-7800.

**West Virginia:** The Mon-Ham-Gala III will be held Sunday, Sept. 2 at Westover City Park, just off I-79. For info, contact Bill James, WA8GYU, Box 193, Cassville, WV 26527. Talk-in on 83/43 and 52.

**West Virginia:** The Jackson County ARC, Inc., will hold a hamfest on Aug. 12 at the Cedar Lakes FFA-FHA Convention Center, Ripley. Admission \$1.50 in advance, \$2 at the gate. Giant flea market, forums, fun for the whole family. For info, QSL to Bob Morris, WA8CTO, 628 Church St., South Ripley, WV 25271.

□ VE2AC, in the true amateur spirit, offers suggestions for helping newcomers to our fraternity.

## 50 Years Ago

August 1929

□ "Matty" of W9ZN describes the Naval Communication Reserve and the opportunities for amateurs both to get advanced radio training and serve their country.

□ Harold Westman has joined the I.R.E. staff, and Jim Lamb replaces him as our new technical editor. Cheyney Beekley has left to join the Maxim Silencer Co.; Don Meserve takes over as QST advertising manager, while Clark Rodimon assumes "Beek's" managing editor responsibilities.

□ Lamb's project this month is "The Modulometer," a device for checking performance of phone rigs, but his description encompasses considerable detail on other aspects of voice transmitter design and construction.

□ Col Foster, W6HM, in "Correspondence," charges the League lost large portions of our bands by acquiescing to international radio agreements instead of insisting the United States go its own way.

□ Bev Dudley discusses resistance control of regeneration, and says that a potentiometer in the tickler circuit works more smoothly than a variable resistor in the B-plus lead.

□ Don't put a book on the key while you're tuning up, W9TJ requests. Rather, use a foot switch for temporary power-on so your two hands will still be free for adjustments of the rig.

□ WIWV is the subject of the station description this month, an outstanding setup where careful construction and operation with the modest power of a pair of 210s matches performance of higher-power competitors.

□ WTAJZ's treatise on break-in is assisted by a series of keying suggestions in the "Experimenter's Section."

## 25 Years Ago

August 1954

□ W5s CA and RFF show us the fundamentals of etching circuit boards in our own workshops to achieve compactness, light weight and reliability in our equipment.

□ "ITV" is the label for the interference caused to radio services, including us, by radiation from television receivers. We are elated that the Commission is proposing some stringent rules to combat the problem.

□ Connecticut civil-defense Area I has an excellent communications control installation, and radio officer W1DBM describes its components and system of operation.

□ W1GKR and W1ZYX have modified the "Monitone" circuit by using r.f. for power, with electronic switching for automatic monitoring of your c.w. output.

□ If BCI and TVI trouble you on 50 Mc., W1VLH has the solution in his phase-modulated exciter unit.

□ V.h.f. enthusiasts have always been a close-knit group, a spirit which has now achieved a coast-to-coast relay on two meters, in both directions.

□ W1ICP relates the fundamentals of propagation theory as they apply to performance of the bands open to Novices.

□ W6WWM has a compact design for his 25-watt mobile rig covering 75 through 10 meters. W3EQK and W3JCI round out things with a dissertation on results of 10-meter mobile whip tests conducted by the Baltimore Amateur Radio Club. — W1RW

## Strays



Hugh Turnbull, W3ABC, an assistant director of the Atlantic Division, presents the ARRL 50-year member award to Paul Stumpf, W3AQN.

### QST congratulates . . .

□ John Carroll, WA0WRC, who was named 1978 "Ad Man of the Year" by the Advertising and Marketing Club of Kansas City, MO.

# The World Above 50 MHz

Conducted By William A. Tynan,\* W3XO



## Reporting

A letter to San Francisco Section SCM AA6DX from N6CT calls attention to several problems associated with reporting to and in this column as well as setting the facts straight on details of some 50-MHz F2 contacts made this past fall and winter. I will reproduce N6CT's letter in toto and then make some comments which, hopefully, will lead to better reporting in the future.

Dear Mark,

I thought I would pass along some of my concerns about reporting accuracy in "The World Above 50 MHz" column and the operation of the OVS system. The crux of what is bothering me is that quick reporting continues to take precedent over accurate and complete reporting. Let me give a few examples:

1) I was very disappointed to read in the May '79 column where the 6-meter QSO of March 11 between VK3OT and W6X1 was reported to be the first VK-W QSO this solar cycle. Such was not the case. My previous OVS reports have shown that on March 2, 1979, at 0400 UTC I worked VK4ZNC for what both of us believe to be the aforementioned "first 6-meter VK-W QSO this solar cycle." Also the QSOs mentioned in the column with VK3AQ1 were actually with VK3AQR. How much nicer it would have been for all involved to have received the report one month later but have gotten it complete and accurate (i.e., I also worked VK4DO, VK4ZEZ and VK2ZDK/4 that first night — I alerted W6YKM and WA6BYA who also worked VK4DO — K6UZK showed up and worked him as well — on March 11 in addition to VK3AQR I worked VK3AKK and VK4HD, not to mention W1QXX/KP4 and H18WPC as well — on March 10 I had worked 10 ZLs, W1QXX/KP4, PJ2DW, KP4EOR and KZ5NW).

2) The January '79 column reported my QSO with WA3DMF on October 31, 1978 at 1730 UTC as the first transcontinental F2 QSO on 6 meters this solar cycle. My OVS report showed up that my QSO with WIQD at 1714 on that date was actually the first such QSO. I also worked nine other stations on the U.S. East Coast, WB2RLK/VE1 (which was reported correctly), LU7JJS, LU1DAU, LU8AHW and JR3PSY that same day. No correction or supplement was ever provided.

3) The January '79 column also gave a last-minute report of a KG6 to West Coast opening on November 12, lasting for 45 minutes. No significant detail was ever supplemented in following issues even though my OVS report had outlined the circumstances. Specifically, W6EDE had heard the KG6JH beacon for several minutes the day before but could not raise Jerry at the time. However, W6EDE was heard by KG6DX, but signals faded before contact could be established. As a result of this I was actively looking for KG6JH on the 12th. About 2035 I began to hear the beacon very weakly and began calling KG6JH between his beacon transmissions. On the third call, Jerry answered me and we had the first 6-meter KG6-West Coast QSO. In addition I worked KG6DX, KG6JIO, JA1RJU, JE1CZV, JA1TGS and JA1VOK. By the way, the original report was from K7ICW as relayed by K5ZMS. To the best of my knowledge, neither of them was involved in the opening.

4) The September '77 column credits K5ZMS with reporting the first 6-meter QSO since statehood between the 49th and 50th states by KH6HI and KL7IFP. It was also reported KH6HI worked a bunch of W7s and VE7s. Although my OVS report gave a blow by blow account, no mention was ever made that I was responsible for the KH6-KL7 QSO setup. I had worked KH6HI and was searching the band for other QSOs, when I ran across KL7IFP and worked him. I realized that was the first time I had ever observed a simultaneous KH6 and KL7 opening, and I told KL7IFP to turn his antenna toward KH6 and go looking for KH6HI. He did, and they made immediate contact.

Needless to say, I'm less than thrilled with the circumstances. In fact, the September '77 column had

left me sufficiently discouraged that I had really lost all interest in the OVS system. Your inquiry last year as to my desire for a renewal of my OVS appointment finally jogged me back in gear. Now I just keep wondering if all of the other reports are as inaccurate and incomplete as those relative to my activity and OVS reports.

It is my feeling that if the OVS system is to be the chosen vehicle to gather information, then it should be fully utilized. I do feel other sources may be considered, but they should not short circuit the efforts of a large number of steady OVS supporters. I feel that the reporting for a given month should be presented uniformly and completely utilizing all sources only after the slowest of the chosen sources has had its allocated time to respond. "The World Above 50 MHz" is not a weekly news magazine and should not try to compete with *Ham Radio Reports* for timeliness. In the event that errors in reporting take place, they should be corrected at the earliest possible time. Mark, please do what you can to encourage broadly based, accurate, complete reporting and discourage all this racing about for flaky information.

73s, Bruce, N6CT

Bruce is quite right on one point. This conductor feels strongly that reports should be as current as possible within the constraints of deadlines and publication schedules. This particular column had to be at Newington just after the middle of June in order for *QST* to be in the mail by about July 20. Members expect to receive the magazine by the first of the month. When they don't, Headquarters is swamped with complaints. Because of this time lag, this month's column concerns happenings of late May and the first part of June. OVS is on a monthly schedule, so the reports are normally submitted a little after the first of the following month and, unless a copy is sent directly to me, they go to the SCMs who extract material for their monthly Station Activity Reports. They then forward the OVS reports to Headquarters which bundles them up and dispatches them on to me. I will normally receive May OVSs anytime from the 15th of June on. This is after the August column has been sent to Newington. If I were to base the column mainly on OVS reports, the May information would be the meat of the September column. I believe that the interest of most readers is diminished when the news they read is over a quarter of a year old. Don't anyone get the impression that I ignore the OVS reports. Nothing could be further from the truth. I read every one I receive as well as all the rest of the mail. In fact, reading the mail is one of the most enjoyable aspects of conducting "The World Above 50 MHz." When OVS reports contain information concerning unique experiments or news of ongoing activity, I do try to include it in the column. However, news of openings, especially if they have already been covered in the previous month's column, I normally do not include.

As to N6CT's comment regarding "accurate and complete reporting," I do strive for the most accurate reporting, as well as the most timely that I can come up with using the information available at the time of writing. I am frequently forced to make long-distance phone calls in order to check out rumors of contacts, sometimes the night before I must mail the manuscript. On the other hand, as I have stated

several times, "complete reporting" is impossible with *QST* space as tight as it is. This is particularly true when activity and propagation are at high levels as they currently are on 6 meters. The most that can be done is to present a synopsis of the more noteworthy events during the reporting period. I endeavor to do this in a readable fashion rather than merely publishing long lists of who worked whom at what time. My feeling is that such reporting is best done in the specialized bulletins like those put out by SMIRK and SWOT and, of course, the *432 EME Newsletter* published by K2UYH. I believe that *QST* has a mission of attempting to interest people in the various facets of Amateur Radio. Thus, in addition to trying to provide a chronicle of events for those who are already devoted followers, I aim "The World Above 50 MHz" especially at those who may still be making up their minds as to whether or not to embark on the part of hamming which we find so fascinating and at the new converts still getting their feet wet. My belief is that building the interest and enthusiasm of these people is vital to the future of vhf. As always, I solicit readers' comments on this approach as well as any other aspect of the column.

Nevertheless, completeness and accuracy are two entirely different things. I always strive to get calls right. When I report a "first," if I am not sure I usually qualify the statement with words like "may" or "according to information on hand at the time of the writing." In the case of the first transcontinental F2 contact of Cycle 21, I did make such a qualification. Unfortunately, in citing the first U.S. mainland-to-Australia QSO of this cycle, I failed to do so. For this lapse, I apologize. However, I don't believe the readers want the column filled with corrections to events carried two months previously whenever I receive new and more complete information long after the deadline has passed, unless such a correction makes a major difference in the circumstances reported. If this assumption is not correct, please let me know.

The best way to improve accuracy as well as completeness, is for more vhfers to report their accomplishments in writing, preferably before the 10th of the month. If something breaks after that time, and you think it should be in the next available column, use the telephone answering machine. That's its primary purpose. Generally, information arriving after the 15th requires major surgery to get into the next column. Very seldom, in the case of extremely hot news, I will call Headquarters and dictate an item reaching me as late as the 20th.

In the case of the first U.S. mainland-to-Australia contact mentioned by N6CT, he did send a copy of his OVS report directly to me but he included items through April 8. I received it April 14, fully one month after closing out the May column. His other examples also had a similar history of timeliness.

I am glad that N6CT wrote his letter both because it corrects some history with respect to the early Cycle 21 openings and because it hopefully will lead to more prompt and com-

\*Send reports to Bill Tynan, W3XO, P. O. Box 117, Burtonsville, MD 20730 or call 301-384-6736 and record your message.

plete reporting to me in the future. With the help of those submitting reports, I will strive to do the best job I can to present timely and accurate summaries with as much detail as QST space will allow.

A forthcoming column will treat OVS and its role in the overall scheme of things. In the meantime, any thoughts which you might have with respect to this appointment and how it might be changed or strengthened will be most welcome.

## SAM HARRIS MEMORIAL VHF ACTIVITY AWARD ESTABLISHED

The Mt. Airy VHF Radio Club (the Packrats) announces the establishment of the Sam Harris Memorial VHF Activity Award. The purpose of the award is to promote club activity, portable operation, and vhf/uhf contest operation.

Rules for the award are as follows:

1) The award will be given to the top-scoring, multiplier, portable station operating in the September ARRL VHF QSO Party.

2) The top score to be determined by the ARRL using its current contest rules for eligibility. The top-scoring station need not be an ARRL affiliated club.

3) The winner of the award must be a portable operation — not from a permanent station. Stations operating from a permanent installation with installed equipment and antennas are not eligible. Eligibility will be determined by the Mt. Airy VHF Radio Club.

4) The Mt. Airy VHF Radio Club is not eligible for the award unless sponsorship of the award is shifted to another group. Members of the Mt. Airy VHF Radio Club may participate in the winning multiplier station but must be less than 50 percent of the number of operators.

A trophy will be retained by the winning group for a period of one year at which time it will be exchanged for a permanent trophy or plaque. The name of the winning group will be permanently engraved on the main trophy.

## ON THE BANDS

**6 Meters** — It appears, as this column is being written in mid-June, that the 1979 Es season will not go down in history as one of our better ones. It has been observed by many that Es conditions during periods of high solar activity are not as good as those of lower activity years. This seems to be true during Cycle 21, as this summer seems to be poorer than last summer, which was certainly poorer than the summer of 1977. Particularly notable for its absence is double hop, although there have been exceptions, of course. One of these was June 15 when W6XJ caught a short session to the 2s and 3s. Followed by the appearance of KH6IAA. It is also understood that KH6IAA was heard weakly by K8WKZ on this occasion.

A week earlier, about 0500 UTC June 8, the West Coast was treated to a JA opening, which may have been of the multi-hop Es type as the Pacific Northwest was also in at the time. W6XJ snagged 11 JAs including JA1TGS, JH1GUL, JA1MRS, JA1PVI, JR1MFD, JA7QVL, JR7YNO, J11RLH, JH7IMX, JA7RPK and JA7PBZ. Gary says that signals ran from S3 to 5 with a few S7. All contacts were on cw except those with JR1MFD, JA7RPK and JA7PBZ who were worked on ssk. AD16C was also in on the action, apparently a little ahead of W6XJ, as he is understood to have worked some 20 JAs.

Other instances of double hop are reported in the detailed log submitted by N6CT. Bruce notes an opening to the 4s, 5s and 9s early in the evening of May 28 (0130 to 0300 May 29 UTC). His SMIRK Contest log (June 2 and 3) shows a number of Southeast contacts. Speaking of the SMIRK Contest, the new 48-hour time period, along with being able to count contacts with non-SMIRK members, seems to have really helped the scores and heightened competition. The highest total that this conductor has heard to date is that from W6XJ who racked up some 350 QSOs and a multiplier of 40. W6XJ reports some double hop to the East Coast during the June VHF QSO Party as well as quite a few 8s and 9s.

Several DXpeditions have lived things up a bit even though propagation has not been particularly cooperative. One was the VE1AIH operation from Sable Island using a TR-6 loaned by WB2RLK/VE1. It is understood that this group did get in on an Es opening to the 8s but everything else was via tropo and scatter. W2IDZ is one known to have come up with this new country the hard way. The W2BN jaunt to KG4 netted KG4BN 430 6-meter contacts in 41 states. Dave also worked VP2VDL, KZSNW, PJ2DW, WIHOY/KP4 and U.S. Virgin Island stations W4UWH/KV4 and NP2AE. During the June VHF

QSO Party, however, he was not as fortunate, netting only 89 contacts in 20 sections. Perhaps the high spot for Dave was a contact with K1ZFE/motorcycle mobile. A SMIRK donated rig was left at Guanatanamo and Dave says that KG4s HC and LP are both interested in pursuing 6-meter operation. Nothing has been heard from WB2RLK on his operation from the British Virgin Islands as VP2VDI, but he is known to have worked a number of stations across the southern part of the country.

W5XW passes along a report on the VP1MT DXpedition which took place in April. The group consisted of XE3RT, XE1BV, XE1HW and W5XW. While in Belize they managed 50-MHz contacts with some 90 stations in North America, South America and Australia. The rig was the IC-502 and 75-watt amplifier normally used in contest work from XE2II. Those who have not received QSLs for 6-meter contacts via the normal route (XE1BV) may submit requests with an s.a.s.c. to W5XW, 16015 White Fawn Dr., San Antonio, TX 78255. Bob is also handling cards for the contest operation of XE2II. XE2BC was active from just south of the border during the June QSO party manned by WB6NMT and a group of XEs but no report has, as yet, been received on their success.

Those who have asked for extended coverage on the muf charts published each month are advised to turn to "How's DX." Note that the charts now cover 6 to 43 MHz rather than 3 to 29 MHz as before. This should provide better information for 6-meter DXers.

**2 Meters** — The ranks of the 2-meter WAS club continue to grow. The latest reporting contacts with state number 50 are WB0ZXU, WA9DOT and K9CA. WA9DOT had completed an EME QSO with WA7JLU, NV, while K9CA worked WA0LPK/KL7 for his 49th and KH6IHP for his 50th. K9CA accomplished the job with 750-watts output from a pair of 4CX250s and four 19FTs. Gus notes that both WA0LPK and KH6IHP are using essentially identical antennas to his and that they both had good signals off the moon. He contends that he has proved that it doesn't take "a super large antenna and big power to have fun on EME."

From ME, a prominent moonbouncer, K1WHS, writes that he completed contacts with 39 stations during the May weekend of the EME contest. Dave says, however, that he heard 45 different calls and can't wait until next year to give it another try. His new antenna, which should be up by fall, will consist of 240 elements. Dave believes that it should pick up 2 dB each way on the old 160-element array. It's hard to imagine K1WHS even more successful at EME! Another new project at K1WHS is a preamp using a 3SK48 MOSFET. A noise figure of under 1 dB, along with a gain of 25 dB, is being obtained. The unit employs tuned line input and output circuits. Leadless bypass capacitors are used to prevent instability.

Dave also notes that he should have a quad of 19-element Yagis up well before this appears in print and hopes to make good use of it for this summer's tropo and m.s. activity. Skeds are welcome. Address is David Olean, Poplar Hill Rd., West Lebanon, ME 04027.

K4GFG, south FL, reports that he has been holding regular morning schedules with KP4EOR. With both stations running kW and quad Yagi arrays, most mornings produce about 10 bursts per minute. On May 2 at 1255 UTC, Tom noticed a strong enhancement in noise lasting about 5 seconds which he attributed to a solar flare. Just 18 seconds later he heard KP4EOR on a strong overdrive burst lasting about 17 seconds. Tom speculates about the possible connection between these two events. K4GFG also points out that the dates for the various meteor showers published in the *VHF Manual* do not necessarily hold, as the actual occurrence of these showers is not the same each year. He suggests consulting the magazine *Sky and Telescope* for the specific dates of the various showers this year. WB4KGY, also of south FL, notes the "auroral quality" of the weak signals heard from Puerto Rico some evenings during the summer. He says that such signals began appearing from KP4EOR at 0037 UTC May 12. To peak the signal he had to offset his beam about 25 degrees to the north of the direct path. Doug managed to work the Puerto Rican that evening, while K4GFG worked both KP4EOR and KP4AAN. The path was open again the following evening but with weaker signals. This conductor notes that 6 meters was open for Es both evenings and that a similar occurrence was observed last year when this type of propagation existed between FL and Puerto Rico at the same time that a massive 6-meter opening to the Caribbean was in progress. From the other end of the path, KP4EOR reports these same openings as well as summarizing the TEP/FAI work of last fall, winter and spring. David says that in February he made 30 South American contacts on 2 meters via the TEP mode. LUs accounted for 29 of them while the other was with a CX. Signals ran between S1 and S9

plus 10 dB. These openings tend to last from about 0100 UTC until 0200 UTC but some have lasted from 0000 until 0300 UTC. On one occasion KP4EOR reports hearing YV5APF on what appeared to be backscatter from the TEP/FAI transmission path. This is the first instance that this conductor knows of in which backscatter has been observed in connection with this mode of propagation. I wonder if others have witnessed such a phenomenon.

WB4EXW writes that he and K4PKV conducted an EME DXpedition to TN for the second weekend of the EME contest. In three days of operating they worked 19 stations including K1WHS, WA1JXN, W7JF, W7FN, W6PO, DK1FGA, SM7BAE, WA7BJU, K4GL, K5GW, W7UB1, WA0LPK/KL7, WB0ZXU, K3NSS, G4DZU, GW4CQT, WA4GPM, WA3VSI and N7NW. The antenna, which appeared to work well, consisted of four of the new Cushcraft "Booniers" spaced 12 feet vertically and 14 feet horizontally.

G4DZU, who is among those reported worked during the TN operation by WB4EXW, reports that his system consisting of four 14-element Yagis is working very well now and that he would like skeds. Those interested may write to the *Callbook* address, or phone United Kingdom plus 532-853564. G4DZU says that GW4CQT is also available for skeds. Another seeking schedules is W2AV. He would like to run with anyone on EME, and is especially looking for KS and NE stations on m.s.

W7LUX, Flagstaff, AZ, reports what he believes to be the first successful 2-meter contact made as a result of the ionospheric heating experiments being conducted from Platteville, CO. Joe says that he worked K5PHF, El Paso, TX, at 0037 UTC June 5. Signals came and went very rapidly, although the heater had been fired up on 6.2 MHz since 0000. Signals were very weak, 219 and 339 with a fast flutter characteristic. In addition, K5PHF noted an fming effect which W7LUX did not observe. The antennas of both stations were aimed at Platteville during the QSO. They both heard each other the previous night at 0230 but failed to establish contact before the effects of the heater disappeared.

The VHF QSO Party was enlivened up and down the East Coast by an excellent tropo opening which formed along an advancing weather front. Many scores benefited but VE1ASJ's experience probably illustrates the effect of the opening best. Andy added over 100 contacts on Sunday evening and completed the contest with 194 in 21 sections on 2 meters. Add to that his 126 in 34 sections on 6 meters and you end up with a very good showing. Contacts on 2 meters for VE1ASJ ranged all the way down the coast as far as NC.

**70 and 23 Cm** — W5GVE, Portland, TX, files an exciting account of 23-cm contacts he made with W5HN, Dallas, and WBSLUA, McKinney, TX, on the morning of May 20. Bill had first worked W5HN on 70 cm with good signals so they tried 23 cm. They established contact immediately with signals building up to 30 dB over S9. The path from Portland to Dallas is about 350 miles with McKinney about 30 miles farther. W5GVE's setup consists of 1 watt to a 4-foot dish at 32 feet. Receiving is handled by a low-noise HP bipolar preamp to a 1WT to a Microwave Modules converter feeding an IC-202. At W5HN, the transmitter provides 50 watts to a 5-foot dish at 70 feet. Leroy's receiver is preceded by a military surplus parametric amplifier. WBSLUA's 23-cm station consists of a tripler delivering 5 watts to a 5-foot TV dish covered with a 1/4-inch screen mounted at 45 feet. Receiving is handled by an HP 35821E into an interdigital converter. By now the dish should be at 70 feet and a 2C39 amplifier on line. The opening lasted about 2-1/2 hours and may occur frequently over this path. You can bet that this possibility is being watched carefully. It appeared that the higher the frequency the stronger the signals. The boys are unhappy only in that they did not have any equipment for the higher bands ready to go.

W5GVE also wants it known that there is a 23-cm activity session every Wednesday at 2100 local time. Normal complement of check-ins includes six Houston area stations and two from Corpus Christi. More are always welcome.

The moonbounce scene was especially active, largely due to the EME contest. From the K2UYH *432 EME Newsletter*, one can glean some of the highlights of that competition. (Full results will appear in an upcoming QST.) K3NSS appears to have topped everyone with 35 contacts on 70 cm and 28 on 2 meters. Other stations doing well on 70 cm include K2UYH, 36 QSOs (a QSO with WB6NMT made the 100th moonbounce station for Al); 15TDJ and ZESJ1, each with 28 contacts; 99FT with 27 and SM6CKU and PA0SSB, each with 25. PA0SSB also made one contact on 23 cm. Also in the thick of the fray was DL9KR with 23, JA6C7D and DL7YCA both with 21, along with G3WGD with 20. □



# Operating News

Conducted By John F. Lindholm,\* W1XX

## Midnight Special

They laughed at the Wright brothers. Said that if man were meant to fly, he would have been born with wings. They laughed at Robert Fulton. Called his steamboat "Fulton's Folly." And they laughed when the ARRL 80-Meter Midnight Special, a two-hour nonprime-time contest, was announced via WIAW bulletin. They called it midnight madness. Said that absolutely no one would be on in the wee hours exchanging ZIP/postal codes.

They were wrong again.

At 0700 UTC on June 2, 80 meters sprung to life with contest activity around the announced frequencies of 3535 and 3900 kHz. And just as suddenly at 0900 the band reverted to the relative silence of hisses and static crashes.

Why sponsor such an activity? First, the concept of improved spectrum management was being tested. Are contest types concerned enough about the use of the spectrum to look to nonprime-time/shorter formats and thus leave more for other interests? We think so.

The most important consideration in the birth of the Midnight Special was to test the feasibility of announcing such activities on short notice via ARRL bulletin. The only announcement of the contest was made through ARRL Bulletin no. 32. Picked up by the official bulletin station network and with a little help from the "contesters' grapevine," and some nice hype by *HR Report*, 104 entries were received.

As usual, the number of logs received is not the ultimate indicator of activity. Some folks like to participate, but hate to do the necessary paperwork to submit an official entry. Over 300 different call signs appeared in the logs. (Not bad for midnight on the oasis!)

The top scorers slightly favored sideband, making 55 percent of the QSOs on voice, while making 45 percent on code. The average top tenner was to change modes an average of five times during the two-hour duration of the Special.

Was the Midnight Special a success? You judge. Comments from participants and interested observers alike follow.

Terrific contest! Let's do it again (AA9U). Prior commitments prevented my entering this contest, but count me in for next time (K3IXD). Really enjoyed the Special. The operators in general seemed much more courteous than in most of the long-lead-time contests...Keep the nonprime-time contests coming (N4BBB). It's a great idea for the family man to be able to compete in two-hour con-

### ARRL 80-Meter Midnight Special Results

Call	Score	Call	Score
K1KI	127	WD4EGT	19
K1ZZ	125	K9MX/5	51
WB1GQR	103	W5OB	35
W1XX	98	WD5AAH	19
AA1K	96	N6JV	47
W1NG	90	WA6UAZ	46
K1WJ	74	N6DG	41
W1MX	72	W6JI	38
(AG1E,op)		N6PE	36
W1GNC	70	W6YMH	34
W1NH	69	AA6DP	33
WA1LOU	66	W6OA	30
W1ID	66	K6RPN	26
WB1ACZ	54	W6RE	25
W1RN	53	N6HE	13
W9KDR/1	48	KH6SP	13
WB1FKO	46	WB7TAZ	64
W1SE	39	W7BUN	60
W2GD	120	KB7CW	42
N2IC	104	WA7NXL	39
W2RR	97	W7ACP	10
(WA2AOG,op)		K8MR	113
WA2OVE	91	AC8Y	104
WB2RMI	84	K8DL	96
WA2YVA	82	W8YA	82
WB2IBE	60	WA8WDZ	80
WB2TOM	51	AC8E	78
K2TWK	32	WB8VPA	71
K2VX	32	K8AAZ	65
W2CC	27	N8VT	59
K3UA	122	W8MPD	58
W3TS	73	WD8QJB	57
W3EDU	70	WD8NTB	46
(WB3AWJ,op)		WD8IUP	38
W3TB	62	W8WEG	27
KB3EH	19	W8CUP	25
KB3GT	10	K8KIR	15
WB3GWM	8	K9RS	90
W3CEI	8	K9KM	86
KA3CUK/N	5	W9FC	83
N4AZI	79	AA9U	70
N4PD	77	WB9OTX	63
K4DZM	67	WB9LQX	33
W4WWQ	62	W9FMJ	27
WA3NAZ/4	60	W9REC	25
N4BBB	60	WA0KDC	58
W4XD	56	W0LFF	18
N4TW	51	WB0UWE	15
WD4COL	47	VE2QO	57
W4WYR	44	VE3KK	47
WD4LMM	41	VE3GOL	34
WD4HO	40	Check Logs	
K4QZV	29	WA1ZDW, K3LR	
N4UZ	22		

tests (WA8WDZ). I am looking forward to the next one (N8VT). I was sure glad to hear KI Wolfman Jack on in the Midnight Special. Very appropriate. Yetch! (W1XX). Super contest. Should be monthly. Great way to check out the new 80-meter antenna before the big contests. Also FB way to improve operating procedures (WB8VPA). I was surprised at the amount of activity; it certainly sounded like a success from out here...Noted propagation changes from out here (Arizona), with 6-land stations strongest at first and the East Coast taking over in the last hour. Was certainly interesting (WA7NXL). Enjoyed this short contest. It is the only contest that I ever operated that I started out sleepy and ended up wide awake rather than starting out wide awake and ending up tired (W3TS). My first try at contesting...Think that more of this short, simple type of contesting would be welcomed by the new hams, who would like to see what contesting is all about, without devoting an entire day to the contest (KB3EH). This type of contest can be great for the "little guys" like me. Helps us learn what contesting is all about (WB3GWM). Instead of calling "CQ S," let's call "CQ Z" in memory of the sleep we are giving up (W3CEI). Always enjoyed contests but am too busy to devote the usual weekends to same...thoroughly enjoyed every minute of this one whether I was making contacts or just listening to the activity (W4WYR). Tell me, was this an exercise to see how well OBSs work? (WD4EGT). (YUP! — Ed.) My wife thought I was nuts when I set the alarm clock for 1:30 A.M....(K9MX). Notice of this contest was received via K7NMQ, OBS, on AIEN (WA7NXL). This contest gave me my first KH6 on 80 meters (VE3KK). I am sending you these results to demonstrate my support for an idea whose time has come; a contest at a time when it should bother the least, short enough to be enjoyable, and compatible with other uses of the band. If all contests were run in this manner, I could be persuaded to become a tester (WB0UWE).

We think that you're absolutely correct, Stephen (WB0UWE, see comment above). The ARRL 80-Meter Special is the type of contest whose time has come. We don't know when and we don't know where, right now, but look for some contests with similar formats to be coming down the pike in the future. If you're interested in this type of activity, drop us a line and let us know. Good suggestions are always welcome. — Bill Jennings, K1WJ

### FREQUENCY MEASURING TEST

"Frustration, mayhem and tears." So said our loyal FMT buffs concerning the mix-up in the May FMT times and frequencies as reported in April QST. We blew it, you knew it and we're sorry. Nuff said!

The FMT umpire measured (yes, he did) frequencies for the early run at 14,104.140, 7046.896 and 3552.491. The late run was checked at 14,098.345, 7062.345 and 3558.387.

\*Communications Manager, ARRL

A total of 549 measurements were taken by 41 participants. Of these, 35 measured within 100 Hz of the umpire (class I OO qualifications). They are listed as follows with average error preceding their calls: (0 Hz) N2LI K3NZS W5I1W W5Q1V K1JH/6 WA6IQI W6QOI W7SC W9TJ, (1) K1BC W3FSV W4NTO W5FMO W6CBX W6RQ W8CUJ W8OK W9HPG, (2) W1JH W1PLJ W4RHZ K0BRS, (4) W8KV, (5) W1UH N6PE, (11) K1VYQ, (13) W2ND, (15) W0GW, (24) K0EZ, (29) VE6MJ, (42) WD8LIU, (58) WA6VPJ, (70) K4MZK, (71) WA3CFC, (85) W6AEE. All entries measuring over 100 Hz have been notified.

### Excerpts

Somebody goofed (W5I1W). I finally found you (WA6IQI...). I feel certain the error was unintentional. Continue the good work as manifested in my years of successful and pleasurable participation in the quarterly FMTs (W9TJ). Will be looking forward to the September tests and hopefully the time and proximates will be correct. Next time, let's try another method of throwing off the jammers, hi (W6CBX). I thought we were supposed to measure the signals...not find them (W8CUJ).

The next scheduled FMT will be September 16 at

### SCM ELECTION NOTICE

To all ARRL members in the New Mexico, Alabama, Western Massachusetts, Alaska, Santa Barbara, Kansas, Tennessee, Michigan, East Bay and Delaware sections: You are hereby solicited for nominating petitions pursuant to an election for Section Communications Manager. A petition, to be valid, must contain the signatures of five or more full ARRL members residing in the section concerned. Photocopied signatures are not acceptable. No petition is valid without at least five signatures on that petition.

Petition forms (CD-129) are available on request from ARRL headquarters, but are not required. The following form is suggested:

(Place and date)

Communications Manager, ARRL  
225 Main Street, Newington, CT 06111

We, the undersigned full members of the . . . ARRL Section of the . . . Division, hereby nominate . . . as candidate for Section Communications Manager for this Section for the next two-year term of office. (Signature . . . Call . . . City . . . ZIP . . .)

SCM candidates must have been a member of the League for a continuous term of at least two years and a licensed amateur of General class or higher (Canadian Advanced Amateur Certificate) immediately prior to receipt of petition at Headquarters.

Petitions must be received at Headquarters on or before 5:30 P.M. Eastern Local Time, September 7, 1979.

Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on October 1, 1979, and returns counted November 20, 1979. SCMs elected as a result of the above procedures will take office January 1, 1980.

If no petitions are received for a section by the specified closing date, such section will be resolicited in January QST, and an SCM elected through the resolicitation process will serve a term of 18 months.

Vacancies in any SCM office between elections are filled by appointment by the communications manager.

You are urged to take the initiative and file a nominating petition immediately.

John F. Lindholm, W1XX  
Communications Manager

### WIAW NOTE

The complete WIAW summer operating schedule appears in May QST, page 89. A WIAW schedule also is available on request from ARRL headquarters. Please enclose an s.a.s.e. See the "Contest Corral" section of QST for times and dates of WIAW Code Proficiency Qualifying Runs.

### SCM ELECTION RESULTS

The following were elected for two-year terms of office beginning October 1, 1979: GA, E. J. Kosobucki, K4JNL; B.C., H. E. Savage, VE7FB; WV, R. L. Thompson, K8BT; S. TX, R. D. Coday, N5FN; L.A., P. Masterson, KD6C; S.F., A. P. Samuelson, W6VV; SV, N. A. Wilson, N6JV.



### I would like to get in touch with . . .

[ ] members of the DL4 gang from 1961-63 for skeds. Contact (DL4LZ, Stuttgart) Mike Kennedy, WA6VBL, 4131 Lowell Ave., La Crescenta, CA 91214.

[ ] high school students interested in being pen pals. Write to Yun Sook Oh, c/o English Club, 18-59 Sixth St. Eulji-ro Jung-gu, Seoul, Korea.

[ ] Morse operators stationed at the 7th (RRFS) Radio Research Station in Udorn, Thailand, between 1968 and 1971. Write to William R. Bogart Jr., KA9CWK, R. R. 4 Box 198, Veedersburg, IN 47987.

[ ] hams who have the Heathkit ET-3400 microprocessor trainer. Contact Earle Adams, K2YEF, 718 Graisbury Ave., Haddonfield, NJ 08033.

### OSCAR 7

DATE (UTC)	Ref. Orbit	Time (UTC)	Long. W.
1 Aug.	21540	0134:11	88.3
2 Aug.	21552	0033:31	73.1
3 Aug.	21565	0127:48	86.7
4 Aug.	21577	0027:08	71.6
5 Aug.	21590	0121:25	85.2
6 Aug.	21602	0020:46	70.0
7 Aug.	21615	0115:03	83.6
8 Aug.	21627	0014:23	68.4
9 Aug.	21640	0108:40	82.0
10 Aug.	21652	0008:00	66.9
11 Aug.	21665	0103:17	80.5
12 Aug.	21677	0001:37	65.3
13 Aug.	21690	0055:54	78.9
14 Aug.	21703	0150:11	92.5
15 Aug.	21715	0049:31	77.4
16 Aug.	21728	0143:48	91.0
17 Aug.	21740	0043:09	75.8
18 Aug.	21753	0137:26	89.4
19 Aug.	21765	0036:46	74.2
20 Aug.	21778	0131:03	87.8
21 Aug.	21790	0030:23	72.7
22 Aug.	21803	0124:40	86.3
23 Aug.	21815	0024:00	71.7
24 Aug.	21828	0118:17	84.7
25 Aug.	21840	0017:37	69.6
26 Aug.	21853	0111:54	83.2
27 Aug.	21865	0011:15	68.0
28 Aug.	21878	0105:32	81.6
29 Aug.	21890	0004:52	66.5
30 Aug.	21903	0059:09	80.0
31 Aug.	21916	0153:26	93.6
1 Sept.	21928	0052:46	78.5
2 Sept.	21941	0147:03	92.1
3 Sept.	21953	0046:23	76.9
4 Sept.	21966	0140:40	90.5
5 Sept.	21978	0040:00	75.4
6 Sept.	21991	0134:17	89.0
7 Sept.	22003	0033:38	73.8

### OSCAR 8

Ref. Orbit	Time (UTC)	Long. W.
7161X	0129:16	66.6
7175A	0134:26	67.9
7189AJ	0139:36	69.2
7202J	0001:32	44.7
7216J	0006:41	46.1
7230A	0011:51	47.3
7244AJ	0017:01	48.6
7258X	0022:10	49.9
7272A	0027:20	51.2
7286AJ	0032:30	52.5
7300J	0037:39	53.8
7314J	0042:49	55.1
7328A	0047:59	56.4
7342AJ	0053:08	57.7
7356X	0058:18	59.4
7370A	0103:28	60.3
7384AJ	0108:37	61.6
7398J	0113:47	62.9
7412J	0118:57	64.2
7426A	0124:07	65.5
7440AJ	0129:16	66.8
7454X	0134:26	68.1
7468A	0139:36	69.4
7481AJ	0001:32	44.9
7495J	0006:41	46.2
7509J	0011:51	47.5
7523A	0017:01	48.8
7537AJ	0022:10	50.1
7551X	0027:20	51.4
7565A	0032:30	52.7
7579AJ	0037:39	54.9
7593J	0042:49	55.4
7607J	0047:59	56.7
7621A	0053:08	58.8
7635AJ	0058:18	59.3
7649X	0103:28	60.6
7663A	0108:37	61.9
7677AJ	0113:47	63.2

### SOVIET RS

Ref. Orbit	Time (UTC)	Long. W.
3335	0015:46	303.9
3347	0020:29	305.7
3359	0025:11	308.4
3371	0029:54	311.1
3383	0034:36	313.8
3395	0039:19	316.6
3407	0044:02	319.3
3419	0048:44	322.6
3431	0053:27	324.7
3443	0058:09	327.5
3455	0102:52	330.2
3467	0107:35	332.9
3479	0112:17	335.6
3491	0116:59	338.4
3503	0121:42	341.1
3515	0126:25	343.8
3527	0131:08	346.5
3539	0135:50	349.3
3551	0140:33	352.3
3563	0145:15	354.7
3575	0149:58	357.4
3587	0154:41	359.2
3599	0159:23	2.9
3610	0003:42	335.4
3622	0008:25	338.1
3634	0013:07	340.8
3646	0017:50	343.5
3658	0022:33	346.3
3670	0027:15	349.4
3682	0031:58	351.7
3694	0036:40	354.4
3706	0041:23	357.2
3718	0046:06	359.9
3730	0050:48	2.6
3742	0055:31	5.3
3754	0100:13	8.1
3766	0104:56	10.8
3778	0109:39	13.5

Have you listened to OSCAR 8 yet? It is available to anyone with a good-quality, 10-meter or 70-cm receiver. To track it, you'll need an OSCARLOCATOR and the above reference-orbit information (also available on WIAW bulletins). It orbits the earth every 103 minutes; the morning and evening passes occur at approximately the same times each day. Decoding the telemetry from the beacon is a simple matter using the ARRL OSCAR telemetry forms, available from Hq. for an s.a.s.e. When you return it, we'll send you a colorful OSCAR 8 QSL card.

To keep abreast of the latest developments, tune in to the regular phone and cw bulletins over W1AW, AMSAT bulletins transmitted around 29.490 MHz on Mode A, 145.960 MHz on Mode B, and 435.160 MHz on Mode J, during O 7 and O 8 reference orbits, and AMSAT nets (East Coast at 0100 UTC Wednesdays; Mid States at 0200 UTC; West Coast at 0300 UTC, all on 3850 kHz Isb; (international net at 1800 UTC Sundays on 14,280 kHz usb).

### Notes

- 1) The times and longitudes are for the satellites' first equator crossing each day, which is called the reference orbit.
- 2) Due to spacecraft problems, OSCAR 7 will not be maintained in any specific mode.
- 3) All Monday orbits are reserved for QRP use only. Use a maximum of 10 watts ERP. Wednesdays are reserved for special experiments. Schedule O 7 experiments through AMSAT, O 8 experiments through ARRL. At no time exceed 10 W ERP using Soviet RS.
- 4) The OSCAR 7 Mode B and OSCAR 8 Mode J transponders invert signals. Upper sideband into the uplink becomes lower sideband on the downlink.
- 5) O 7 progresses an average of 28.737690° W. per orbit in a period of 114.944805 minutes. O 8 progresses an average of 25.806159° W. in a period of 103.22852 minutes. RS period is 120.3894 minutes. RS progresses 30.227° W.
- 6) O 8 modes of operation are Mondays and Thursdays — Mode A, Tuesdays and Friday — Mode AJ, Saturdays and Sundays — Mode J. Wednesdays are for experimental use on Mode A or J or recharge Mode D.

### Spacecraft Frequencies

Spacecraft	Uplink	Downlink	Beacon
O 7			
Mode A	145.850-145.950 MHz	29.400-29.500 MHz	29.502 MHz
Mode B	432.125-432.175 MHz	145.975-145.925 MHz	145.972 MHz
O 8			
Mode A	145.850-145.950 MHz	29.400-29.500 MHz	29.402 MHz
Mode J	145.900-146.000 MHz	435.100-435.200 MHz	435.095 MHz
RS			
Mode A	145.880-145.920 MHz	29.380-29.400 MHz	29.401 MHz

Further information on the radio amateur satellite program can be obtained free of charge from ARRL hq. OSCAR locators for O 7, O 8 and Soviet RS are available in the new *Satellite Communications* package at your dealer or direct from ARRL; \$4.75 U.S., \$5.50 elsewhere.

# Contest Corral

## A Roundup of Upcoming Operating Events



Conducted By Tom Frenaye,\* K1KI

### AUGUST

2

**West Coast Qualifying Run** (W6OWP prime, W6ZRJ alternate), 10-35 wpm at 0400Z. The run takes place at 9 P.M. PDT on August 1. Frequencies are approximately 3590/7090 kHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid, and send to ARRL for grading. Please enclose your full name, call (if any), and complete mailing address. A large, self-addressed envelope will help expedite your award/endorsements.

4-5

**ARRL UHF Contest**, July *QST*, page 82.

**Illinois QSO Party**, July *QST*, page 87.

**YO-DX Contest**, July *QST*, page 87.

10

**WIAW Qualifying Run**, 10-35 wpm at 0200Z (10 P.M. EDT, August 9). Transmitted simultaneously on 1.835 3.58 7.08 14.08 21.08 28.08 50.08 147.555 MHz. May *QST*, page 89, carries the complete WIAW schedule of code practice and bulletins, or send an s.a.s.e. to ARRL for a copy. Other details per the August 2 listing.

11-12

**European DX Contest (WAE)**, cw, July *QST*, page 88. (Entries not using official forms will be classified as check logs.)

18-19

**Seantet World Wide DX Contest**, July *QST*, page 87.

**SARTG World Wide RTTY Contest**, sponsored by the Scandinavian Amateur Radio Teletype Group. Three eight-hour periods: 0000-0800Z and 1600-2400Z on August 18 and 0800-1600Z August 19. 80-10 meters. Single op or multiop, single transmitter. Exchange signal report and serial number. Count five points for QSOs with your own country, 10 for different country, same continent, and 15 points for different continent. U.S., Canadian and Australian call districts considered different countries. Same station may be worked on each band. W/VE/VK call areas plus DXCC countries count as multipliers. Score equals QSO points times sum of multipliers per band. Logs must contain band, date, time (UTC), call sign, exchanges sent and received, points and multipliers. Use separate log for each band. Multiop stations must list all operators with call signs. Awards. Logs should be received no later than October 10, 1979 by C. J. Jensen, OZ2CJ, Meisnersgade 5, 8900 Randers, Denmark.

23

**WIAW Qualifying Run**, 10-35 wpm at 2000Z (4 P.M. EDT). See August 10 for more details.

25-26

**All Asian DX Contest**, cw, June *QST*, page 88.

**Ohio Interstate QSO Party**, sponsored by the Ohio Council of Amateur Radio Clubs and the Mad River Radio Club. From 1800Z August 25 until 0400Z August 26 and 1800Z August 26 until 0400Z August 27. Phone and cw. Work each station once per mode per band. No repeater QSOs, but satellite QSOs permitted. Ohio stations exchange signal report, serial number and county. Others send signal report, serial number and ARRL section or country. Score one point per QSO. Ohio stations multiply QSO points by number of ARRL sections, Ohio counties and DX countries worked. Others multiply QSO points by number of Ohio counties worked (max. 88). Bonuses: stations operating portable (signing /8), using temporary power and antenna for the contest period in any counties of Ohio except Butler, Clark, Cuyahoga, Franklin, Hamilton, Lake, Lorain, Lucas, Mahoning, Montgomery, Portage, Richland, Stark, Summit or Trumbull may multiply their final score by 1.5. This includes mobile operations. QRPp stations (less than 5-W output) may multiply final score by 1.25. Multiop, multi-transmitter stations ineligible for

awards. Participation certificate for 50 or more QSOs. Suggested frequencies: 5 kHz up from lower end of General class bands. Try 15 meters on the hour and 10 meters on the half hour, 1800-2300Z. Mail entry by September 8 to Jeff Maas, K8ND, 4410 Norwell Dr., Columbus, OH 43220. Enclose s.a.s.e. for results.

### SEPTEMBER

1-2

**Skokie Aviation Enthusiasts Contest**, 24-hour period from 2000Z September 1. Nonmembers exchange "nonmember," serial number, signal report and state/province/country. Members exchange "member," serial number, signal report, member number, airport identifier (if applicable), flight number or aircraft number. Count two points per QSO, except four points for airport operations (only noncommercial airfields with proper FAA/FCC permission) and five points for in-flight QSOs (on non-commercial aircraft only with proper permission). Suggested frequencies — cw: 50 kHz from bottom of band; phone: 3.975 7.275 14.280 21.375 28.550 50.105 MHz; Novice: 3.725 7.125 21.125 28.125 MHz; fm: all simplex frequencies (no repeaters). Score equals QSO points times sum of states, provinces and countries. Awards. Postmark entry by October 1, 1979, to Lawrence Cotariu, WA9MZS, 8041 N. Hamlin, Skokie, IL 60076.

**10-Meter Portable Contest**, sponsored by the Associazione Radioamatori Italiani. From 1200Z September 1 until 1600Z September 2, with a required four consecutive hour time-off period. Phone and cw. Use 28.0 to 28.2 and 28.5 to 28.7 MHz only. Fixed and portable classes. Portable stations must sign portable and must use other than the normal QTH and antennas. Exchange signal report, serial number and ITU zone. Enter mixed mode, phone only or cw only. Each station may be contacted only once. Score two points per QSO in the same country, five points different country, same continent, and 10 points different continent. Multiply QSO points by number of ITU zones worked for total score. Logs must include time (UTC), call sign, complete exchange, points, your input power. Separate cw and sbb logs. Awards. Mail by December 31, 1979, to Sanremo A.R.I. Section, P. O. Box 114, 18038 Sanremo, Italy. Enclose at least one IRC for results.

**Amateur RTTY Art Contest**, sponsored by the Southern Counties Amateur Teleprinter Society, from September 1 through November 30, 1979. Entries must have been originated by means of manual input to a teleprinter using a standard communications keyboard, and may be submitted by the originator of the art or by the amateur on behalf of a family member. Submitted art may be of any subject suitable for transmission by Amateur Radio. Submit as many entries as desired. Each entry should have a short title. Art may contain outline shading. Tapes of entries shall be formatted to permit a reasonably short running time, and be compatible with machines which do and do not downshift on space. Compatibility with machines which interchange bell and apostrophe is not required. At least three functions must be used between each line: CAR, RET, LF, LTRS. Maximum of 72 characters per line (including space). Tapes limited to a maximum running time of 40 minutes at 60 wpm for the art itself. Prints must be in one single part — no splices. Each entry must have been transmitted for the first time via Amateur Radio after September 1, 1979, and must be accompanied by a confirmation (QSL card or letter) of at least one receipt of its transmission, identifying the title of the art and the call letters of both stations. The tape and prints of each entry shall carry the full name of the author, call letters of the submitting station, and mailing address. This should be on the beginning leader of the tape and punched in the tape to appear on page copy when reproduced. Entrants must submit one five-level paper tape and five prints of each entry and by such submission agree that the tapes and prints may be used, duplicated and published for any purpose. Entries will be judged on the originality of the author in selection and subject matter, on excellence in producing the art and formatting the tape, on overall appearance of the art when viewed from a distance, on suitability for

publication and on compliance with contest rules. Awards. Mail entries no later than November 30 to RTTY Art Contest, Norm Koch, K6ZDL, Box 1351, Torrance, CA 90505.

**LZ DX Contest**, sponsored by the Bulgarian Federation of Radio Amateurs, 24-hour period on September 2 UTC. (1979 rules not received but assume the same as 1978). Separate cw and sbb categories, single operator and multiop. Call CQ LZ DX. LZ stations will send signal report and a two-digit number (01-28) indicating their administrative district. Others send signal report and serial number. Suggested frequencies: 3.520-3.760, 7.010-7.090, 14.020-14.300, 21.020-21.300, 28.020-28.500 MHz. Count one point for QSOs on your own continent and three points for the rest, except LZ QSOs count double. One contact per band. Multiply QSO points by sum of LZ districts worked on all bands, plus one. Awards. Mail by October 15 to BFRA, Box 830, Sofia, Bulgaria.

5

**West Coast Qualifying Run**, 10-40 wpm at 0400Z (9 P.M. PDT September 4). See August 2 for more details.

8-9

**ARRL VHF QSO Party**, this issue, page 62.

**European DX Contest (WAE)**, phone, July *QST*, page 88.

**Pennsylvania QSO Party**, sponsored by the Nittany ARC, from 1700Z September 8 until 2359Z September 9. Super activity planned at 2359Z Saturday evening and 1700Z Sunday afternoon. Exchange signal report and PA county, ARRL section, Canadian province or DX country. PA stations count three points per out of state QSO and one point for in state QSOs. Multiply by number of ARRL sections and no more than one DX multiplier for final score. Non-PA stations score one point per QSO. Multiply by number of PA counties worked for final score. Stations may be worked once each on sbb and cw. Logs must include date, time (UTC), call sign, signal reports, band, mode, county/state/province. Number new multipliers as worked. Non-PA stations include a list of PA counties worked. Awards. Mail by October 15, 1979, to Douglas Maddox, W3HDH, 1187 S. Garner St., State College, PA 16801.

**AC-DC Contest**, sponsored by the Canadian Ladies ARA, 24-hour period starting 1800Z September 8. Each station may be worked twice, once on cw and once on phone or on two different bands cw or phone. Exchange signal report, name and QTH. CLARA members score one point per QSO. Nonmembers count one point for each CLARA member worked, except three points for bonus stations (they'll tell you if they are bonus stations). Multiply point total times number of Canadian call areas worked for final score. Awards. Mail entry by November 30, 1979, to Diana VanderZande, VE7DTC, Jensen Rd. SS no. 3, Prince George, BC, Canada V2N 2S7.

9

**North American Sprint**, sponsored by the National Contest Journal, from 0100Z until 0500Z September 9. Single operator, cw, 80-40-20 meters only. Suggested frequencies: 3530-3550, 7030-7050, 14,030-14,050. Stations outside of North America work NA stations only. Stations may be worked once per band. Exchange his call, your call, serial number, your name, state (or VE province or country). Proper logging requires the time for each QSO. Serial numbers start with 001 and must be consecutive. An operator may only use one call sign during the contest. Multiply total valid QSOs by the sum of states, VE provinces and other North American countries to get final score. USA and Canada don't count as countries. KH6 not counted as state or country. VE multipliers are Maritime (VE1, VO1, VO2) and VE2 through VE8. Non-North American countries do not count as multipliers. Special QSY rule: If any station solicits a call by sending CQ, QRZ?, QRZ, etc., he is permitted to work only one station in response to that solicitation. He must then move at least one kHz before working another station, or at least five kHz before soliciting other calls. Team competition: Each

\*Assistant Communications Manager, ARRL

team has a maximum of 10 members. To qualify as a team, the name, call sign of each operator, and call sign of the station operated should be the operator be a guest at a station other than his own must be registered with N6SF. The team information may be contained in a letter, which must be received before the start of the Sprint, or be contained in a Western Union Mailgram dated at least 24 hours before the start of the Sprint. No distance/meeting requirements for a team entry. Disqualifications may be made for illegibility, incorrectness, or illegal or unethical operation. Awards. Entries should be mailed in time to reach N6SF no later than October 9. A complete entry consists of a summary sheet showing name, address, score computation, etc., and a log (including dupes marked as such) with new multipliers numbered. Separate dupe sheets for each band. Send to Rusty Epps, N6SF, 235 Montgomery St., Suite 2600, San Francisco CA 94104.

## 11

**W1AW Qualifying Run**, 10-35 wpm at 0200Z (10 P.M. EDT September 10). See August 10 for more details.

## 15-16

**Scandinavian Activity Contest**, sponsored by Suomen Radioamatööriliitto R.Y., from 1500Z September 15 until 1800Z September 16. 80-10 meters. CW and ssb, no cross-mode QSOs. Prefixes used: LA/LB/LG/LJ (Norway), JW (Svalbard and Bear Is.), JX (Jan Mayen), OF/OG/OH/OI (Finland), OHØ (Aaland Is.), OJØ (Market Reef), OX (Greenland), OY (Faroe Is.), OZ (Denmark), SJ/SK/SL/SM (Sweden). Single operator, multiop single transmitter, and multiop multi-transmitter classes. Club stations considered multiop. Multi-transmitter stations use separate serial numbers each band. Exchange signal report and serial number. Count one point per QSO, except non-Europeans count three points per QSO on 7 and 3.5 MHz. Multipliers are call areas. LA1=LB1=LG1. SM3=SK3=SL3. Multiply QSO points by sum of all multipliers from all bands for final score. Separate CW and ssb logs. Awards. Send entry by October 15 to SRAL, Postilokero 306, SF-00101, Helsinki 10, Finland.

**CAN-AM Contest**, phone, sponsored by the Ontario Contest Club and Canadian DX Association. 24-hour period UTC on September 15 (CW: September 29). Three classes: single operator, multioperator single transmitter (includes single-operator club stations, and single operator other than the licensee) and club competition. Exchange signal report, serial number and multiplier abbreviation. W/K stations use two-letter postal abbreviations (CA, CT, CO, etc.), U.S. Caribbean possessions use CN, U.S. Pacific posses-

sions use PC. Canadians use NF (VO1, VO2), NB, NS, PE (Prince Edward Island), SI (Sable and St. Paul Islands), PQ, ON, MB, SK, AT, BC, NW, YU. Count three points per W/VE QSO and two points for W/W and VE/VE QSOs. Multiplier is 50 states, two possessions, 10 Canadian provinces, two territories, one island (65 possible per band). Stations outside of their call area must sign /KH6 or /3 or whatever is appropriate. Final score is QSO points times sum of multipliers per band. Phone and CW sections of the contest are separate but overall CW plus phone scores will be used for overall competition. Trophies, plaques and awards. For club competition the club secretary must submit a list of those eligible and their scores. Logs must show time in UTC. Do not use separate logs for each band. Logs with more than 200 QSOs must include check sheets (dupe sheets). Include declaration that all rules were followed, including FCC/DOT rules. Mail entries by October 15 (October 29 for CW) to: Yuri Blarovich, VE3BMV, Box 292, Don Mills, ON, Canada M3C 2S2.

**Washington State QSO Party**, sponsored by the Boeing Employees ARS, from 0100Z to 0700Z September 15, 1300Z September 15 to 0700Z September 16 and 1300Z September 16 to 0100Z September 17. Score two points for each phone QSO, three points for CW QSOs. WA stations multiply QSO points by sum of states, provinces and DX countries worked. Others multiply by number of different WA counties worked. Add one multiplier for each eight stations worked in one county. Exchange signal report, serial number, and county (WA), state, province or country. Suggested frequencies: CW, 1805 3560 14,060 21,060; phone 1815 3925 7260 14,305 21,380 28,580; Novice: 3725 7125 21,150 28,160. Entries with more than 100 QSOs include dupe sheets. Include statement that decisions of contest committee will be considered final. Mail by October 17, 1979, to Boeing Employees ARS, c/o Contest Committee, Willis D. Probst, K7RS, 18415 38th Ave. South, Seattle, WA 98188.

**Kentucky QSO Party**, sponsored by the Bluegrass ARC, from 0100Z September 15 until 2359Z September 16. Exchange signal report, serial number, and county (KY), state, province, or country. KY stations use states, provinces and countries for multiplier. Non-KY stations use KY counties as multiplier. Special multipliers: (a) 1.5 for all 10-meter QSOs between 0200 and 1000Z, (b) 2.0 for input of 15 watts or less, (c) 1.5 for input of 200 watts or less, (d) 2.0 for all vhf QSOs (simplex only). No repeater or prearranged QSOs allowed. Suggested frequencies: low edge of General bands and Novice bands, Novice and Technicians multiply by 2.0 for final score. Awards. Mail logs by October 5, 1979, to Donald Page, WD4HPL, 309 Pochontas Tr., Georgetown, KY 40324.

## 16

**ARRL Frequency Measuring Test**, at 0200 and 0500Z (10 P.M. EDT Saturday and 1 A.M. EDT Sunday). The periods for measurement start at 0207Z (20 meters), 0215Z (40 meters), 0223Z (80 meters); for the late run 0507, 0515 and 0523 respectively. Each measuring period lasts five minutes. Submit your averages for each five-minute period which will be compared to the umpire's average. (The umpire is a professional measuring laboratory.) Tell how many readings you took to form your averages. Approximate frequencies (simultaneous) are 14,085 7040 and 3525 kHz for the early run and 14,075 7100 and 3545 for the late run. Your report must be received at ARRL Hq. by September 26. Results will be sent by ARRL bulletin by W1AW beginning September 27.

## 22-23

**KZ5 QSO Party Scandinavian Activity Contest**, phone

## 29-30

**CAN-AM Contest**, CW  
**KZ5 QSO Party**  
**Delta QSO Party**  
**Classic Radio Exchange**

## OCTOBER

### 6-7

October QRP QSO Party  
VK/ZL/Oceania DX Contest, phone  
ARRL Simulated Emergency Test

### 13-14

VK/ZL/Oceania DX Contest, CW  
ARRL CD Parties

### 20-21

WADM Contest  
Jantiboree-on-the-air

### 27-28

CQWW, phone

## NOVEMBER

### 2

ARRL Frequency Measuring Test

### 3-4

ARRL November Sweepstakes, CW  
17-18

ARRL November Sweepstakes, phone

## Strays

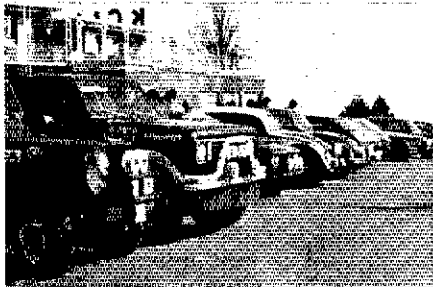
### MO HAMS PROVIDE COMMUNICATIONS FOR SPORTS CAR RALLY

□ "Net Control . . . This is the Rally Chairman. Forty-one cars have moved out and are proceeding to Stage One."

With that message at 3:30 P.M. on Saturday, March 10, a convoy of 18 radio amateurs using mobile 2-meter fm transceivers began an arduous and continuous 12-hour task of providing communications for an overnight rally of the Sports Car Club of America along a rugged 300-mile course through the Ozark backwoods of southeastern Missouri.

From the start of the "Rally in the 100-Acre Wood" until the end of the 10-stage course, the hams provided virtually solid communications for rally officials. All communications were coordinated through the net control station, WØLLC, located on the ninth floor of a hotel in Salem, MO, at the northwest edge of the rally course through the Mark Twain National Forest. The station, manned by WØCZE, WØLLC and KØSFI, included a pair of 2-meter fm transceivers operating simplex on 146.52 MHz — one of them driving a 250-watt linear amplifier — and a transceiver monitoring 223.5 MHz. A second 2-meter frequency, 146.94 MHz, was reserved as a secondary simplex frequency for on-the-air consultations.

A mobile van with a crossband repeater and a 30-foot-high antenna array stood by near the rally course. When the radio-equipped vehicles plunged into low spots, the repeater was manually turned on to relay the 2-meter signals back to the net control Sta-



Contestants line up for start of overnight weekend rally held March 10-11, 1979, by Sports Car Club of America. Eighteen hams from St. Louis area used 2-meter fm mobile transceivers to provide communications for rally officials. (photos by Hank Wall, WØCZE)

tion on 223.5 MHz. The repeater, manned by NØBJ and KØGAH, was needed on only a few occasions.

The combination of antenna height at the net control station, the quarter-kilowatt linear amplifier (loaned by WØKUJ), and the crossband repeater provided readable signals for all stations at virtually all locations within a 25-mile radius. The 18 hams, who had driven 150 miles southwest from St. Louis to provide communications for the rally, brought along 2-meter mobile fm transceivers with outputs ranging from 10 to 25 watts. They temporarily installed their units in vehicles driven by rally officials, obtaining power through cigarette-lighter plugs and installing 1/4-wave or 5/8-wave vertical antennas with magnetic mounts or gutter clamps.

The rally officials who were provided with instant radio communications by the hams included the rally chairman, troubleshooter, medical teams, control stewards, lead cars, slow sweep cars, service marshals, and main time control van. Periodic time checks were received from WWV.

The 1979 rally was the second in which the St. Louis hams had been asked to participate. The hams learned a great deal in the 1978 rally and applied their knowledge to the 1979 event.

Station identification, for example, had created some confusion during the previous event. Therefore, to help rally officials understand the destination and source of each radio message, the hams used rally designations at all times — such as "Chairman," "Lead Car One," and "Service Marshal Two." To comply with the FCC 10-minute identification rule, the hams used their call letters at the start and finish of message exchanges.

Also, to better coordinate their operations, the hams held meetings on a St. Louis repeater and held planning meetings with officials of the Sports Car Club of America several weeks before the rally. In addition, a breakfast meeting was held immediately after the rally, followed several weeks later by on-the-air discussions and face-to-face critique sessions.

The Sports Car Club officials seemed highly impressed with the efficiency and reliability of the amateur 2-meter communications and with the professionalism and discipline displayed by the ham operators. The hams, in turn, were impressed with the rally and most of them are planning a bigger and better return engagement in 1980. The ham group was organized by Hank Wall, WØCZE, who recruited volunteers from St. Louis Repeater, Inc., a club with 450 members. — John J. Waidmann, WØVDU, Hazelwood, MO

# Station Activities

A-1 OPR ✕ EC ✕ DXCC ✕ RCC ✕ WAS ✕ STM ✕ OES ✕ OTS ✕ NM  
 SCM ✕ ARES ✕ OVS ✕ SEC ✕ OBS ✕ TCC ✕ OO ✕ NTS ✕ WAC ✕ CP ✕

## CANADIAN DIVISION

**BRITISH COLUMBIA:** SCM, H. Ernie Savage, VE7FB — BCEN and BC Phone net report no drop off of members since we have gone into Day Light time, but QNCs have dropped considerably for the month. 3755 kHz phone net during summer is very busy with mobiles, please observe our three second pause between transmissions so they can break in. VE7AS returned home from the week-end and found only a pile of ash instead of a home. We are all very sorry for them both. VE7QC Net Manager BC Net has been spending time in hospital. VE7ATV in Vancouver General. Has had spinal surgery. The month of May has been very busy on two meters with Public Service communications events. Traffic: VE7ZK 106, VE7CCJ 62, VE7FB 44, VE7COA 43, VE7BLO 20, VE7DFY 20, VE7BLS 9.

**MANITOBA:** SCM, Peter Guenther, VE4P — Asst/SCM: VE4JP, SEC: VE4TR, STM: VE4RO, NMs: VE4S IZ VJ TE AGB. The flood in the Red River Valley was responsible for lack of a proper report last month. A more detailed report to come when it is all resolved. Many amateurs were involved during that time. Following this, the annual car rally was well taken care of on May 26. April and May 1979 will go down as a year to remember. MEPN: QNI 897, QTC 37, Sess 31. MTN: QNI 177, QTC 86, Sess 30. MSN: QNI 11, QTC 11, Sess 9. MMN: QNI 500, QTC 25, Sess 31. WHN/Emergency Net: QNI 149, QTC 443, Sess Continuous 24 hrs a day. Traffic: VE4IZ 89, VE4OU 44, VE4TE 25, VE4JA 22, VE4PG 22, VE4QZ 17, VE4CR 14, VE4AED 12, VE4AL 11, VE4NE 11, VE4ID 9, VE4AAD 7, VE4ACX 5, VE4AEJ 4, VE4GB 4, VE4LB 4, VE4AEA 3, VE4AN 3, VE4AAU 2, VE4FK 2, VE4OD 2.

**MARITIME/Nfld:** SCM, Aaron D. Solomon, VE1OC — AJSCM: VO1FG, STM: VE1WF, SEC: VE1ASW, NMs: VO1JN VE1VF, Silent Key: VO1BH, Hosp: VE1BG, VO1EF, VE1OC had pleasure of addressing MAARC. VE1ASJ wkcd. 26 states, 6 Prov. on 6M, 11 states & 4 Prov. on 2-m. VE1RL wkcd. W1UR 432 MHz. wid 13 Watts. NBARA Ex. VE1BKJ, pres.; VE1AXG, vice pres.; VE1BRA, secy; VE1BCG, treas.; VE1TC, call pres.; VE1XL, CNIB. VE1FO rec'd mention CARF cover story "Way Up North." MAARC plans Lobster Car Rally and Field Day. ARC & HARC plan Joint Flea Market meet in July. VE1BJG ppt. NCS. Met. Net. posted CFB. Gagetown. VE1KG ret'd vacation Co-land had 6 CO Am thers. New Rptrs. on shortly incl. Shelburne, Bear River, Liverpool. Rec. visitors Hfx. incl. VE1s AKB CL CX RY VE3UD, VE1s AMJ BFZ have new rigs. VE7CAM1 ret'd. West Coast. VO1KO winner VO1AA Award. VO1EF ex. Hosp. VO1OO passed Adv. Am. Ex. at Corner Brook. APN: Sess. 31, QNI 191, QTC 11797, NPN: Sess. 30, QNI 722, QTC 2 (April) Traffic: (May) VE1WF 240, VE1RI 60, VE1LCR/RO 52, VE1BSE 36, VE1OC 25, VE1BMN 5, VE1KR 4, VE1XF 3, VE1CB 2. (Apr.) VE1CH 65.

**ONTARIO:** SCM, Larry Thivierge, VE3GT — SEC: VE3APK, STM: VE3GLO, ONTARS has undergone a change of net managers with VE3HFR stepping down and VE3BC assuming the familiar duties. VE3BC was the founder and first mgr. of the net. Congratulations to VE3HFR for his dedicated service. ONTARS as many know, meets dy on 3755 kHz, 0700 to 1800 local time, has done a fine job. If anyone can assist in the operation of the net, please contact VE3BC, he'll be glad to hear from you. New Field appointments are: OTS and OVS: VE3PI; OTS and EC for Oshawa, VE3IMR, VE3FN now active on 432 with 10 watts and has worked VE2DFO and W1AIM. Bancroft Special Event Station XJ3TEC will be active on all bands except 160 meters during Aug. 11 to 18. You may win an award, prize or memento for working the station. Contacts will be given on 146.52 MHz and repeater VE3TBF 47.2484 MHz. National Capital Chapter of the OCWA has elected the following executive: VE3KN, pres.; VE3BKW and Py directors; VE3CGO, secy/treas. VE3s JLE KBU KFA and KXL have earned their Advanced tickets. VE3JUZ installing a 20 meter quad atop his 48 ft. tower. The following have become Silent Keys: VE3s BDC YD AUR HDV BWA DKJ and OY. Welland Co. ARC has 82 members and have been pleased with attendance at their meetings this year. VE3AIC, pres. gives the credit to their program chairman, VE3CUN. Vice-Director VE3AR recently presented Oakville's 3 term Club president, VE3FZG with a well-earned Certificate of Merit. VE3BIF penned an interesting article on stamps reflecting the growth of Amateur Radio in the May issue of QST. A special scroll commemorating the Fort Kamistiquia bicentenary will be available during 1979 to any Canadian or US amateur who works 5 stations in Thunder Bay using the prefix VX3. For DX stations; work 3 VX3 stations and, 2 IRCs will be required from these applicants. Send log in to: Lakehead ARC, P. O. Box 2571, Thunder Bay, Ont., P7B 5G1. Traffic: (May) VE3GLO 255, VE3KK 227, VE3CYR 180, VE3GFN 176, VE3GT 164, VE3ISW 154, VE3HGJ 141, VE3DPO 137, VE3JRT 130, VE3HSF 118, VE3S9 103, VE3FZG 82, VE3JPP 62, VE3JJK 60, VE3HS 53, VE3GJ 48, VE3GYD 48, VE3VGT 47, VE3PHZ 31, VE3JRO 29, VE3APK 22, VE3ANJ 22, VE3IMR 20, VE3JG 14, VE3JHE 8, VE3GFN 5, VE3GNW 5. (Apr.) VE3BZR 37, VE3AWE 35, VE3EBC 33, VE3FGU 13, VE3FZG 13.

**QUEBEC:** SCM, Harold Moreau, VE2BP — SEC: VE2DEA, VE2NL doing a fine job as EC, for Sept/les area. New Amateurs in the St-Hyacinthe area: VE2AAE, VE2AWP, New Advanced Amateurs: VE2EVM VE2DML. De la Mauricie VE2EC nous informe que la repetitive VE2AT est maintenant VE2RTR, et que VE2AOL est maintenant VE2AT. Lorsque la belle saison sera terminée l'esperer bien recevoir plus de nouvelles sur vos Activités. Traffic: VE2EC 39, VE2EKC 17, VE2FFE 26, VE2APT 10.

**SASKATCHEWAN:** SCM, Norm Watho, VE5AE — NMs: VE5HG VE5DC, SEC: VE5WM. The Regina Club has been very active this spring communicating for a tennis tournament and Beaver Days and looking forward to Field Day. The repeaters and nets are quite active this time of year due to the tourist season. I hope to see you at the

summer games in Saskatoon. There are a few new hams around the province this summer, congrats on the new exam. SATN for May 31 sessions, QNI 336 QTC 18. Traffic: VE5HG 21, VE5WM 15, VE5AE 14, VE5NJ 6, VE5OL 5, VE5PD 1.

## ATLANTIC DIVISION

**EASTERN PENNSYLVANIA:** SCM: G. S. Van Dyke, Jr. W3HK — SEC: WA3PZO, STM: K3NGN, NMs K3KWK W3VA W3BKVK K3AIZ Net Ret's: PFN QNI 352, QTC 845; PTTN QNI 354, QTC 204; LVN QNI 13, QTC 31. EPA QNI 653, QTC 433. AREC (2) QNI 15; EPAEP&TN QNI 236, QTC 117. OVS: W3GOA W3BCTU N3CP W3CL WA3BJJ. COs: W3KEK K3NSN. OBS: W3T K3EBZ W3JZA W3CL W3AVJ W3ID N3AIU. BPL: K3NSN W3CUL W3VFR W3WQP W3JZA N3AIU W3ADT PSHR: KB6FRJ W3WQP W3JZA W3VFR W3ADT W3BCTU W3JZA W3GOA W3CUL W3VFR W3ADT W3BCTU W3JZA what they are making room for. WA3WQP now has TA-33 working. W3JZA has new keyer with a memory. I need a test cw recvr with memory! On net reports, in fact all reports, remember the dead line. Some are getting too late. Many reports of activity during TMI. NMs report tic a bit slow. Tamaqua Trans Society Hamboree saw 135 take FCC exams. A record? Glad to see hams setting up tic route to WA3KFC recently hospitalized. W3GZV got his big A. After all this rain we must be in for a dry spell. Hope FD preparations are all done and it was a success. N3CP coming back to EPA from VA. LZ1AM has set up comms for local Air Show. W3VRE up to 239 kcs who will be on 300? W3U a cw op can't get used to SSB lingo. The Pack Rats are at it again HAMARAMA 78 Oct 6-7 Oct 6, VHF Conference, 7th, Flea Market. RRC had their first Hamfest. Watch for an article that says ham radio radiation is a hazard, not the mega watts all around us! Stay healthy. Traffic: K3NSN 6135, W3CUL 3478, W3VFR 765, WA3WQP 670, W3JZA 502, K3KWK 463, WA3ATQ 396, N3AIU 286, W3FAF 256, KB6FRJ 253, AA3B 198, AD3X 153, AG3R 143, KA3BD 130, W3JPF 130, W3PDX 106, W3JYZ 85, W3VA 78, K3NGN 65, W3JGP 60, W3GZV 42, W3ID 26, WA3WQ 25, W3CAI 23, N3CP 21, W3TI 20, K3YTL 13, W3BUU 11, W3CL 11, W3GO 10, K3J 10, N3CP 8, W3HK 6, WA3VIL 6, WA3YOE 5, WA3BJJ 4, K3AI 1, W3AUJ 1, W3ELA 1, W3EU 1, W3GOA 1, W3KEK 1, W3VRE 1.

**MARYLAND - DISTRICT OF COLUMBIA:** SCM, Karl R. Madrow, W3FA — W3HJH our SEC has moved. Thanks for a good job well done and good luck in Florida. The Anne Arundel Radio Club enclosed a copy of their ARES Emergency Services Plan. This looks like a good thing for all clubs to have. How about you? K3RXX keeps skads on 2 and 20 meters, and has been bitten by the County Hunter Bug! W3ZWN has the RTTY going on 2 and 80 meters. N3IT has a nice traffic total for early AM operations. WA3HEM added daughter #2 to the roster. Congrats to MOM and DAD. KB3AP is house hunting, a new experience. W3WBV and W3TFP are awaiting new equipment. W3BXQ and N4BHJ have theirs in use. W3ECN likes the old rig and is waiting for the new one. W3CEN sold his new keyer. W3CDO is low key this month. W2HXT visits Mark I'wain country. Mountain ARC Cumberland has W3EDP, pres.; K3IFB, vice pres.; K3OMN, secy, and WA3YVV, treas, says W3BHE publicity man. The new PVRC slate is K3NA, pres.; W3BDNL, vice pres.; WA3DDP, secy and W3WR, treas. Thanks to all who sent in reports this month. W0VJD3 and K3IU are busy and reliable. W3BDKQ keeps Glen Burnie heard from. K3ORW had a busy month as liaison man. W3CE3 holds back with the amplifier. W3FVZ is there when needed. AA3S is getting primed for the MEPN Picnic. N3QA lends a helping hand on the cw net. N3APS traffic total shows a busy month. N3SJ has a beautiful signal from the eastern shore. QO reports from W3MR W4MLR/3 and W3WBV. With the nets: Net/Net Mgr. Sessions/Traffic/QNI average. MEPNA/AS3 30/117/23.3. 100% W3ADQ, W3BFFK and WA2YFM. Missing 3 or less. WA3HW, K3ORW and AA3S. WR PONAW3DFW 17/22/17.5. The Washington County net under W3BGEJ was 4/0/15, and all on 2 meters in Hagerstown. Traffic: W0VJD3 151, K3IU 117, K3ORW 95, N3APS 69, N3SJ 63, W3FVZ 46, AA3S 35, W3BJRW 34, N3IT 26, KB3AP 23, N3QA 14, K3RXX 10, W3BKDQ 7, W3ECN 3, W3CE3 4, W3HXT 4, W3ZWN 2.

## SOUTHERN NEW JERSEY:

SCM, Bill Luebckemann, W2LCC — SEC: W2HOE.  
 Net Time (PM) Freq. Sess. QNI QTC Mgr.  
 NJNJE 10 3695 31 601 395/349 AP2  
 NJNJE 10 3695 31 461 285/242 AP2  
 NJNPN 6 3950 35 660 439/353 K2VX  
 JSARS 8:30 91 31 438 78/65 WA2HEB  
 MCN 10:30 075 31 282 76/67 AA2H  
 SJVN 10:30 27 29 134 100/85 W2LCC  
 SPARTN 10:30 94

**NO DATA RCVD D2BEV**  
 I regret to announce the resignation of WA2YAV as EC for Atlantic County. His many other obligations made it impossible for him to continue. We wish him the best. W2KP is the newly appointed EC for Atlantic County. Do you know who your EC is? Every county has an active ARES program. Why not contact your county EC or me for more details. We need you! As the summer progresses, I will be attempting to wrap up my first round of club visits. If I haven't been by your club yet let me know. I hope not to miss anybody. And don't forget to say hello at the GCARC and WJRA hamfests in August and the SJRA hamfest in September. Traffic: AA2H 182, W2LCC 130, W2QZ 120, WA2GXU 84, WA4JRP 88, N2AJ 63, W2HOB 48, N2ALS 45, N2AFN 43, WA2ONW 40, WA2CUN 35, WB2HUV 32, WA2HEB 28, K2UL 24, N2ABT 22, WB2PUW 21, WA2GYF 18, AA2C 14, WD2AHO 13, KA2CDF 11, WA2GTJ 7, AG2O 6, W2UGA 6, W2AII 2, WA4RD 1.

**WESTERN NEW YORK:** SCM, Lonnie J. Keller, WA2AOG — STM: W2MTA, SEC: WB2FTX. Welcome to new appointees WA2GJJ, who replaces WB2JEJ as EC in Oneida Co., and K2OIU, who replaces N2BCJ as Monroe

County EC. 73 to QTS WB2PJU as he begins his employment in Connecticut. New Rochester ARA officers: AC2K, pres.; WB2RJB, vp.; K2RJ, treas.; W2EBF, secy. New Auburn ARA officers: WA2QYT, pres.; WA2MVX, vp.; WB2JIF, treas.; WA2MWB, secy. License upgrades: WB2PJU Extra; WA2MVB General. WA2MFU has a new 2-meter beam; WB2SVJ a SB-301/401 combo and planning an 813 amp. WB2EAG manager of new cw net - NET - which stands for North East Training net, which meets at 8 PM local time (eastern) on 3732 MHz Mon. Wed. & Fri, and is an offshoot of the very successful OCTEN managed by WA2MFV, 22302, 146.19/79 serving the Onondaga/Oneida county areas. Are you an ARRL appointee? If you are, spread the word and let's get some more activity from the outreaching parts of the section. If you might be interested, drop me a line and I'll be glad to send you data. No BPL this month, but PSHR to W2MTA WB2PJU WA2ZJP N2APB and W2ZQJ. Traffic: (May) W2ZQJ 203, W2MTA 192, WA2MFV 176, N2APB 167, WB2PJU 134, W2R 120, W2HFU 112, W2BQTC 91, WA2HSB 72, K2GWN 51, WA2ZJP 45, WB2OMZ 44, W2TZ 39, WA2MFU 36, KA2BGX 35, W2RF 24, AF2K 23, WB2VJ 19, WB2DYJ 15, K2VR 14, WA2AIV 6, WB2NAO 5, W2AET 4. (Apr.) WB2SYK 189. (Mar.) WB2SYK 5.

## WESTERN PENNSYLVANIA:

SCM, Otto L. Schuler, K3SMB — ASCM: N3FM, STM: W3QO, SEC: WA3VUP, Ass't SECs: WA3FLX and WA3JQB. NMs: W3NEM W3KUN W3MMI & WA3PXA.  
 Net Freq. QTC QNI Freq. Time/Dy  
 WPACWN 31 136 401 3585 7:00 P Dy  
 WPAFTN 31 142 467 3983 6:30 P Dy  
 WAP2MTN 31 85 427 146.28/88 8:00 P Dy  
 PATTN 3610 6:30 P Dy  
 WPA RACES 3990.5 9:00 A Su  
 Silent Keys are W3PUT (W3SM's Father) and W3NED both longtime Amateurs. Our sympathies are extended to their families in their loss. New Novices are WA3CJR KA3DDG and KA3CGU. Upgrading to General, WB3IAB, to Advanced, WB3AHB and WA3YYA, to Tech, N3ATN(WB3JCV), to Extra W3WVD and AG3HW(WB3LEA). Congratulations to all. Best wishes for a rapid recovery to W3GAE, pres. of WARA and his son Kenny who were injured in a motorcycle accident May 6. WA3ZMS and WA3VTC are moving to Florida and we wish them good sunny weather and good health. On May 9 WA3OKK W3GWR WB3GTE and AD3T assisted in a disaster drill at Western Center in Wash. County, about 100 patients were transferred to Mayview Hosp. In the mock drill. On May 6, 31 amateurs in Allegheny County provided communications for the March of Dimes Walkathon and about 10,000 people participated. Also on May 6, the Indiana ARC and the Indiana County CD amateurs provided communications for a Bike Hill sponsored by the Pennsylvania Assn. for Retarded Citizens. Traffic: WA3PA 258, W3EG 277, NGE 145, W3YQ 114, W3SMV 89, K3SMB 54, W3UHL 53, N3FM 46, W3MMI 34, WB3PAV 34, WB3JDI 34, W3KUN 24, WA3JUNX 24, WA3QNT 23, W3EXC 18, K3HCT 17, W3SN 17, W3RUL 13, WA3VRE 12, W3BGWJ 10, W3BBOB 9, AB3X 8, W3LOD 6, N4DR 5, K3MS 4, W3BZGR 3, K3UA 3, AF3B 2, N3KB 2, W3JIT 2, N3NR 2.

## CENTRAL DIVISION

ILLINOIS: SCM, Edmond A. Metzger, W9PRN — Asst. SCM: W9RYU, SEC: WA9ES. MNs: WA9KFK and W9JSR. Cook County EC: W9HPH.

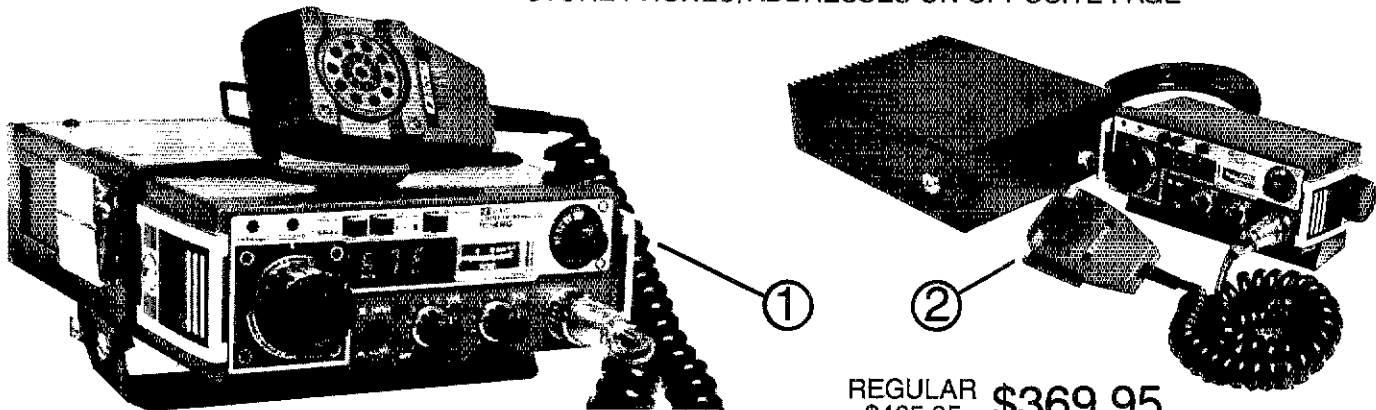
Net	Freq.	Time/Days	Tic.	Sess.
ILN	3690	0030/0400 Dy	351	62
Ill Phone	3915	2245 Dy		
NCPN	3915	1300/1800 Dy	145	49
IEN	3940	1400 Su	no report	
W9VEY		6	26	

(Mem Stn)  
 W9FKC assisted by WB9TEW in DX exercise from Sweden Hill, IL worked SK9MG/5 in Biskopskulla, Finland. Our sympathy to 9BL upon the death of his mother and to W9OK upon the passing of his mother-in-law. WD9DZE passed General class. K9EI is now a central office technician for Illinois Bell in Springfield. The Chicago two-meter repeater group W9SRO/1 provided excellent communications for the 1979 Green Bikathon in May. The Central Division ARRL convention and Hamfest will be held in Rockford on Sun Sept. 9th. Contact P. O. Box 1744, Rockford for details. WA9TAS KA9AWG KA9CBZ WA9AES W9UFR K9BML WA9NVL N9ES WA9VRD KA9BYB WB9MLI WB9OEI WD9QVZ WB9ION, participated in the Annual Memorial Day APBA races in Decatur. WD9NT1 WB9SVC WB9GHN and WB9DFD were elected officers of the York Radio Club for the coming season. W9JJC is the past president of his mother-in-law. WD9DZE passed General class. K9EI is now a central office technician for Illinois Bell in Springfield. 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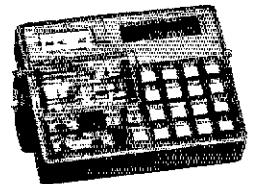
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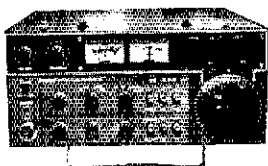


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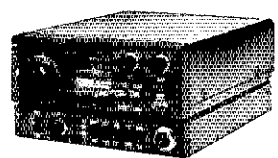
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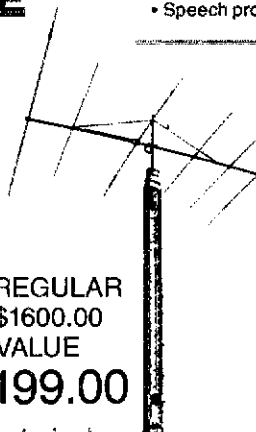
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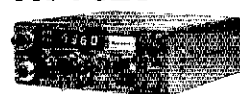
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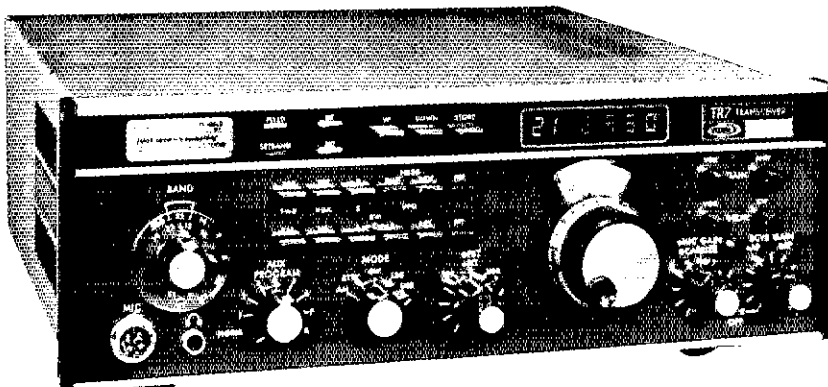
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IPON report for April QNI 102, QTC 6 in 4 Sess. Ind was 100% on D9RN again. N9AEI has taken over an NM for ICN. Thanks to WB9YXN who has done an outstanding job in the past year as manager. Congrats to WB9UYO and WB9IHH for their first annual CAN certificates. Indianapolis Radio Club has had 50 years continuous membership in ARRL. New officers of Purdue ARC for '79: R. WB9GDX, pres.; W9NMT, vp.; EX-VPSDT, secy.; WB9ICA, treas. and AMX. WAT net meets every Wed nite 8 PM local on 144.280 MHz. Other two-meter SSB activity centers around 144.2 and can be heard nightly. Those of you who have never been on 2 either than through a "machine" are missing a very interesting band. I am gonna let a secret out. Building a 2-m power amp has got to be one of the easiest projects I have undertook in a long while. Who sez homebrewing is dead? I wish to express my thanks to K9CGS for the excellent job he did as manager of ITN. WB9QDC now a Silent Key. Traffic: (May) WB9UJ 937, WB9CF 190, WB9UYI 139, WB9CIS 124, WB9LW 115, WB9D 84, WA9QCF 83, N9AEI 81, WB9VJE 75, WB9DY 81, K9F 22 49, WB9IHH 46, N9PS 37, WB9DK 17, K9GGS 15, WA9CWX 13, WA9CCK 11, W9KT 10, K9WWJ 9, WB9EM 9, WB9WEI 8, W9COT 7, K9DZC 7, WB9HUF 6, W9PMT 5, WA9GJZ 5, WB9DAG 4. (Apr.) W9RTH 15.

WISCONSIN: SCM, Roy A. Pedersen, K9FHI -- SEC: W9OAK, NMs: W9AYI W9IEM WB9IHC WB9ZRE W9DM K9LJU K9EN. STM: K9UTQ. Neis freq time QNI QTC Mgr. BWN 3985 1145Z M-Sa 785-703 W9AYK. BEN 3985 1700Z Dy 606-84 W9IEM. W9BN 3985 2230Z Dy 937-209 WB9ICH. WNN 3725 2215Z Dy 45-9 WB9ZRE. WIN-E 3662 0000Z Dy 280-86 W9DM. WIN-L 3662 0300Z Dy 212-91 K9LJU. WI Ex PO 3925 1701Z M-F 519-30 WA9NIX. New Novices Ellsworth area KA9EY KA9DQH. W9SK has RAR-T4XC. WISL net would like items of interest, gossip or what have you. Contact K9FHI for address. Sorry to hear W9ZGO in hospital at the time of writing this he is home and doing real well, good to have you on the nets again. New Novice La Crosse KA9EHG KA9EHH. WI State Convention was a success Manacor banquet was a success. Neenah-Menasha swapfest and banquet was also a success. New Novice Watertown area KA9EKR. New Novice Ixonia KA9EOV. New Novices Price County KA9EOJ KA9EON KA9EOL KA9EOK KA9EOL KA9EOM KA9EOD KA9EDI. KA9CKY has Tech and a new call N9ATA. Northwestern traffic net on 2-meters had 501 stations checking in and handling 34 messages in 1125 minutes. Looks like an active net. Glad to see Wisconsin stations checking in CAND and D9RN all stations in hospital at the time of writing reports to your SCM, every one of you. I hope every one has a good summer. Will probably see many of you during the summer. Traffic: (May) W9ZGO 335, W9CY 238, W9DND 162, KA9CA 151, W9YCV 143, W9IEM 126, WB9YPY 92, K9FH 90, AD9X 87, WD9ESZ 58, W9AYK 53, WB9ZRE 51, N9CP 49, K9UJ 48, W9FDY 46, K9LJU 44, W9RHRU 44, K9FA 40, WD9PHF 37, WB9IHC 37, W9DM 36, AG9G 36, K9JPS 33, KA9KG 32, W9UJ 31, WB9ESM 30, K9CPM 29, WB9UJ 27, WB9WHQ 26, W9LDO 24, WA9DXV 23, K9HDF 22, W9EAO 19, WB9JSW 19, W9S-C 17, K9AL 16, WA9WYS 16, K9ANY 10, W9NLU 10, K9LTO 6, WB9PZ 6. (Apr.) WB9KP 27, WA9WYS 9. (Mar.) WB9KPX 11.

### DAKOTA DIVISION

MINNESOTA: SCM, Helen Hayes, WB9HOX -- SEC: K9HJC. STM: AF9O.

MSPN N 3945	12:05 P	W9OPX	QNI	QTC
MSPN E 3922	5:45 P	W9DJW	496	75
MSN 1 3882	6:33 P	W9JVS	605	183
MSN 2 3889	5:15 P	K9PZ	215	124
MSN 3 3719	5:30 P	W9BFR	149	50
MWX 3925	8:15 P	WB9UKI	344	283
PAW 3925	9:12	WA9EPX	2656	188

News seems a little off this time, however, since summer finally came, all who can, are enjoying other hobbies and hamfests. Bernidju had their first hamfest June 9-10 and it was a definite success despite the cold weather and rain. Seven states and 2 Canadian Provinces were represented. Oh yes, yours truly was given a key to the 4th place in the code sending with her left foot, and was told to practice for next year. Hi. The gravevine has it that 4 of the 6 students taught by W9FII got their license June 8 but as yet this has not been confirmed. Speaking of license upgrades: from Novice to General KA9COZINAXG XYL of WA9ABC and WB9SZV congratulations to you both. MN SEC K9HJC, tells me that we need more ECs, any volunteers? STM AF9O reminds me and you that we have spots in MN that aren't represented on our nets. Come on folks. The MN Section expresses our deepest sympathy to the family of W9LST who became a Silent Key on May 27. He will be missed by all who know him. Traffic: (Apr.) WB9HOX 263, WA9TFC 179, WB9QCF 135, W9DJW 121, WA9YU 114, K9PZ 98, W9DCGM 87, WB9UKI 76, K9CSE 72, W9OPX 54, W9RIQ 51, N9AHA 38, W9BZB 29, OEOM 29, KA9BZM 18, WB9NZB 16, K9ZBI 15, WD9FFE 14, K9UTW 10, WB9BYT 10, K9RMX 7, WA9LVG 6, N9JP 6, W9UMX 3.

NORTH DAKOTA: SCM, Lois Jorgensen, WA9RWM -- Congratulations to the new Novices at the Goose River Club: KA9CVR KA9CVU KA9CVV KA9CVS KA9CCT KA9CVW KA9CVX KA9EDB KA9EDC KA9EDD KA9EDTV and WA9QBN. W9KZU upgraded to Advance. Congratulations to the new Novice from the Three Rivers Club KA9CBP XYL o! WB9TAB.

Net Freq \_\_\_\_\_ Day/Time \_\_\_\_\_ Sess. QNI QTC Mgr. DATA 3996.5 kHz 0330UTC Dy 8 77 4 WA9CHR On July 29th the DXE expedition will be at Carl Ben Ellison Museum at Haddon. K4OPR is now at Mayville as a barber. K9FRP is leaving ND to live in Waco, MN. Good luck in your new job. We express our sympathy to the family of W9CJN who is a Silent Key. Congratulation to WD9BRL and XYL on their new harmonic. Traffic: WA9RWM 113, N9AFP 7.

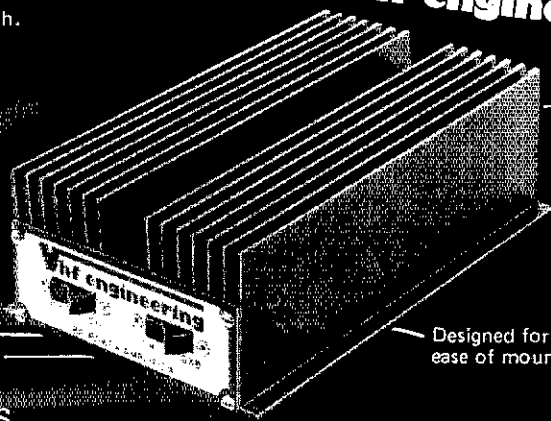
SOUTH DAKOTA: SCM, Lydia S. Johnson, W9KJZ -- Ass't SCM: W9DVB, SEC: WA9TNN, NMs: W9S WE HOJ MZI NEO TNM VRE. Regret to say that W9OFF a Silent Key. K9JBQ moved to Little Rock, AR. N9ABE and W9BMR active in daytime NTS. WB9YQS placed 1st in '79 VHF SS. Need ECs for Minnehaha and Pennington Co. How about volunteers from our two largest cities? Congrats to newly licensed WD9ADF, and to KA9S ARD BAV. BMT QCD for upgrading to Technician. And WA9TNN for making QSO for total 2900. Div. Convention dates Oct. 5-6-7 in St. Traffic: WA9TNN 195, WA9VRE 162, W9BMR 117, W9DVB 98, W9HJO 98, K9FRE 79, W9MZI 70, W9KJZ 30, W9IG 18, WA9BZD 2.



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BLC 30/150	144 MHz	30 W	150 W
BLD 2/60	220 MHz	2 W	60 W
BLD 10/60	220 MHz	10 W	60 W
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BLE 10/40	420 MHz	10 W	40 W
BLE 2/40	420 MHz	2 W	40 W
BLE 10/80	420 MHz	10 W	80 W

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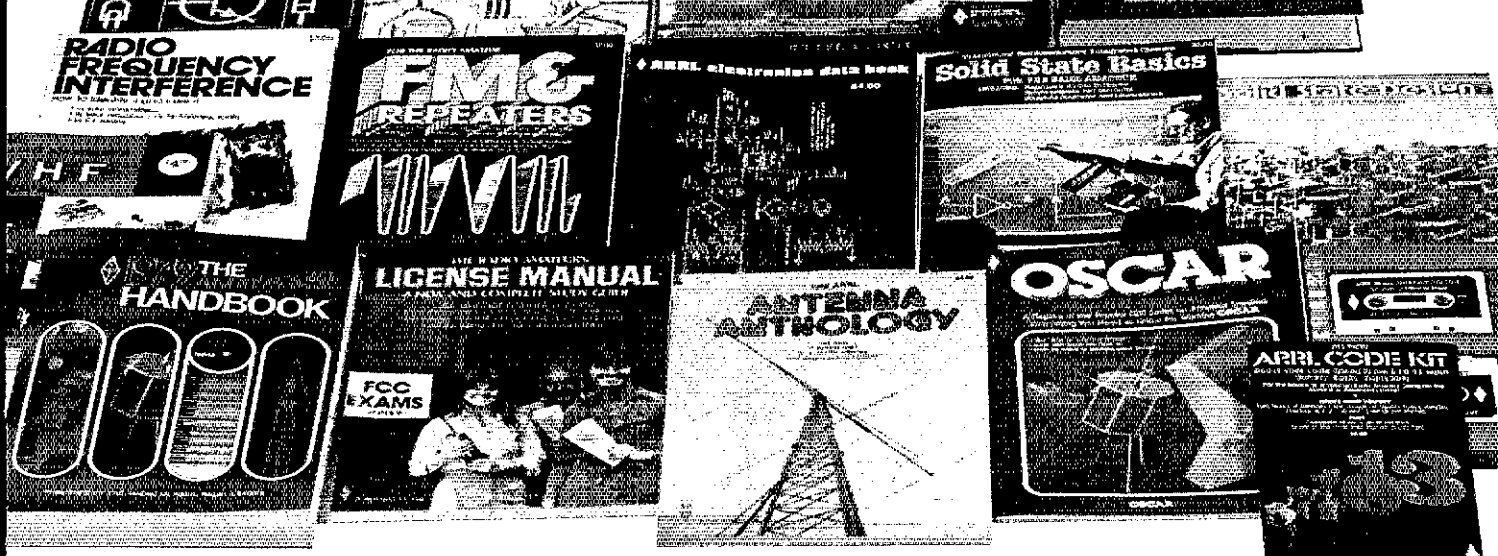
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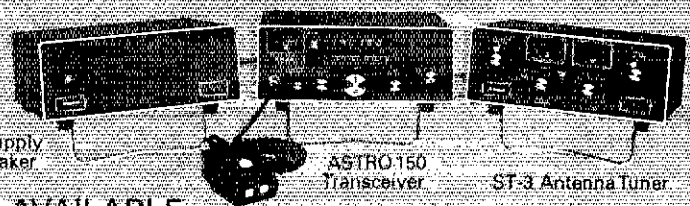
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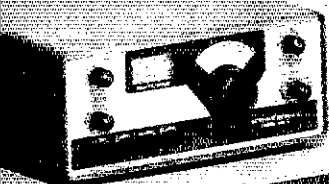
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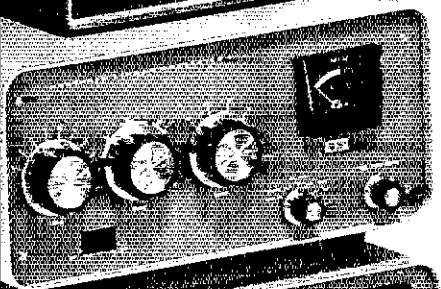
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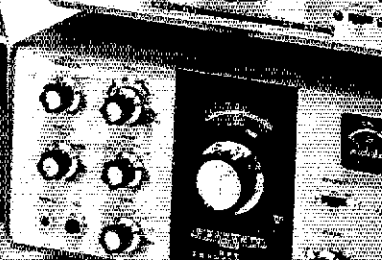
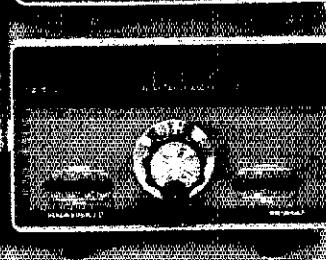
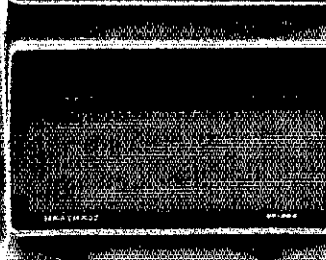
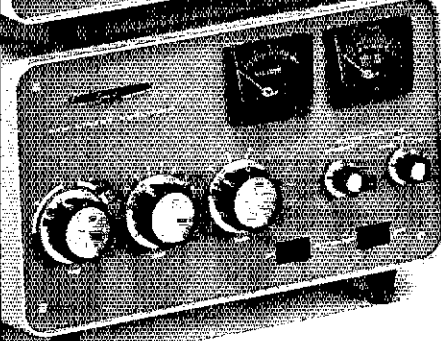
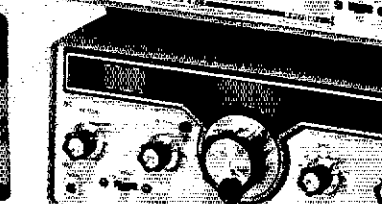
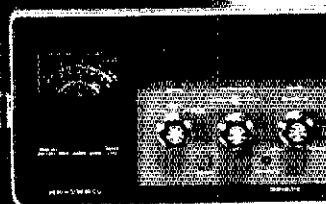
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- OPTO-8000 1AK Kit Form - 1 Year Parts Guarantee \$279.95
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## OPTO-7000 10 Hz to 600 MHz Miniature Counter

- XTAL (TCXO) Time Base  $\pm 0.8\text{ PPM}/^\circ\text{C}$  Standard • Aluminum Case • Hz & 50 Ohm inputs
- 1 Sec. & 1/10 Sec. Gate times • Auto Dec. Pt. • Built-in Prescaler and Preamps Standard
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- OPTO-7000K Kit Form \$59.95 #AC-70 AC Power Pak \$ 4.95
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## CM-1000 Digital Capacitance Meter

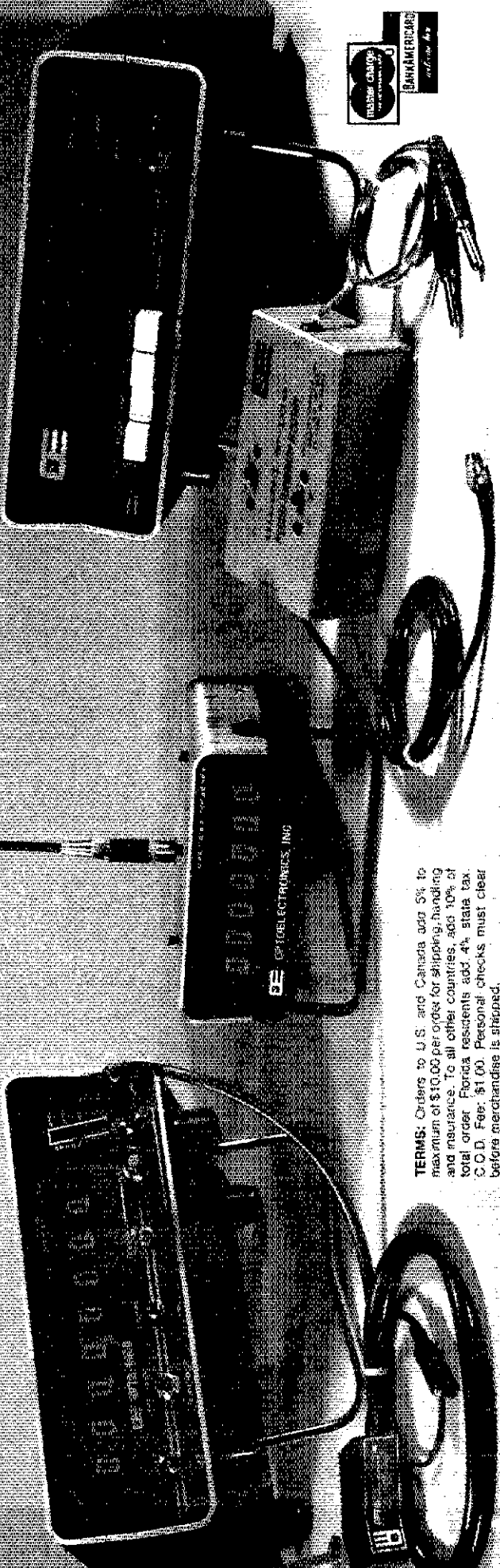
- Featured Sept. 1978 Radio Electronics Magazine • Measuring accuracy of 0.1% • 6 Digits • Aluminum Case • Accuracy of  $\pm 0.1\%$  • #CM-1000 Factory Assembled \$179.95
- #CM-1000K Kit Form \$129.95

## T-100 Precision Thermometer

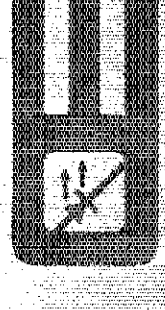
- For Use with Digital Voltmeter • Output 10 mV per Degree • Resolution to 0.1° with 4 1/2 Digit Meter • Features Two 1/2" T-Type • T-100 Factory Assembled & Calibrated \$59.95
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- #D-146, Antenna, Rubber Duck, 146 MHz
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# 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.

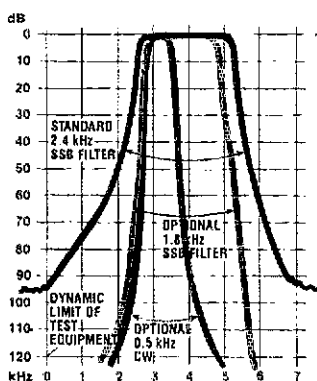
The 1.8 kHz crystal ladder filter transforms an unreadable SSB signal in heavy QRM into one that gets the message through. The 0.5 kHz 8-pole filter provides extremely steep and deep skirts to the CW passband window which effectively blocks out even the very strong adjacent signals.

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.

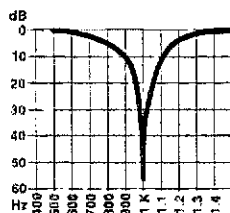
**NEW NOTCH FILTER.** A variable frequency notch filter in OMNI/SERIES B is placed inside the AGC loop to eliminate interfering carriers and CW signals without affecting received signals. Attenuation is more than 8 "S" units (over 50 dB) for any frequency between 0.2 kHz and 3.5 kHz.

**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;



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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,  $\pm 5$  kHz or  $\pm 0.5$  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:  $5\frac{1}{4}''$ h x  $14\frac{1}{4}''$ 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.





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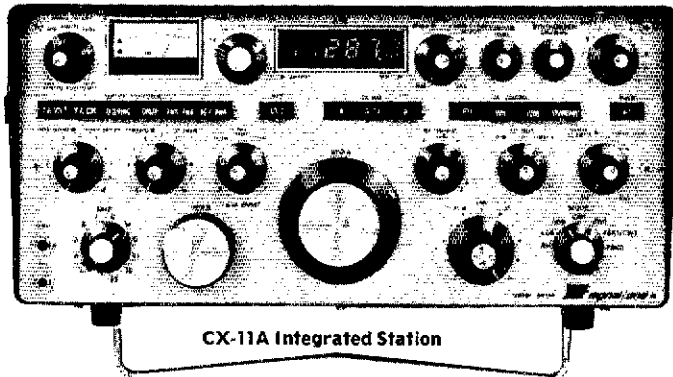
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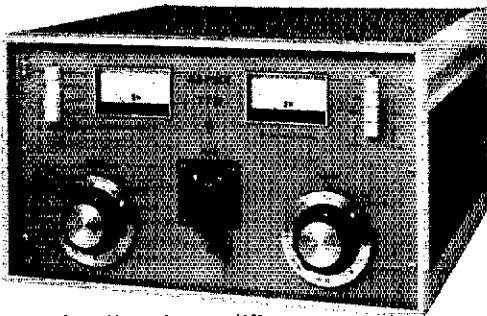
signal/one CX-11A



**GENERAL SPECIFICATIONS AND FEATURES**

- SYNTHESIZED FREQUENCY COVERAGE: All amateur bands 1.8-30 MHz in full 1 MHz bands, plus 4 additional 1 MHz bands for future expansion.
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- SENSITIVITY: 116dBm (.25 uv) for 10dB S/N at 28 MHz (2.4 KHz band width).
- SELECTIVITY: Dual matched 2.4 KHz 8 pole crystal filters deliver 16 pole 1.4:1 shape factor (6dB/60dB), plus post detection 1.5, 1.0, .4, and .1 KHz band width selectivities.
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- THIRD ORDER INTERCEPT POINT: Plus 22dBm
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- POWER OUTPUT: 150 watts DC/CW/PEP output all bands, all modes.
- BUILT-IN: A/C supply, IF shift, noise blanker, RF clipping, CW keyer, notch filter.
- PRICE: \$5900, mfg by Signal/One Corp., Phoenix, AZ 85021.
- BUILT FOR: Those who demand the finest.

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**PAYNE RADIO**

**DELTA DIVISION**

ARKANSAS: SCM, S. M. Pokorny, W5UAU — SEC: WD5IRB. NMs: AD5D W5MYZ W5POH W5ASZWZ. Nets freq time/day QNI QTC Mgr. OZK 3780 0000/Dv 116 18 W5MYZ. ASN 3745 0030/T-5a 81 14 W5WVPV. NEAVN 146 28/88 0030/T-5a W5AVUJ. SCARC 26,765 0130/Su 0030/M. 84 6 W55VJC. APN 3,991 1000/5a 893 41 W5POH. M-Bird 3928 2130M-F 742 20 W5ASZWZ. ARN 3,995 2330/Dv 1223 88 AD5D. CAREN Hamfest Aug 4/5 Info from CAREN, P.O. Box 8244, Little Rock AR 72203. Jonesboro Hamfest Aug 19 at Jonesboro. W5KL WA5WAR took trip to Virginia to visit son WAYE. EC endorsements W5ASD W5BLP W55BYV W55EPD W55GZR (now KB5KM) W55GWU W55HDZ W55KUI W55MQH W55MWI W55NXV W55PMY W55QOR K55RO WA5TIX K5TML W5UVP. Obs W55WWA 3 W5UAU 2. Traffic: AD5D 49, W5POH 28, W5UAU 17, W5KL 14, W5BLP 10, W55WWA 6, W55CAA 3, W55GQH 3.

LOUISIANA: SCM, S. T. "Tom" Losey, Jr., K5TL — Asst SCM: K5DPG. SEC: W55VH. STM: NSYL. Net Mgrs: N5RB K5ARH. N5IB W55CMA W55VH N5EK W5YZL W55CMA K5DPG all active on DRNS. W55LBR will take over as the net mgr. 1st of July. Congratulations you deserve. This month's figures show her to be number 1 in all categories of LAN — QNI, NCS, RN5 REP. Field Day again this month and Clubs all over the State have been planning and preparing for it. Should really be a good one this year. W55VH has moved to new QTH and is off the air temporarily. KB5AS running all over the State and QNI and Nets from his mobile. K55L out of hospital and doing fine since his motorcycle accident. Wonder what W55OOM did to that dog that kept chewing up his coax. The Louisiana Traffic Bulletin needs your help. Prices have gone so high with printing and mailing its come to an impasse. If anyone has any ideas about this please contact myself or W55GHP. What we need more than anything is an inexpensive way to print it. K55BN not back in new home since tornado to took the old one, will be back on the Nets soon.

Net Freq. Time(PM)Day QNIQTCMgr.  
LAN 3615 7 & 10 Dy 319 189 N5RB  
LTN 3910 6:30 Dy 433 114 K5ARH  
LSN 3703 7:30 M-F 125 30 N5IB & W55CMA  
LRN 3587 5:30 Su 2 1 N5RB  
RACES 3993 5:00 AM Su W55VH  
LEN 3910 9:00 AM Su W55VH

Traffic: W55GHP 553, N5YL 193, W55LBR 152, N5ES 127 K5TTC 104, K5TL 90, N5RB 80, K5DPG 48, K5ARH 40, N5IB 40, W55USS 26, WA5TOA 25, W5YN 12, K5BLV 2, W55IK 2.

MISSISSIPPI: SCM, E. Ed Robinson, W5XT — SEC: W55XA. Spring is springing and ham activities picking up nicely in the state. MSBN North MS picnic in Ackerman was fine outing with old and new eyeball QSOs. WA5FH has had to retire as VHF frequency coordinator which he has done a tremendous job for past five years, well done and tnx. Congratulations to new MSBN net mgr. K5MK and also many tnx. to outgoing K5WSC. CGCHN(WB4PGB) Sess. 31, QNI 2199, QTC 182, MSBN (K5WSC) Sess. 31, QNI 2167, QTC 101, MTN (K5OAF) Sess. 31, QNI 133, QTC 53, MSN (W55GNR) Sess. 13, QNI 45, QTC 14, MN(WA5JWD) Sess. 31, QNI 641, QTC 7. MS RACES (N5AMK) Sess. 4, QNI 168, QTC 3, Capital LEN (W55D) Sess. 4, QNI 67, QTC 0, ICARON (W55DCC) Sess. 23, QNI 185, QTC 6, NEMs FMN (W55PDP) QNI 200, QTC 3, Delta AEN (W55BEU) Sess. 23, QNI 368, QTC 8, Traffic: K5OAF 134, W55IKD 124, W55FHA 62, W5EDT 53, N5AMK 35, W55TRZ 33, W55SNB 32, W5WZ 24, WA5OKI 19, W5XT 19, K5MK 17, W55YGO 9, N5XA 7, W55CSU 5, W55LXX 4, W55UPN 4, W55DCK 2.

TENNESSEE: SCM, O. D. Keaton, WA4GLS — SEC: WB4DYJ. Asst. SCM: WB4PRF. STM: W4ZJY. The TN Hamfests got off to the usual great start for 1979 with the very successful Humboldt and Knoxville Hamfests this month. Everyone get ready to attend the Bristol Hamfest on the 18th & 19th and the Cedars of Lebanon Hamfest on the 26th. QTB appointments have been made to W4DYJ, K4Q, W4YPC & W4AGC. The Mid-South ARCs members are very active in supporting the Memphis area US Weather Service. The new officers of the Lake Way ARC are: W4PER, pres.; K4FKY, vice pres.; W4WQT, secy/treas. Net Certificate was awarded to KA4BJL. Phone nets report 178 sessions, 6559 QNI & 848 QTC. CW nets report 72 sessions, 482 QNI & 178 QTC. TLC reports functions 12 at 27%, traffic 3. The early and late TN is needing more participants, please join them. Traffic: WA4NF 235, WA4ONY 232, AF4T 189, WB4BKF 123, K4JGW 118, W4DGG 113, K4XF 108, N4BCA 101, K4WOF 82, WB4PRF 74, N4UC 72, WB4YPO 56, WA4M 40, W4ZJY 40, K4AMC 38, KB4G 37, WB4ZSZ 25, K4VM 22, WA4DKC 18, WA4CGK 17, WA4GLS 17, K4VVO 17, K4EOH 13, N4BBB 9, W4RUW 8, W4TYV 8, W4VJW 8, W4EWR 7, W4PSN 6, WA4VWV 3.

**GREAT LAKES DIVISION**

KENTUCKY: SCM, Joe Miller, K4DZM — SEC: WB4ZML. NMs: WA4AVV W4BEJ WA4IGS WA4JTE KB4OZ Nets reporting.

Net	QNI	QTC	Net	QNI	QTC
KRN	424	59	5-ARES	23	5
MKPN	348	76	6-ARES	58	2
KTN	1955	122	CARN	168	15
KNTN	359	139	SEKEN	31	0
KSN	211	69	D-9RN	—	192
KYN	240	79	KPON	59	4

D-9RN needs QNI from Kentucky nets. Congratulations to all members of KNTN, top traffic net for May. Upgraded to General KA4AZT WD4OAM. N8ZO now in 9J2 land. W4YID and K5ED now in Texas, our loss their gain. 4th Dist. ARES complete sky warn WX watch program. Bullitt County ARS has new Navics: KA4SI KA4ISJ KA4ISW KA4ISX KA4ISY and KA4ISZ. Very good club licensing program. Signit Key: WB4VWV. Traffic: K4DZM 148, WA4GAL 100, KB4DZ 100, WA4AVV 99, WA4EBN 89, WD4COF 70, WB4NP 64, W4CDA 60, W4NLN 47, WA4WSM 46, WD4RNI 32, WB4KDP 27, WA4-JAV 26, WA4JTE 25, KA4AXT 24, WA4YPO 21, WA4IGS 18, WD4EKZ 17, WB4AUN 16, WB4APC 14, WD4OAM 13, W4CID 13, W4FAF 13, WA4AGH 12, K4HDE 11, WB4RIT 11, K4AML 10, W4HKT 8, WA4SWF 7, K4AVX 4.

MICHIGAN: SCM, Stanley J. Briggs, W8MPD/K8SB — Asst. SCMs: W8DHB W8SOP STM: W8BMTD. SEC: W8BEFK. NMs: K8LNE K8KMQ K8BAI K8RV W8BYDZ W8DHB W88ZNS.

Net	Freq.	UTC*/Day	QNI	QTC	Sess.
GMN*	3663	2200/0200 Dy	1084	348	92
GLETN	3932	0130 Dy	1017	222	31
MITN	3953	2300 Dy	655	286	31
MACS*	3953	1500 Dy	818	188	31



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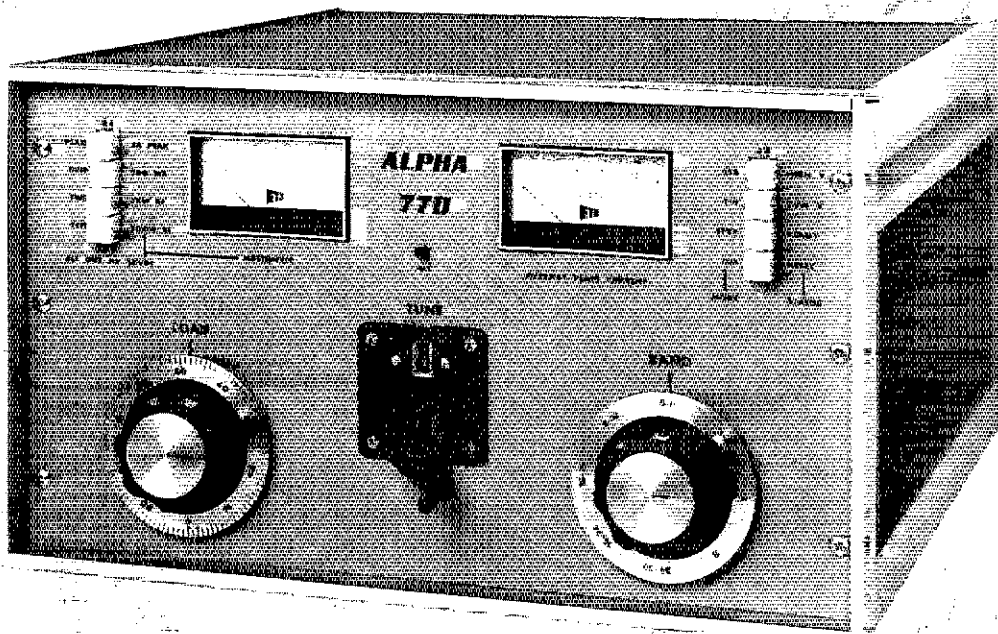
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# This NEW MFJ Versa Tuner II . . .

has SWR and dual range wattmeter, antenna switch, efficient airwound inductor, built in balun. Up to 300 watts RF output. Matches everything from 1.8 thru 30 MHz: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced lines, coax lines.

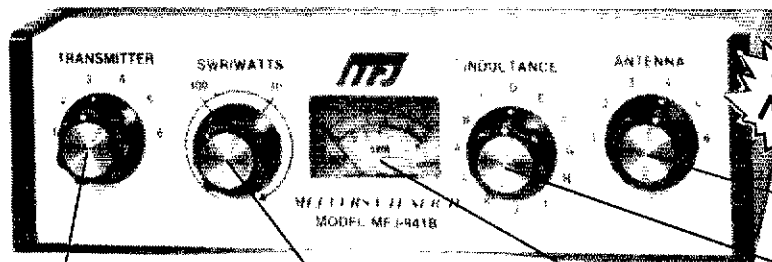
## MFJ LOWER PRICES!

NEW, IMPROVED MFJ-941B HAS . . .

- More inductance for wider matching range
- More flexible antenna switch
- More sensitive meter for SWR measurements down to 5 watts output

NEW LOWER PRICE

# \$79<sup>95</sup>



**Transmitter matching capacitor.** 208 pf. 1000 volt spacing.

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

**Meter reads SWR and RF watts** in 2 ranges.

**Efficient airwound inductor** gives more watts out and less losses.

**Antenna matching capacitor.** 208 pf. 1000 volt spacing.

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

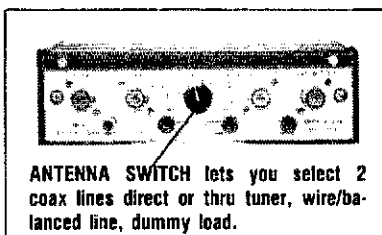
A SWR and dual range wattmeter (300 and 30 watts full scale) lets you measure RF power output for simplified tuning.

An antenna switch lets you select 2 coax lines direct or thru tuner, random wire/balanced line, and tuner bypass for dummy load.

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

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

With the NEW MFJ Versa Tuner II you can run your full transceiver power output — up to 300 watts RF power output — and match your



**ANTENNA SWITCH** lets you select 2 coax lines direct or thru tuner, wire/balanced line, dummy load.

transmitter to any feedline from 160 thru 10 Meters whether you have coax cable, balanced line, or random wire.

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

You can even operate all bands with just

one existing antenna. No need to put up separate antennas for each band.

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

It travels well, too. Its ultra compact size 8x2x6 inches fits easily in a small corner of your suitcase.

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

S0-239 coax connectors are provided for transmitter input and coax fed antennas. Quality five way binding posts are used for the balanced line inputs (2), random wire input (1), and ground (1).

## NEW 300 WATT MFJ VERSA TUNER II'S: SELECT FEATURES YOU NEED.

NEW MFJ-945 HAS SWR AND DUAL RANGE WATTMETER. NEW LOWER PRICE

**\$69<sup>95</sup>**



Same as MFJ-941B but less 6 position antenna switch.

NEW MFJ-944 HAS 6 POSITION ANTENNA SWITCH ON FRONT PANEL. NEW LOWER PRICE

**\$69<sup>95</sup>**



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NEW MFJ-943 MATCHES ALMOST ANYTHING FROM 1.8 THRU 30 MHz. NEW LOWER PRICE

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Same as MFJ-941B, less SWR/Wattmeter, antenna switch, mounting bracket. 7x2x6 in.

## ULTRA COMPACT 200 WATT VERSA TUNERS FOR ALL YOUR NEEDS.

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Efficient 12 position air inductor for more watts out. Matches dipoles, vees, random wires, verticals, mobile whips, beams, balanced lines, coax. 200 watts RF, 1:4 balun, 5x2x6 in.

MFJ-900 ECONO TUNER MATCHES COAX LINES/RANDOM WIRES. NEW LOWER PRICE

**\$39<sup>95</sup>**



Same as MFJ-901 but less balun for balanced lines. Tunes coax lines and random lines.

MFJ-16010 RANDOM WIRE TUNER FOR LONG WIRES. NEW LOWER PRICE

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1.8 thru 30 MHz. Up to 200 watts RF output. Matches high and low impedances. 12 position inductor. S0-239 connectors. 2x3x4 inches. Matches 25 to 200 ohms at 1.8 MHz. Does not tune coax lines.

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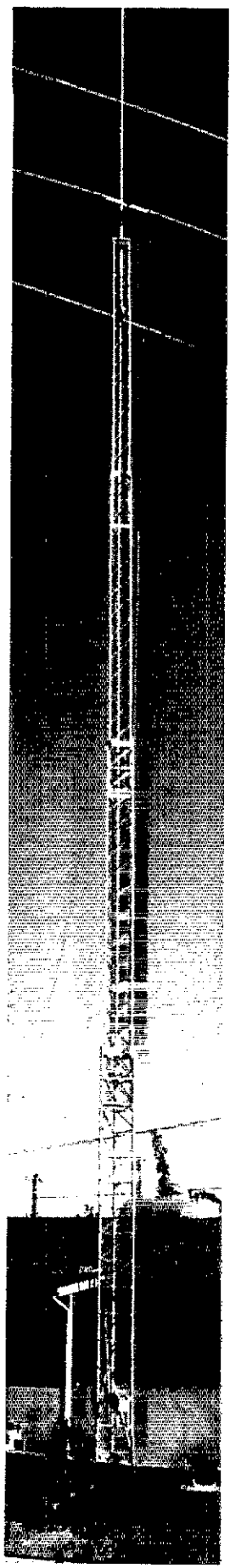
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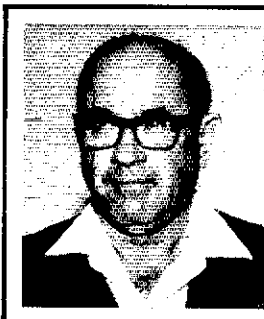
Tower Master's new self-supporting, crank-up TMZ-471 is the tower of the year.

It's taller.  
It's bigger.  
It's stronger.

It's one of an all new line of hot-dipped galvanized steel towers made expressly for HAM Operators now available from Tower Master. Made to meet the demanding requirements of today's modern equipment. And if you're a HAM, you know what we mean.

Like Tower Master's TMZ-HD-554 and -571, with top section OD's of 15 inches to easily accommodate the new "Tail Twister" CDE rotor.

Or try the TMM-HD-554 and -571 series from Tower Master, with top section OD's of 14-3/4 inches. These freestanding crank-ups will also hold the "Tail Twister."



**THE MAN BEHIND THE TOWER**  
His name is folklore in the tower industry. One of the giants of tower design. Maybe you recognize him. He's Lou Tristao. We asked him to design the TMZ-471 for Tower Master. We like what he's come up with. You will, too.

That's why we call the increasingly popular TMZ-471 the tower of the year! We are convinced it really is. You will be, too. Just write — or call — Tower Master today. Lou may answer the phone. Do it now.

Or, see your dealer today.

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## TOWER MASTER

UPN\* 3922 2100 Dy 653 74 35  
MNN\* 3722 2130 Dy 307 62 31  
WSSBN 3935 2300 Dy 713 57 31  
BR 3930 2130 M-Sa 355 27 30  
MEN 3930 1300 Su 159 4 4  
VHF LOCAL NETS: 16 Reports 916 18 63

\*NTS Section nets. QMN operators sent messages during Michigan week to State Governors all over the country on behalf of Michigan's Gov. Milliken. The project was coordinated by K8KMO. Local Net Certificates (May QST page 51) are now being issued. Local Net Managers should contact the STM for information. There will be two ARPSC workshops again this fall. The first will be in Escanaba on Aug 25 and the Lansing session will be Sept. 15. Amateurs interested in emergency and traffic communications are encouraged to attend. Mich-A-Con ARC at Iron Mountain amateurs used 2-meters to assist authorities in a search for a 15 year old youth believed drowned. Field appointments: W0MVR/8, OO-11, WDBARC, EC for Lenawee Co. N8AZM, EC for Iosco Co. WBBBGY, EC for Jackson & Hillsdale Co. K8BGC, EC for Wexford and Missaukee Co. W8BFLK, EC to coordinate the communications to the National Weather Service from the 8 county area in Southeastern MI. W8BKA, EC for Mecosta Co. W8BQAF, EC for Macomb Co. W8DQO, EC for St. Joseph Co. W8BUIN, EC for Genesee Co. W8VBZ, EC for Keweenaw Co. QMS reports from W8NOH, W8WHL, CO reports from K8JH and W8QO. OBS reports: NBAG W8BDJS, K8NKB W8ARN, W8SOP AC8Y. I am very sorry to report the following Silent Key in the MI Section: W8WZL. The SEC, W8EFK, reports that the ARES membership in the Section has reached the 2000 mark for an all time record! Traffic: W8BMTD 303, W8VPW 301, K8DTG 201, W8BKZX 196, K8RV 176, K8KMQ 163, W8BKA 145, W8DLRT 143, W8BRY 116, W8BNON 107, K8LNE 103, W8MPD 103, W8BZY 86, W8NOH 83, W8EGQ 81, W8ADHB 78, W8PDP 76, AF8V 72, W8HX 60, K8BAI 57, W8SOP 55, N8ABA 54, W8AKY 54, W8HIT 54, K8EO 53, W8VQ 49, W8CUP 48, W8B 47, W8LST 47, W8BLY 47, W8B 44, W8BGC 43, W8BOS 39, W8BCSA 34, W8BSYA 31, W8HIN 27, W8VZ 27, K8ZJU 25, K8DY 21, K8GXV 20, W8BDJS 18, W8BIV 18, K8CPS 16, W8TBP 16, W8MJB 15, W8BPL 14, W8FXR 13, K8DMJ 12, K8BFK 12, W8BYG 11, K8BZ 11, W8BNN 10, K8UPE 10, W8XJ 9, W8UPL 9, W8BEK 8, AC8F 8, W8PBO 8, W8WVV 8, W8WJO 8, W8AFO 7, W8LDS 7, W8BVF 6, W8BVF 6, W8GJ 5, K8DD 4, W8IXZ 4, W8JUP 4, K8JED 4, W8NJO 4, K8NKB 4, W8QO 4, N8AOA 3, W8AXF 3, W8HKL 3, W8BUJ 2, W8FSZ 2, K8BBS 2, W8WV 2, W8BIEK 1, W8BIA 1.

OHIO: SCM, Harold C. Chapman, W8BJGW — Asst. SCMS: W8BMC R W8TP NAVY. SEC: K8AN, NM: AF8A K8AE W8BKW W8BKWD W8BOMQ W8B5GW. Net reports (May)

Net	QNI	QTC	Sess.	Time (Local)	Freq.
BN	573	273	30	6:45/10 PM	3.577
BNR	136	272	31	6 PM	3.605
QNN	85	20	24	6:30 PM	3.708
OSN	208	107	30	6:10 PM	3.577
OSSBN	2378	747	93	10:30AM/4:15 & 5:45 PM	3.9725

06mN 473 49 31 9 PM 50.160

Congratulations! Thanks a heap! The results of the first session of SET '79 are in and they indicate that a lot of planning, effort and air time was exerted from all corners of the section. Even though it's not a contest (they keep telling us) the total figures reflect an increase of activity and emergency preparedness, which after all is the name of the game. It shows that this section is going to be pretty well prepared when the real thing comes along again. Anticipating October; if you were a NM or an EC who did not submit the required brief report for the January session, please take time to do so following the October session. Your figures, no matter how small you think they might be, are important in the overall picture. Let's EXCEED JANUARY'S figures. The "Buckeye Bull" is back in print again due to the efforts of the Ohio Council of Amateur Radio Clubs. If you have information which you would like to pass onto others via the "Bull" please forward it typewritten to K8HLJ for one of the subsequent quarters. If you feel that you should be receiving the "Bull" through your club, or individually, please forward a note or QTC to K8HLJ. In addition, urge your club to participate in the Council - it's a good way to promote your thoughts and ideas to Newington and to provide your club with information on what Newington is doing. Keep in mind that YOU are the ARRL. Appointments: AF80 as Asst. SCM for Official Bulletin Stations replacing NAVY who has been attending school and is awaiting assignment as a "sparks" on the high seas. Thanks and good luck. K8AAZ as BN manager to replace K8AE who was forced to resign due to family health problems. Hope things continue to improve. QTS: W8ENI K8C Local net reports: BRTN - QNI 325, QTC 78, Sess. 31; COARES - QNI 119, QTC 25, Sess. 5; EOTN - QNI 125, QTC 35, Sess. 26; Huron Co. RC Net - QNI 39, QTC 13, Sess. 4; T8RAC - QNI 669, QTC 99, Sess. 25; Van Wert Co. Emerg. Net - QNI 34, QTC 2, Sess. 4. Your SCM needs info on license upgrades, Silent Keys and events of interest. Don't forget the Ohio OSO party August 25 and 26, 2 PM to 12 PM EDT each day. Details elsewhere in QST. Traffic: (May) K8AAZ 419, W8BKWD 355, W8PMJ 321, W8ENI 262, W8BOMQ 196, K8BYR 187, W8AGMT 181, W8BVTs 140, W8BHG 131, K8GQ 12, W8BDTG 9, K8BAN 89, W8BSY 7, W8B 7, W8BL 7, W8B 7, W8BIEK 7, W8BMOK 70, K8AE 66, W8BSIQ 66, N8TM 63, W8BJGW 61, K8PE 60, W8BSRC 60, W8BKW 55, W8LPP 65, W8BTRK 63, W8QZK 51, W8BYTD 48, W8WEG 41, W8TH 37, W8TP 37, W8BQMP 36, K8CKY 33, W8GGX 33, K8RC 33, W8BYGW 33, W8BINK 28, W8BPIY 28, K8OZ 27, W8BYTI 27, W8DJT 26, W8SED 26, AF8A 25, W8BCCJU 25, W8BMAZ 23, W8BOYK 23, W8BQZM 23, W8BHM 20, N8JR 20, W8BKFN 20, N4VY 20, W8BJK 19, A8BP 18, W8BWHF 17, W8BPEI 16, W8BQHV 16, W8BPPQ 15, W8VT 15, N8AKS 14, W8BPUH 14, K8BBOE 12, W8BMKC 11, W8BML 10, W8BCKX 10, W8DL 9, W8RG 9, K8CYX 8, W8BQH 8, W8BTSX 8, W8BWN 8, N8AUC 7, W8BHL 6, W8BUDA 6, W8ADIP 5, K8BFU 5, W8BM 5, N8AUH 5, AF80 5, W8BYTO 5, W8BKKI 4, W8BNI 4, W8BNT 3, W8BOTO 3, W8BRUW 3, W8XT 3, W8BIL 2, W8BYUS 2, W8BEKI 1, K8BGM 1. (Apr.) W8BOYK 8.

**HUDSON DIVISION**  
EASTERN NEW YORK: SCM, Guy L. Olinger, K2AV — SEC: W8ZVUK, STM: W8ZPL, ASGM: W8BZUG W8ZCOY W2IT W8ZKOC, NM: W2CS W2WSS K8JG W8ZOOH. Nets: NYPON 5 PM 3913, ESS (slow) 6 PM 3590; NYSPTEN 6 PM 3926, NYS 7 & 10 PM 3677; HVN 6:45 & 7:30 PM M/F 3797; SDN 6:45 & 9:30 PM S/T/T 68106

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**SAME DAY SHIPMENT ON MOST ORDERS**

RX28C Kit	28-35 MHz FM receiver with 2 pole 10.7 MHz crystal filter	\$ 64.95
RX28C W/T	same as above-wired & tested	129.95
RX50C Kit	30-60 MHz revr w/2 pole 10.7 MHz crystal filter	64.95
RX50C W/T	same as above-wired & tested	129.95
RX144C Kit	140-170 MHz revr w/2 pole 10.7 MHz crystal filter	74.95
RX144C W/T	same as above-wired & tested	131.95
RX220C Kit	210-240 MHz revr w/2 pole 10.7 MHz crystal filter	74.95
RX220C W/T	same as above-wired & tested	131.95
RX432C Kit	432 MHz revr w/2 pole 10.7 MHz crystal filter	84.95
RX432C W/T	same as above-wired & tested	142.95

## RECEIVERS



SRX150 Kit	High performance, single board, 144 MHz revr w/4 pole crystal filter	94.95
RXCF	accessory filter for above receiver kits gives 70 dB adjacent channel rejection	9.95
RF28 Kit	10 mtr RF front end 10.7 MHz out	13.50
RF50 Kit	6 mtr RF front end 10.7 MHz out	13.50
RF144D Kit	2 mtr RF front end 10.7 MHz out	18.50
RF220D Kit	220 MHz RF front end 10.7 MHz out	18.50
RF432 Kit	432 MHz RF front end 10.7 MHz out	29.50
IF 10.7E Kit	10.7 MHz IF module includes 2 pole crystal filter	29.50
FM455 Kit	455 KHz IF stage plus FM detector	18.50
AS2 Kit	audio and squelch board	16.00

TX50 Kit	transmitter exciter, 1 watt, 6 mtr	44.95
TX50 W/T	same as above-wired & tested	71.95
TX144B Kit	transmitter exciter-1 watt-2 mtrs	34.95
TX144B W/T	same as above-wired & tested	65.95
TX220B Kit	transmitter exciter-1watt-220 MHz	34.95

## TRANSMITTERS



TX220B W/T	same as above-wired & tested	65.95
TX432B Kit	transmitter exciter 432 MHz	49.95
TX432B W/T	same as above-wired & tested	87.95
TX150 Kit	300 milliwatt, 2 mtr transmitter	24.95
TX150 W/T	same as above-wired & tested	43.95

PA2501H Kit	2 mtr power amp-kit 1w in-25w out with solid state switching, case, connectors	69.95
PA4010H Kit	2 mtr power amp-10w in-40w out-relay switching	69.95
PA50/25 Kit	6 mtr power amp, 1w in, 25w out, less case, connectors & switching	59.95
PA144/15 Kit	2 mtr power amp-1w in-15w out-less case, connectors and switching	49.95
PA144/25 Kit	same as PA144/15 kit but 25w	59.95
PA220/15 Kit	similar to PA144/15 for 220 MHz	49.95
PA432/10 Kit	power amp-similar to PA144/15 except 10w and 432 MHz	59.95
PA9610 W/T	144 MHz, 100 w, repeater amp. incl. power supply	549.95
PA9611 W/T	220 MHz, 90 w, repeater amp. incl. power supply	549.95

## POWER AMPLIFIERS



PA9612 W/T	432 MHz, 70 w, repeater amp. incl. power supply	579.95			
Blue Line	RF power amp, wired & tested, emission-CW-FM-SSB/AM				
	Model	Band	Power Input	Power Output	
	BLC 10/70	144 MHz	10W	70W	159.95
	BLC 2/70	144 MHz	2W	70W	184.95
	BLC 10/150	144 MHz	10W	150W	269.95
	BLC 30/150	144 MHz	30W	150W	249.95
	BLD 2/60	220 MHz	2W	60W	189.95
	BLD 10/60	220 MHz	10W	60W	169.95
	BLD 10/120	220 MHz	10W	120W	269.95
	BLE 10/40	420 MHz	10W	40W	169.95
	BLE 2/40	420 MHz	2W	40W	219.95
	BLE 10/80	420 MHz	10W	80W	289.95

PS15C Kit	15 amp-12 volt regulated power supply w/case, w/fold-back current limiting and overvoltage protection	99.95
PS15C W/T	same as above-wired & tested	134.95
PS25C Kit	25 amp-12 volt regulated power supply w/case, w/fold-back current limiting and overvoltage protection	139.95
PS25C W/T	same as above-wired & tested	169.95
PS25M Kit	same as PS25C with meters	159.95

## POWER SUPPLIES



PS25M W/T	same as above-wired and tested	189.95
O.V.P.	adds over voltage protection to your power supplies, 15 VDC max.	14.95
PS3A Kit	12 volt-power supply regulator card with fold-back current limiting	11.95
PS3012 W/T	new commercial duty 30 amp 12 VD regulated power supply w/case, w/fold-back current limiting and overvoltage protection	274.95

RPT50 Kit	repeater-6 meter	599.95
RPT50	repeater-6 meter, wired & tested	899.95
RPT144 Kit	repeater-2 mtr-15w-complete (less crystals)	599.95
RPT220 Kit	repeater-220 MHz-15w-complete (less crystals)	599.95
RPT432 Kit	repeater-10 watt-432 MHz (less-crystals)	649.95
RPT144 W/T	repeater-15 watt-2 mtr	899.95
RPT220 W/T	repeater-15 watt-220 MHz	899.95
RPT432 W/T	repeater-10 watt-432 MHz	949.95

## REPEATERS



DPLA50	6 mtr close spaced duplexer	680.00
DPLA144	2 mtr, 600 KHz spaced duplexer, wired and tuned to frequency	409.95
DPLA220	220 MHz duplexer, wired and tuned to frequency	409.95
DPLA432	rack mount duplexer	379.95
DSC-U	double shielded duplexer cables with PL259 connectors (pr.)	29.95
DSC-N	same as above with type N connectors (pr.)	34.95

## REPEATER BASE STATIONS

RB50 W/T	50 MHz repeater base station w/autopatch	2,355.00
RB144 W/T	144 MHz repeater base station w/autopatch	2,085.00
RB220 W/T	220 MHz repeater base station w/autopatch	2,085.00
RB432 W/T	432 MHz repeater base station w/autopatch	2,105.00



## OTHER PRODUCTS BY VHF ENGINEERING

CD1 Kit	10 channel receive xtal deck w/diode switching	\$ 8.95
CD2 Kit	10 channel xmit deck w/switch and trimmers	16.95
CD3 Kit	UHF version of CD1 deck, needed for 432 multi-channel operation	14.95
COR2 Kit	carrier operated relay	23.95
SC3 Kit	10 channel auto-scan adapter for RX with priority	21.95
CWID Kit	159 bit, field programmable, code identifier with built-in squelch tail and ID timers	42.95
CWID	wired and tested, not programmed	59.95
CWID	wired and tested, programmed	64.95
TD3 Kit	2 tone decoder	39.95
TD3 W/T	same as above-wired & tested	64.95
HL144 W/T	4 pole helix resonator, wired & tested, swept tuned to 144 MHz ban	34.95
HL220 W/T	same as above tuned to 220 MHz ban	34.95
HL432 W/T	same as above tuned to 432 MHz ban	34.95

## AUTO PATCHES

RA300 W/T	Amateur autopatch w/power supp.	299.95
RA500W/T	Full duplex, same as above	895.00

## ATV TRANSMITTER

TVX10 W/T	UHF fast scan tv transmitter w/power supply	399.95
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# NEW! MFJ INTRODUCES THE GRANDMASTER MEMORY KEYERS

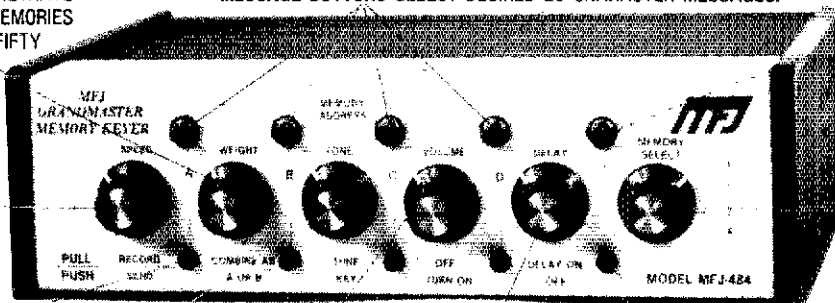
At \$139.95 this MFJ-484 GRANDMASTER memory keyer gives you more features per dollar than any other memory keyer available — and Here's Why . . .

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

**MESSAGE BUTTONS SELECT DESIRED 25 CHARACTER MESSAGES.**

**RESETS MEMORY IN USE TO BEGINNING.**

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



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

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

**TONE CONTROL. PULL TO TUNE.**

**VOLUME CONTROL. POWER ON-OFF.**

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

**LED INDICATES DELAY REPEAT MODE.**

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

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

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

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

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

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

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

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

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

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

**PLUS A MFJ DELUXE FULL FEATURE KEYER.** Iambic operation with squeeze key. Dot-dash insertion.

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

All controls are on front panel: speed, weight, tone, volume. Smooth linear speed

control. 8 to 50 WPM.

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

Tone control. Room filling volume. Built-in speaker.

Tune function keys transmitter for tuning.

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

**OPTIONAL SQUEEZE KEY**

for all memory keyers. Dot and dash paddles have fully adjustable tension and spacing for the exact "feel" you like. Heavy base with non-slip rubber feet eliminates "walking". \$29.95 plus \$2.00 for shipping and handling.



**THIS MFJ-482 FEATURES FOUR 25 OR A 50 AND TWO 25 CHARACTER MESSAGES.**

- Speed, volume, weight, tone controls
- Combine memory switch
- Repeat, tune functions
- Built-in memory saver

**\$99<sup>95</sup>**



Similar to MFJ-484 but with 1024 bits of memory, less delay repeat, single memory operating LED. Weight and tone controls adjustable from rear panel. 6x2x6 inches. 110 VAC or 12 to 15 VDC.

**THIS MFJ-481 GIVES YOU TWO 50 CHARACTER MESSAGES.**

- Repeat function
- Tune function
- Built-in memory saver

**\$79<sup>95</sup>**



Similar to MFJ-482 but with two 50 character messages, less weight controls. Internal tone control. Volume control is adjustable from rear panel. 5x2x6 inches. 110 VAC or 12 to 15 VDC.

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Order any product from MFJ and try it. If not delighted, return within 30 days for a prompt refund (less shipping).

Order today. Money back if not delighted. One year unconditional guarantee. Add \$2.00 shipping/handling. For technical information, order/repair status, in Mississippi, outside continental USA, call 601-323-5869.

Order By Mail or Call TOLL FREE 800-647-1800 and Charge It On

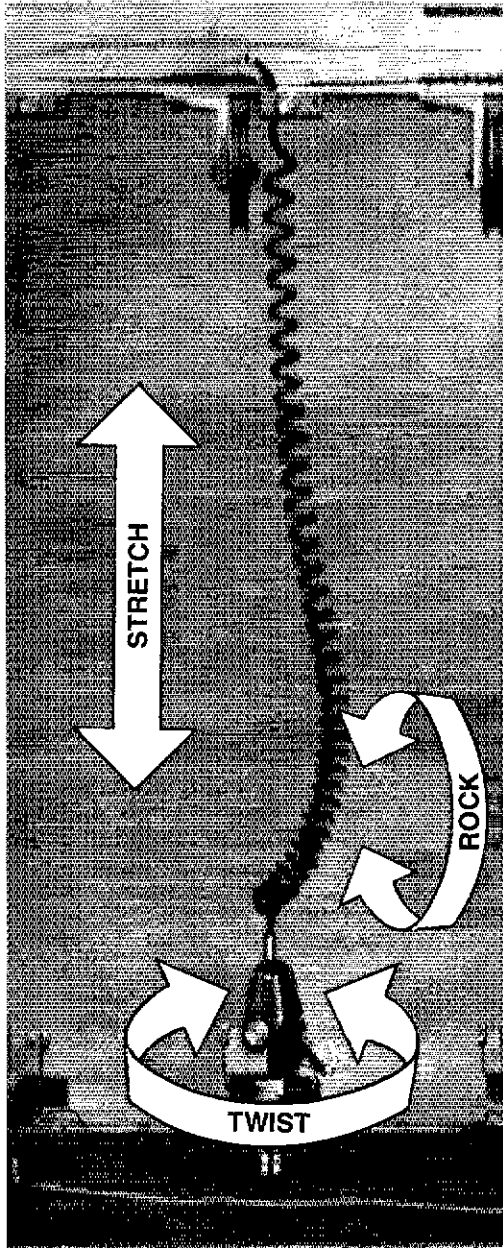


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# fact: our quality assurance is your performance insurance.

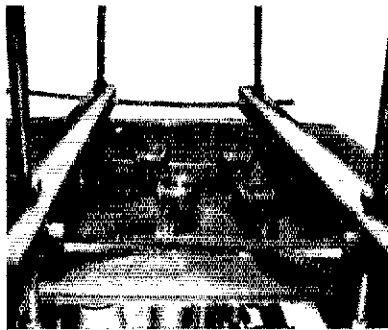


Originally designed for battlefield ruggedness, the microphone elements in Shure mobile and communications microphones offer unequaled reliability. Our quality control engineers anticipate the worst possible field conditions. These microphones have been subjected to the most rigorous tests in the industry, including six-foot drops onto hard floors; violent vibration tests; temperature variation tests ranging from a bitter -54°F. to a searing 185°F., and 100% humidity tests. We've even dragged them behind automobiles on open roads and subjected them to a battery of corrosion tests. And yes, they really work after all that!

### Exclusive Three-Way Flex Tester

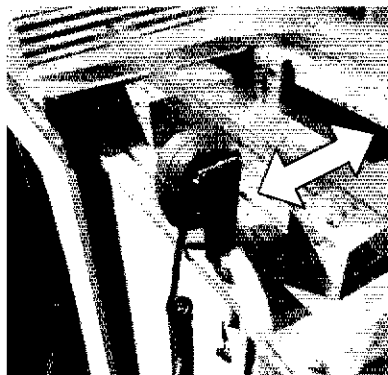
Shure knows that the single most common cause of microphone malfunction is failure of the cord. An exclusive Shure-designed story-and-a-half tall microphone cord tester dishes out more abuse than the average microphone gets in a lifetime.

Stretch, rock, and twist: first, the cord tester stretches the microphone to the full length of the cord. Then it simultaneously rocks the microphone 270° at the end of the cord while it gives the microphone a violent 90° twist in two directions. And this goes on day after day!



### 3-D Shake Tester

A microphone that fails spells disaster for a mobile communications system. Every Shure microphone is designed to withstand hours in our brutal 3D Shake Tester — simulating years of driving over rough, bumpy roads.



### Million-Cycle Switch Tester

Another abused microphone component is the switch. Shure-designed long-life leaf switches operate with a wiping action that resists the buildup of corrosion and dirt. And Shure's ongoing tests show that they continue to make contact reliably and positively after *one million switching operations*.



mobile communications microphones

**SHURE**®

Shure Brothers Inc., 222 Hartrey Ave., Evanston, IL 60204 In Canada: A. C. Simmonds & Sons Limited  
Manufacturers of high fidelity components, microphones, sound systems and related circuitry.

The name  
Shure Brothers Inc.  
on the back of your  
mobile microphone  
is your assurance  
of proven quality  
and reliability.

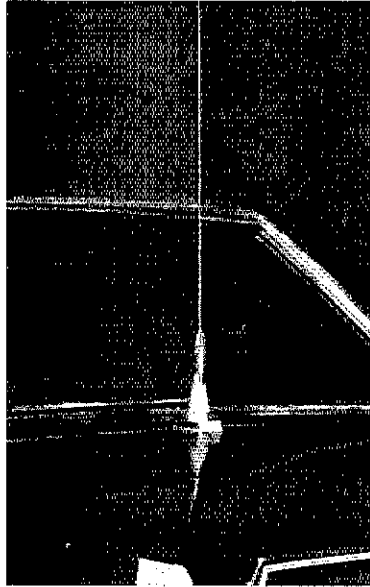
# Decibel offers more in the Amateur bands!

- 144 to 148 MHz
- 220 to 225 MHz
- 442 to 449 MHz

Whichever band you're operating in, depend on Decibel to provide your best combination of quality and performance. We supply mobile and base station antennas and duplexers in the frequencies where you need them. Any repeater's operation and performance will be improved by upgrading to Decibel's 30-year tradition of quality.

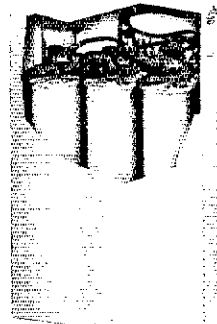
## MOBILE GAIN ANTENNAS

Decibel offers two outstanding series of mobile antennas designed to provide the utmost in performance, reliability and durability. The Decision series, illustrated, features space-age styling plus traditional quality for roof or trunk attachment. Standard, no-hole or magnetic mounting is offered with or without springs. The Classic series, proven over the years, continues a tradition of quality and performance.



## BROAD BAND GAIN ANTENNAS

Decibel's base station antennas are rugged and include built-in protection against lightning damage. For extreme resistance to environmental factors, they're constructed using our exclusive Vapor-Bloc® weather resistant cable. They feature high gain and are factory adjusted for minimum VSWR over a wide frequency range. Easy to install . . . and easy to buy . . . from Decibel.



## DUPLEXERS

Duplexers from Decibel are available in 4- or 6-cavity models, with the enclosure offered optionally. We offer industry's broadest choice of models.

## WHATEVER YOUR REQUIREMENTS FROM 30 TO 960 MHz, DECIBEL'S GOT YOU COVERED.

Decibel offers multiple products that have made us leaders in the commercial RF market.

- Base station antennas
- Cavities and filters
- Duplexers
- Mobile antennas
- Isolators and circulators
- Hybrid couplers
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MW/F 615/015; NET (slow) 8 PM MW/F 3732. Got a nice letter from WB2PID at W2SZ. RP1 gang active on NYSPTEP these days. W2CS has a new 10m mir beam up. See should make a difference in the SS. (OH, jealousy, . . .) Also congrats to him for winning the code contest at Rochester at 45 wpm. Congrats to WA2OTC on his medallion BPL. You emergency prep folks in Putnam County check with WA2ZSG, EC. By this printing Putnam repeater WA2URH/R should be up on 53/13. Tnx WA2URH for lotsa hard work. Note that SDN running alternate nites on WR2AGI & WR2AIS. We have a new net, Northeast Training Net MW/F 8 PM local up in the Novice band, 3732. W2ZOJ and WA2MFV in charge. Hope all you straight key guys show up & help out. The call up is "NET". Imagine, a net called "NET". PSHR May: WA2SP1, W2YJR, WB2QOH, WB2KDC, Traffic (May) WA2SPL 1258, WB2KDC 154, W2CS 102, W2YJR 84, K2AY 75, AD2X 57, WA2OTC 57, WB2QOH 39, WB2HDO 28, N2EF 28, K2MI 23, WA2MZJ 23, WA2ZSG 21, WB2ZCM 20, W2EFU 14, WA2CJY 12, WB2KHK 11, AA2Y 11, W2SZ 10, W2IQK 4, WA2EQW 3. (Apr.) WA2OTC 588, WB2ZCM 48, WB2KHE 1.

NEW YORK CITY — LONG ISLAND: SCM, Paul A. Lindgren, WA2UWA — Asst. SCM: Stephen H. Bloom, WB2IDP. STM: WB2BNY. NM: WB2LIG NM/ASCM: WB2EUF. The following are traffic nets in and around the section.

Net	Time/Day	Freq.	Manager
NLI*	1900 Dy	3710	WB2EUF
NLI*	2200 Dy	3630	WB2EUF
NLIPN*	1730 Dy	3928	WB2LIG
ESS	1800 Dy	3590	WB2EUF
NETN	2000MWF	3732	WB2EAG
Clear House	1100 Dy	3925	WB2EAG
Mike Farad	1300 Dy	3925	WA1LAD
NYSPTEP	1800 Dy	3925	W2GLH
BATN	2000 M-F	146.40/147.00	K2ACNN

\*Denotes section net, all times local. Two new nets this month, the North Eastern Training net which meets Mon Wed, and Fri on 3732. For information contact WB2EAG. Another net is the Big Apple Training net. This net meets Mon through Fri at 8 PM local on WR2ADN 146.40/147.00. For more information contact KA2CNN. Crack 00 N2NT officially observed Field Day from an observatory in Northern New Jersey. Congratulations to new Novices KA2WPK and KA2FBX. WB2HQ made it over the plateau and now has 105 countries. EC reports received from N2EM WA2SUB and WB2LOU. Section activities going down as warm weather beckons and our OMs thoughts turn to YLs and our YLs thoughts turn to OMs! WB2ZB gave a very interesting talk on computers and microprocessors at the May Suffolk County Radio Club meeting. 00 N2LI found over 70 poor quality signals on the bands this month. All operators should check their signals occasionally to make sure they are clean. The rain gods did not look kindly on the LIMARC hamfest this year. Congratulations to KA2AGG who upgraded to General. WB2QY, who is the harmonic of WA2TFI, also upgraded to General. WA2CX had surgery and is now recovering nicely. WA2SXW/R became W2LJR effective July 1. LIMARC puts out extremely fine professional looking bulletin. As usual your SCM received many Field Day messages. Any stations who have appointments up for renewal it is your responsibility to send in your renewal. Huntington High School Radio club station WB2TKV planning to buy all new equipment for the 1979-80 school year. Remember to support your local traffic and ARES nets. Traffic: (May) W2GKZ 252, WA2UWA 204, WB2EUF 133, K2GCE 111, WB2LIG 83, WB2HQ 76, WA2USJ 23, WB2DCJ 16, WB2IDP 13, N2LI 11, N2NT 2. (Apr.) WB2BNY 158, N2EM 107, K2LIE 41, WA2USJ 18.

NORTHERN NEW JERSEY: SCM, Robert Neukomm, WA2MVC — SEC, W2ZJF. NM: W2ZJF. NMs: AF-2L, K2VX, WA2LVH, WB2RMI, WA2OPJ, W2PSU & W2UEZ.

Net	Mgr	Freq.	Time/Days	Sess	QNIQSP
NJN	A2L	3695	7 P Dy	31	395 349
NJN	AF2L	3695	10 P Dy	31	283 242
NJPN	K2VX	3950	6 P Dy	35	650 353
			9 A Su		

UCEN	WB2RMI	146.085/685		31	280 90
OBTN	WA2OPY	147.72/12	8 P Dy	31	380 67
NJSN	W2UEZ	3735	6:30 P Dy	29	165 48
NJVH	WA2LHV	49/49	10 P Dy		
NJRTTY	W2PSU	145.7	7 P Dy		

WB2WFL from Tech to General. Union County ARES provided communications for Cranford Citizens and Cranford Physical Fitness Run June 3. WB2RMI coordinated the operations. W1AW checked into NJPN May 28 - afterwards worked many stations to issue QSL cards. OK, now how about W1AW checking into NJN - we'd like to hear your "list"! Cranford ARS was in Field Day along with the following known clubs: Tri-County, BAHA, 550 Club, Englewood ARC - didn't hear from any others prior so let's hear from the clubs that participated. All Union County Red Cross chapters advised UCETN capability and have been given phone and address list of UCETN members. Other repeaters take note! AF2L is chasing DX. Logged the 150 DXCC sticker recently. He also qualified for the CODX/GVW operations during recent Armed Forces Day and also with recent DX-expitions. Watch that band edge! W2XD reports a new 11-element 2-M beam & a 20M dipole up at 60 ft. WB2RMI reports getting a new 50 ft tower for his AT834. Traffic: N2CR 530, W2RQ 387, WB2RMI 273, K2VX 210, WB2TOM 228, W2SQ 169, AF2L 164, WA2MVO 148, W2UEZ 140, AG2R 108, W2ZEP 95, WA2OVE 92, WB2RMIJT 90, N2IC 79, WB2HSG 68, N2NS 63, W2XD 61, WB2MCO 56, WB2CNF 54, WB2KTRT 43, KB2HM 38, WB2QOT 36, W2UH 30, W5DTR 25, WA7DPK 24, K2PH 20, K2NJ 18, WA2QV/R 18, WB2KLF 15, K2ZF 12, W2CC 11, N2TM 8, W2CU 7, WA2DLZ 6, W2CVV 4, W2NR 4, W2TCA 3, WB2STW 2.

## MIDWEST DIVISION

IOWA: SCM, Max R. Otto, W0LFF — SEC, W0IYW Aug will have two happenings. The Des Moines Ham-Computer Fest at Vet's Auditorium on the 18th and 19th. Hickory Hills Park south of Waterloo will be the scene of

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- Linear Converter for SSB, CW, FM, etc.
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- Use low power tap on exciter or attenuator pad
- Easy to align with built-in test points
- Link with VHF RX converter for transceive

**KIT ONLY \$69.95**

MODEL	INPUT (MHz)	OUTPUT (MHz)
XV2-1	28-30	50-52
XV2-2	28-30	220-222
XV2-3	28-30 (26-28)	222-224 (220-222)
XV2-4	28-30	144-146
XV2-5	28-30	145-147
XV2-6	26-28	144-146
XV2-7	144-146	50-52
XV2-8	144-146	220-222

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MODEL	RF RANGE	OUTPUT RANGE
C28	28-32 MHz	144-148
C50	50-52	28-30
C50-2	50-52	144-146
C144	144-146	28-30
C145	145-147	28-30
C146	146-148	28-30
C146	144-146	26-28
C220	220-222	28-30
C220-2	220-222	144-146
C110	Any 2 MHz of Aircraft Band	26-28 or 28-30
C110-ELT	121.5 (121.6)	CB Chan 9 (17)



**UHF KIT ONLY \$34.95**

MODEL	RF RANGE	OUTPUT RANGE
C432-2	432-434	28-30
C432-5	435-437	28-30
C432-4	432-436	144-148
C432-7	427.25	61.25
C432-9	439.25	61.25

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- Fully shielded designs
- Double tuned circuits for spurious suppression
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<b>T50-150</b>	6-chan, 2M, 2W Kit	\$49.95
<b>T50-220</b>	6-chan, 220 MHz, 1 1/2W Kit	\$49.95
<b>T40/T20</b>	11-chan, 450 MHz, 200mW Kit	\$49.95

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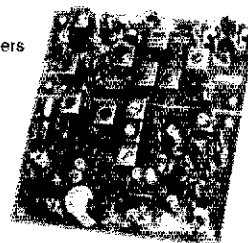
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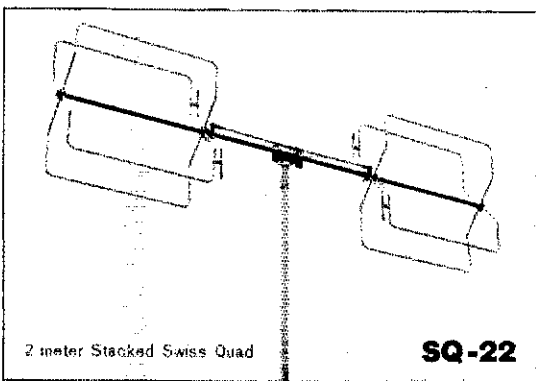
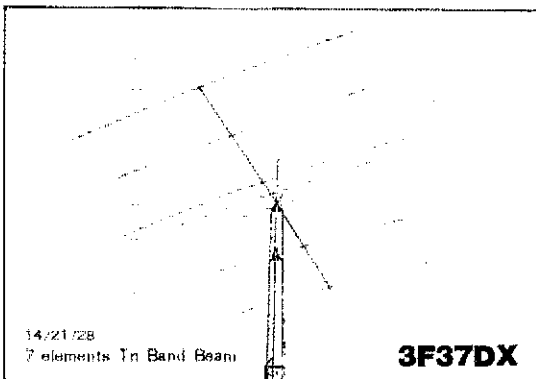
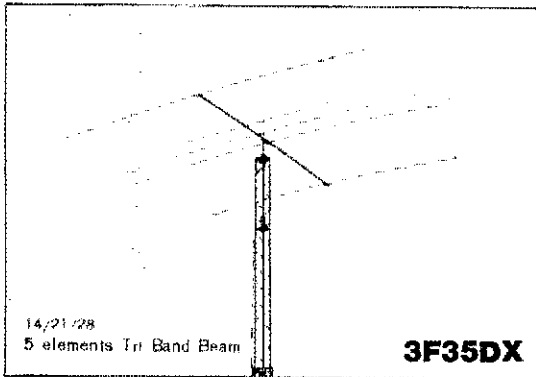
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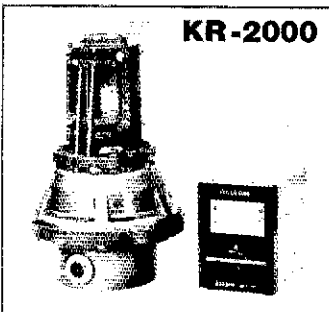
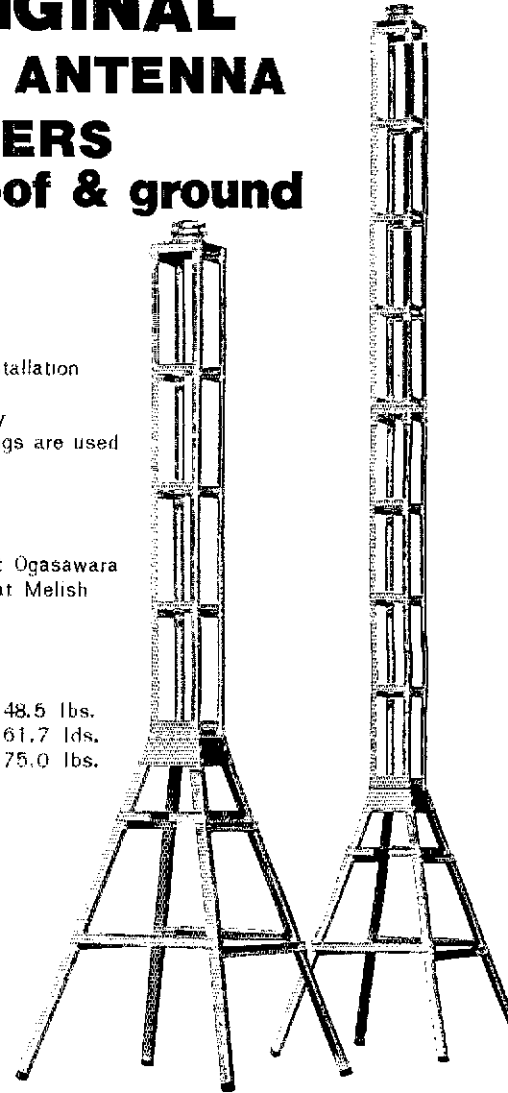
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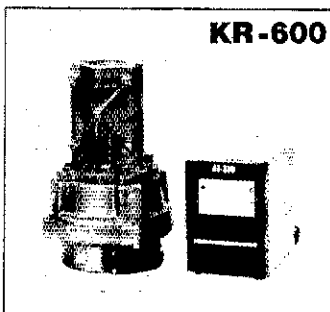
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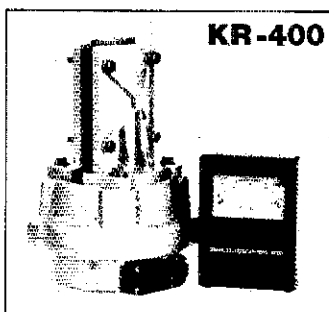
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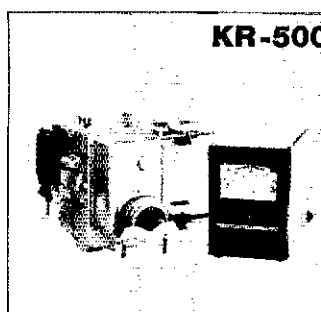
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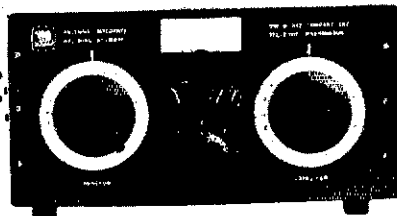


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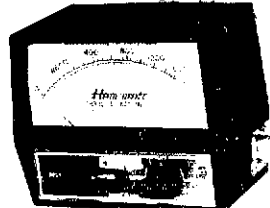
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10 watts	10A	10A	10A	10A	10A	10A	10A	10A
25 watts	25A	25A	25A	25A	25A	25A	25A	25A
50W	50H	50H	50H	50H	50H	50H	50H	50H
100Watts	100H	100H	100H	100H	100H	100H	100H	100H
250Watts	250H	250H	250H	250H	250H	250H	250H	250H
500Watts	500H	500H	500H	500H	500H	500H	500H	500H
1000Watts	1000H	1000H	1000H	1000H	1000H	1000H	1000H	1000H
2500Watts	2500H	2500H	2500H	2500H	2500H	2500H	2500H	2500H
5000Watts	5000H	5000H	5000H	5000H	5000H	5000H	5000H	5000H

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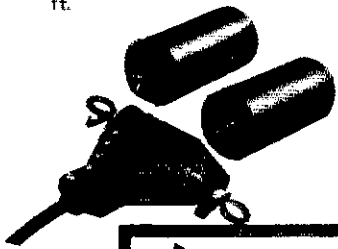
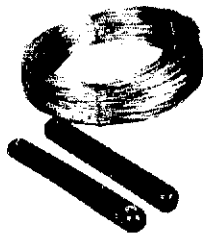


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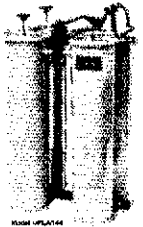
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the Iowa 75M Picnic on the 26th, WD5HZZ moved from Orion, to Humboldt. K0GVB has 312 countries with 301 confirmed. WA0KLD retired from Motorola. Sooland Repeater Assn. Officers: K0FTT, pres.; WB0WXH, treas.; K0AAR and K0ACF board members. In Mount Pleasant: WB0EVC, pres.; KA0BTE, vice pres.; WA0KLD, treas.; WD0ENR, secy; W0SWY, trustee; WB0VHB, ec. Alta welcomes KA0FU. KA0EY is new in Holstein. Congrats for upgrades go to: KA0ZK for Tech.; WB0WZ and KA0CDD for General; WA0FSA for advanced and WA0GQK for Extra. K0AAR and WB0TLD received Radar Endorsements. New equipment Dept: WB0VHB Stack-lives on 2M. K0CF 50 ft tower; WA0ALY SBE-34; WB0DKY HW-2036A; WB0SWQ WB0VHB and WD0ENR all have new Wilson MK-II HTs. Iowa has 98% on NTS-TEN via W0SS W0YRS K0GP N0SM WD0GDL AE0R AI0Q WB0PYD and WB0YRH. On DTE also 98% via WA0AUX and W0UPX. WB0TKH WB0SWD and W0UJ flushed the Bunny at Burlington in 40 minutes.

Net	Freq.	Time/2	Days	QNI	OTC Sess.
Iowa 75M	3970	1730	M-S	1240	58 27
Iowa 75M	3970	2300	M-S	871	62 27
TLCN	3560	2350	Dy	325	97 62

Iowa Code 3713 2359 M-W-F 50 24 13  
Traffic: WA0AUX 530, W0SS 185, W0YLS 165, K0GP 55, K0OFI 17, WB0AVW 14, W0LFE 14, W0BW 11, WD0HND 3, K0HCO 2. (Apr.) WB0PYD 32.

**KANSAS:** SCM, Robert M. Summers, K0BFX — SEC: W0KL. CW Net Mgr: W0FT. Phone Net Mgr: W0OYH. VHF Mgr: W0BSZS. Our incere sympathy is extended to the family of K0BTG on the recent death of his XYL and also to the family of WA0KDP. Congratulations are in order to WD0GZO who has recently earned his Eagle rank in the Scouting program. Missed quite a few of you at the Salina Hamfest this year. A lot of new faces though did enjoy the activities. New officers for the Johnson County ARC are: W0NDQ, pres.; W0RFA, v. pres.; WD0DZE, treas.; W0HJ, secy. The OKARC officers at Salina are: WD0BNC, pres.; K0BKD, v. pres.; AB0R, secy/treas.; and K0WA activities Mgr. We also understand that K0BKO is also the vice-Mayor of Salina. Net reports for May activities: KWN QNI 755, QTC 424; QKS QNI 414, QTC 158; KSBN QNI 1165, QTC 223, and KPN QNI 205, QTC 43. All activities seem to be slightly off—possibly due to band condx. Traffic: (May) WB0OBH 234, WD0ACG 146, W0FIR 108, W0HI 102, W0OYH 121, WA0LBB 67, W0CHJ 61, W0FT 46, WD0FBP 32, W0AM 28, K0BFX 26, W0PB 17, W0KL 15, W0RBO 10, K0KD 11, W0N 6, W0AOL 6, W0RT 3. (Apr.) W0RT 5.

**MISSOURI:** SCM, L. G. Wilson, K0RWL — Assistant SCM: Joe Flowers, W0OTF. SEC: WB0FFKY.

NET	QNI	OTC	NET	QNI	OTC
HBN	366	45	MON	242	272
MEOW	336	52	MON2	161	60
METN	125	123			

Due to the efforts of WB0NIE and AG0K, Missouri now has a Net newsletter. It deals with all net operations in the state. To help defray printing costs, etc., donations would be appreciated. Welcome to KA0ELU who recently transferred to Missouri. The Lamar picnic was hosted this year by W0HH and was a huge success. Congratulations to W0HH on a job well-done. Understand that WD0BEV has graduated into a top cw operator within a year. Those who are into cw realize what an accomplishment this is. Glad to hear that WA0ZHY is out of the hospital. Nobody seems to know why he was in but he is in good health now and on the air frequently. I regret to report the passing of W0GBJ to the ranks of the Silent Keys. He gave my brother and I our first tests and was a friend. He will be missed by everyone who knew him. Congratulations to W0OQ on obtaining 2nd Class Commercial license and these following new licensees: Novice: WB0TKA WD0CQC KA0S EAB EAJ EAK EAO through EAR FAZ EBM EBP EBS EBV EBY EAZ ECA ECN ECR ECU ECW EDB EDC EDJ EDJ DZO. Tech: N0S AV0 AVN AVQ. General: N0S AV0 AWA. Traffic: W0BMA 585, W0HH 214, W0BY 168, K0S 167, WB0SND 164, K0SSN 141, K0ONK 130, W0UOD 113, W0D 98, W0DFZ 85, W0ECE 52, W0GBJ 39, WB0DMC 38, K0RWL 15 and W0VTF 13.

**NEBRASKA:** SCM, Ed O'Donnell, WB0GWR — The Sandhills WX Net is discontinued for the summer. Another Field Day has been held and we hope Amateurs in NE developed some skills in emergency operations. The time is never forcast when we will be called upon for some emergency service. As this is my last report, I wish to thank the operators in NE for their cooperation. Thanks to the net managers, net controls and ECs throughout the state. All reports, news, & questions should be sent to your new SCM, Rex Greenwell, K0KPK, 1534 E. Street #11, Lincoln, NE 68508. NET REPORTS: Cornhusker Net, QNI 875, QTC 25, Mid-Nebr. ARES 2-Mtr Net, QNI 142c, QTC 1; Morning Phone Net, QNI 1301, QTC 118; Nebr. ARES 2-Mtr Net, QTC 1; Nebr. Storm Net, QNI 950, QTC 28; Pawnee ARC 2-Mtr FM Net, QNI 133, QTC 0; Platte Valley 2-Mtr Net, QNI 44, QTC 0; PM Net, QNI 177, QTC 15; OCWA Net, QNI 43, QTC 0; Sandhills Weather Net, QNI 44, D; Western Nebr Net, QNI 531, QTC 78. Traffic: W0VEA 106, K0AIE 85, W0FQB 40, K0BRS 31, WA0PCC 21, W0HOP 29, W0VYX 25, W0ZNI 22, WB0GWR 19, W0EUT 15, W0NIK 14, WA0EQ 11, W0HTA 9, WB0ROG 9, K0UHU 8, WB0GMO 7, W0LJO 5, K0-JT 4, W0WKP 4, W0YFR 4, K0SFA 3, WA0LOY 1.

**NEW ENGLAND DIVISION**  
**CONNECTICUT:** SCM, William J. Pace, W1ID — SEC: W1SY. STM: WB1AID. Nms: WA1LOU K1EIR K1EIC WA1ELA WB1CPF.

Net	Freq.	Time/Days	Sess.	QNI	OTC
CN	3640	1900/2200	Dy	82	447 339
CPN	3965	1800	M-S	31	465 192

Net	Freq.	Time/Days	Sess.	QNI	OTC
Nutmeg	2888	2130	Dy	31	431 119
WEXCON	7818	2030	Dy	31	632 109
Rason	1373	2100	M-W-F-Su		

Hi QNI CN: WB1CPF W1WP W1EFW WA1UUA K1GF. Hi QNI CPN K1CD W1HJM AD10. Congratulations to WA1LOU and WB1AIE who both made DXCC. WB1AIE also sports the 20 country sticker! WB1CPF is net manager of our newest net, HASON which covers the Norwich-New London area. Welcome to WB9FVG1 who just moved into the area from IL. WDFT active in a number of areas...main man for long haul out of W0SCNI working hard to get ARES going in SE Conn area! That's 43 traffic totals for month ever! WA1RLV traffic totals suffering but the farming sure helps his tan. W1QV traffic totals down because of heavy social load! WB1AIE out of business on two with a defunct rig, but his low band efforts moving forward! It would seem:

## Do you remember your first QSO?

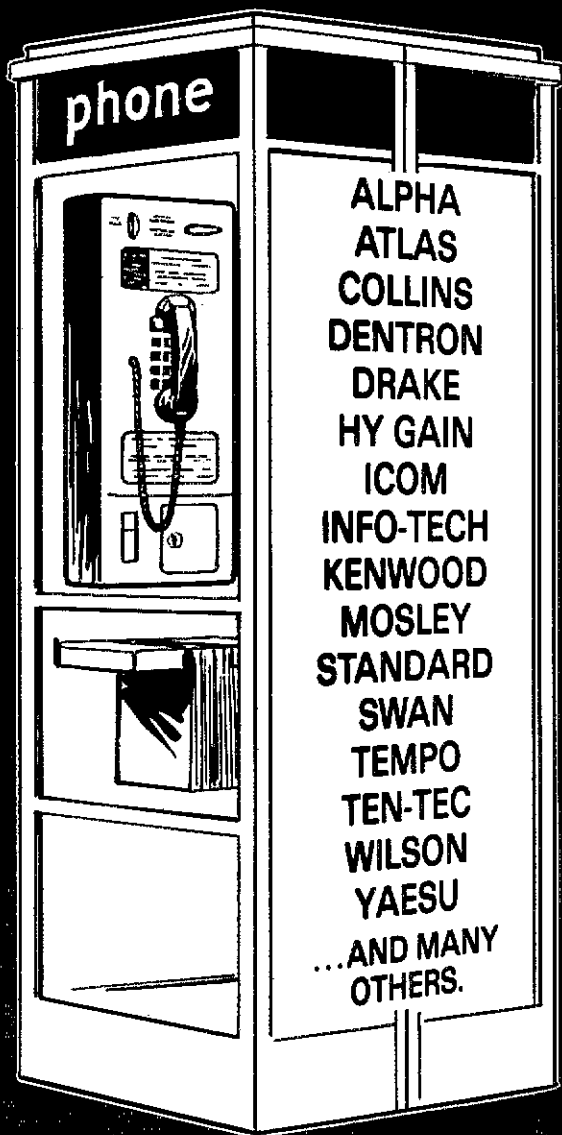
Mike Peterson sure does! His exciting first contact was the beginning of a new world for him — a world without restrictions — a world supported by the Courage HANDI-HAM System.

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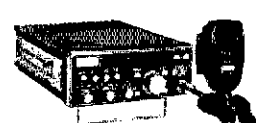
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Polarad Spectrum Analyzers AB4T	1695
Hewlett Packard 400C	75
Precision E-400 Signal Generator	125
Electro Impulse Spectrum Analyzer	395
Dyna/Sciences Model 330 Digital Multimeter	195
Hewlett Packard 4905A Ultra Sonic Detector	550
Hewlett Packard 120A Scope	250
TS-323/JR Frequency Meter	175
Hewlett Packard 49108 Open Fault Locator	650
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Nems Clark 1400	495
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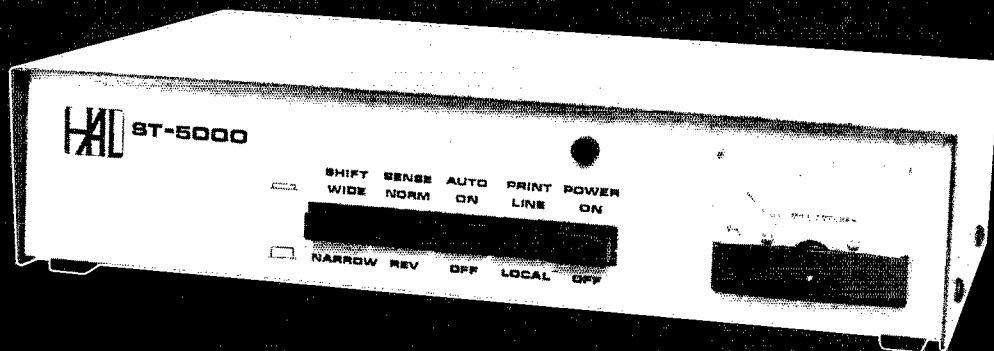
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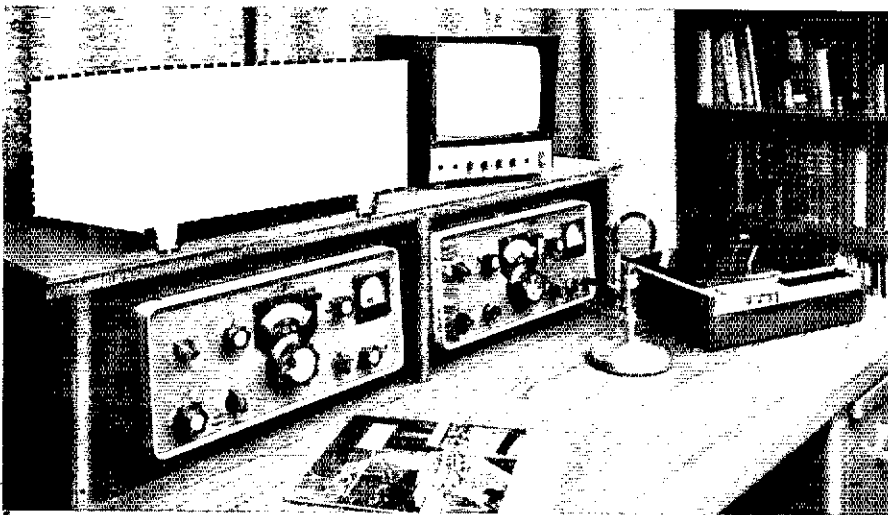
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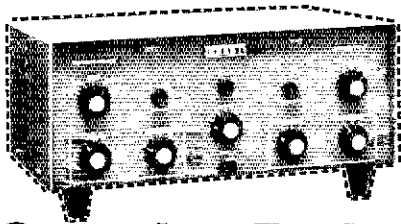
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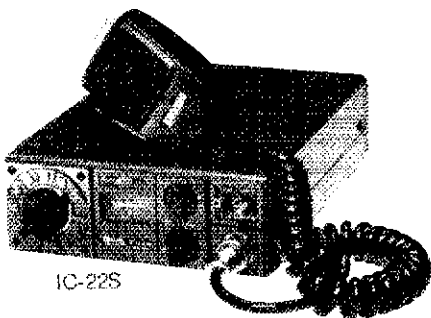
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have an all-time first in the Naugatuck area. WA1VNX, who has been "puttering with ATV was shocked to find himself in the middle of a 450 band opening and was able to simplex several ATV stations in the Virginia area. He reports excellent picture quality both ways, even with only his 13 watts and encourages more hams to try it! The PVRA elections were held and the following slate was elected: WA1ZUS, pres.; K1TXG, exec. vice pres.; WA1NKG, op. vice pres.; N1ABI, publications vice pres.; WB1DOP, dir.-at-large; W1FLW, treas.; W1FXK, secy. Naugatuck Red Cross Bike-a-Thon ably covered for communication by a local group headed by WB1GVW. Local DX chasers generally complaining about lousy DX condx. By the time this appears in print (probably sometime in August) we will be approaching the best DX band conditions ever. Those fellows who are now taking the time to install new antenna systems and correcting old ones will be ready for the best OLD POPPA PROPAGATION has to offer. Traffic: (May) WB1ICPF 263, WA1UUA 222, W1DFT 146, W1HJM 118, WA1UAX 110, K1XA 74, WB1DGR 73, WA1RLW 60, K1AUE 45, KA1CXM 43, W1GVT 34, WB1AIU 30, WB1AIE 16, WA1LOU 16, WB1ASH 7, W1CUH 7, W1JA 7, K1OOG 7, W1QV 7, WB9PGV 6, W1BDI 4 (Apr.) WB1AIU 87, WB1ASH 19.

**EASTERN MASSACHUSETTS:** SCM, Rick Beebe, K1PAD — SEC: WA1BLG, STM, WA1TBY. EC report received from W1LH W1ZMO K1FMM W1XA. GC reports received from W1NF K1I W1A1NAE W1ALQ. OBS report received from WA1QAA.

Net	Freq.	Time/Day	QNI	QTC
EMRI	3.66	192300 Dy	570	411
EMRIPN	3.898	1730 Dy	450	246
HHTN	04/64	2230 Dy	367	111
HHTN (Apr.)			333	81
NEEPN	3.945	0830/Su	50	10
EM2MN	90/30	2000 MWF	30	38
EM2MN	145.8	2000 11h		

Early results from W1FJI on the MA QSO Party indicate that the previous QSO record of 664 was shattered by K1SSK with about 1500 and N1CE with 915. K1BA was also on the list and K1CQ was found mobilizing in the late western counties. Kudos to W1CF, and the other organizers! Bigger and better next year. Club news: Whitman ARC ran a very successful message fair from Southgate Mall in Brockton for Mothers Day; W1GT (Minuteman Repeater Assoc.) K1CCW (Quannapowitt Radio Assn.) combined with very interesting article in June QST; Raytheon hams at the Bedford Lab got a big boost with a fine article in their publication. Featured in the article were WA1TKH W1LGV WA1TAC WA1OJX and W1SI. Quannapowitt Radio Assn. News had article by W1BHD on origination of the Club in 1948. Does anybody know which club is the oldest in the Section? Wellesley publication had a questionnaire to find out members' preferences for the coming year. W1FCJ revisited Framingham club which he was a president of in the '60s. Framingham Club submitted its support for AB1Zs petition RM-3272 to the FCC. K1LOG gave a talk on 50 MHz homebrewing techniques at Chemistford Club. Sturdy Memorial Hospital ARC participated in Attleboro Road Race. Billerica ARS had WA1WUH demonstrate his home computer RTTY/CW setup. Public Service: A League Officials Meeting was held at Hewlett-Packard Company in Waltham; W1HHR presided over interesting talks on traffic handling and emergency communication. K1TX also attended representing the League. WA1LP and X1 celebrated 40th anniv. W1AN back from Florida and in Somerset NH on 75. K1TCC home from hospital and doing well. K1PFF moving to NY. W1GUU moving to CO for summer. WB1FMN and KA1BNW got General. WB1DPS Tech. W1TDFU Extra. W1XA and WA1UMA assisted Woonsocket Red Cross in drill. WA1FNM having antenna trouble. WA1EYY was in hospital for two weeks. W1AMO back from Puerto Rico. Traffic: (May) WA1TBY 487, WA1VAB 312, W1PEX 248, WA1ZAZ 133, K1GN 131, W1TG 121, WA1EYY 118, WA1PLM 108, K1CQ 81, W1FJI 76, W1ATX 75, K1BSC 68, WB1EMU 66, WA1YVK 65, W1CZE 64, WB1EZF 57, WB1ACH 56, K1DMH 53, K1BZD 50, KA1OC 23, W1GK 19, WA1FNM 16, KA1AHD 15, WA1WYC 15, W1ZGK 13, WB1GEX 12, AF1Z 11, W1EMG 8, KA1BJY 4, W1AEC 2, N1EE 2, W1ALP 1 (Apr) WA1VAB 242, AF1Z 3, KA1BJY 3, W1MJ 3, WB1GEX 2.

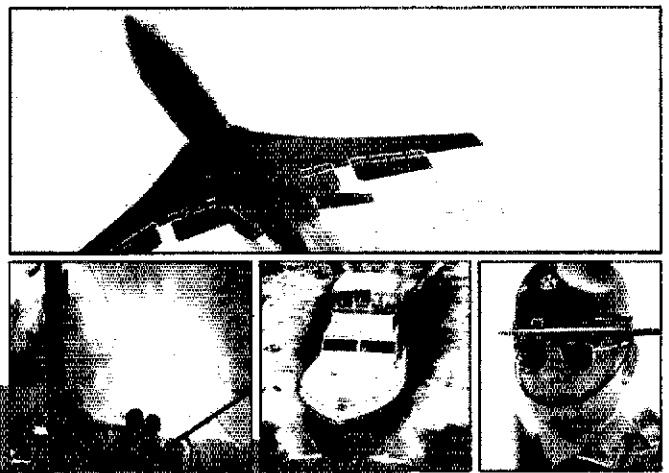
**MAINE:** SCM, Ed Bristow, WA1MUX — New EC Somerset Civ WB1BYR SAHA moving toward affiliation. Has series on digital logic in newsletter. AARC(Ant-dross.oggin) has new repeater in the works. WCAR officers - KA1AYP, pres.; W1TJO, vice pres.; W1GFB, secy.; KA1AYP, treas.; PSHR: W1BJ AF1L W1RWG Sess: QTC/QNI-PTN 31/101203; SGN 28/154/984; MFSN 49/62; BYN 27/35/963; AEN 40/37; SPSN 87/49. Net: time/freq/days-SGN 5 PM/3940/Mon thru Fri; PTN 7 PM/3940; MFSN 9 AM/3940/Su. Traffic: W1LSO 104, W1RWG 84, W1KX 83, W1BYR 70, W1BJ 62, N5YX 49, N1RP 48, WA1MUX 43, WA1JZP 47, AF1Z 41, W1LTH 39, W1AHM 33, W1HDC 28, W1CTR 14, W1BMX 10, W1FCM 9, WA1YNZ 7, WAZMEO 2.

**NEW HAMPSHIRE:** SCM, Robert C. Mitchell, W1SWX/W1NH - SEC: K1BSC NMS; W1TN & N1NH Endorsements: K1ACL K1HI W1TN W1ELP & W1UBG as QTS. W1JSM OVS. W1TN OBS. Net certificates awarded to WB1HF W1GUX K1UQX W1TN & K1BSC for Granite State FM Net (34/94). Seen on Hwys & Bwys: N1CB & K5HML. KA1ADJ now General. K1MFO's first moonbounce QSO WA0LPK, only 49 states to go. K1DIO/RPT WD4MRW W1JUF N1AHR W1HUD & K1DIO NCS of Coos County Emergency Net provided communications for the Danny Homestead Jude Hospital Bikerathon. For the Danny Home St. is now on the air. He is enjoying traffic on both modes. K1GO W1TN WA1SRU KA1CB & yours truly attended Director Sullivan's (W1HHR) League officials meeting in Waltham. Upcoming events: Central New England Net outing at Saunders Bay on Sept 15 & 16. Conn Valley FM Assn. Hamfest on Sept 23 at King Ridge. Details from N1CB. New England ARRL Convention, Hartford Sept 28, 29, & 30. At Deerfield, W1AF was presented Public Service Award by Director Sullivan for outstanding repeater. Traffic: K1BSC 745, W1TN 271, W1GUX 213, WB1HF 63, K1ACL 19, K1UQX 9, WB1HOB 8, WA1SRU 7, K1DIO 6, W1NH 5, WB1HGO 4, WB1CTJ 4, W1SWX 3, W1BYR 2.

**RHODE ISLAND:** SCM, J. Titterton, W1EOF. — SEC: N1D, S1A, N1R. Check in emergency Net on Wed at 7 PM, local time, on 146.52 MHz. W1VIE is active on RTTY and looking for interested hams on NE Teleprinter Net. W1OP repeater is on air on 222.38/223.98. N1DM is Scientific Special Services Channel Coordinator for the Amsat Phase III Satellite. W1SJO W1WWN and W1CEZ working slow scan TV on 34.94 rpt. Sub Signal & Bryant College Novice classes

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100	50	Axial	-.25
220	25	P.C.	-.32
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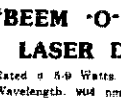
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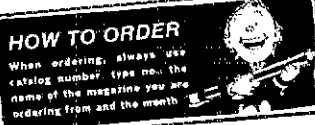
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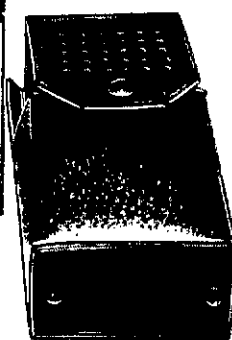
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completed more in fall. WB1CWY new General, RIEM 2-M Tic Net WA1CSO, mgr. sessions 23, QNI 297, ttc 100, great job. K1DT still has many areas that need ECs. Contact him if interested. Fidelity YY rcvr contest won by AD1P and WA1UHT. Hope your summer is a productive and happy one. Traffic: W1YNE 111, WA1YUH 64, W1E0F 50, WA1CSO 44, AE1S 26, N1R1 12, N1DM 7, K1DT 4.

WESTERN MASSACHUSETTS: SCM, Bill Lowe, W1TM — W1DNB, STM, W1KKK, NMs: WA1MJE W1UD. K1JHC reports Worcester County Area provided communications for Fitchburg YMCA Walk Run. NCS was W1JTL. Participants were K1JHC WA1DWS W1UD WB1FCV WA1KPO K1ZDX W1HFN W1GUY WB1JJC. SCM enjoyed 2 wks. vacation in SC. Enjoyed their excellent section net (CN). Congrats to W1KKK. He was awarded "Ham of the Year" by HCRA. Non-TFC snt reporting: WA1YJN and K1SF. SCM looking forward to receiving info on advanced/extra exam results on recent class members instructed by K1BE K1BUB W1JP W1KKK W1KUL N1PF and WB1EMN. WA1OPN needs help with her snt equipment. SCM would appreciate more public service activities central and south Worcester County. Traffic: (May) WA1MK 95, W1R1 108, K1JHC 49, K1JLV 36, WB1CGK 26, W1BWR 23, W1EFC 25, N1CQ 15, W1UKR 15, WA1YVW 13, W1GQB 12, WA1OPN 11, K1BE 10, W1KUE 9. (Apr.) K1SSH 109, N1OQ 11.

## NORTHWESTERN DIVISION

ALASKA: SCM, Roy Davie, KL7CJUK — The Eilsen and Fairbanks Clubs sponsored a Hamfest and Flea Market in Fairbanks. About 200 persons visited the festivities. The SCM had a ARRL booth there. The Anchorage Club sponsored an Amateur Radio demonstration at the Sears Mail Mothers Day, handling 2648 messages. We have a new net "Alaska Bush Net" meets on 7250 kHz dy at 0330 GMT. KL7HOV reports having a new boat. Kodiak reports that KL7JBX and KL7JBT upgraded their licenses, congratulations. KL7DG and his XYL have been back to Boston to the Boston Marathon. KL7AM and family is motoring the midwest with GRP. Several made BPL this month. We are expecting to have a new SEC soon. AL7AC has agreed to take the job on and get ARES going again. Summer brings lots of visitors to Alaska and we hope to QSO many of them. The woodpecker has been giving every one lots of QRM. We are very sorry to hear that V. Pres. Vic Clarke has been ill, get well soon. Traffic: KL7AA 2648, KL7P 595, KL7D 524, KL7ZAP 36, KL7ZAF 24, KL7FKO 225, WL7ACV 135, AL7OJ 89, KL7LH 88, KL7LZ 58, KL7BJ 55, KL7IPV 44, KL7JEO 40, KL7FZN 32, KL7EB 9.

IDAHO: SCM, Lem Allen, W1JMH — Six amateurs and five CAP members in Elmore County held a joint SET exercise June third. Much was learned about emergency communications needs. Novice code classes are starting up again. Congrats to new Novice KA7EKR. IMN now has 25 members on the roll and is handling more traffic than all the other nets combined. K7MIY has built a beautiful set of mag mount whip antennas, using helical windings and top loading for use on all bands in his 18-wheeler — and do they ever work good! The Kootenai club is having a ball with bunny hunts. WA7MMG has suggested a "gas" net for those who travel — seems like a very good idea. K7CD taking a two week trip with Centurion award. K7ARS reports KARS Club repeater on 146.3797 Plus K7GD KATAS K7EJ W7GNU WATHPB W7LOT WA7MMG WB7WBZ WB7WIA kept track of North Idaho runners on their 25 mile marathon May 26 — good show!

Net	Freq.	Time/Day	Sess.	QNI	QTC
FARM	3935	8 P Dy	31	1173	29
GD	3990	6-10 A M-F	24	611	14
IMN	3635	9 P M-F	23	185	105
EL-CEN	146.52		4	31	0
TV-EMG	146.44	9 P Su	4	151	11

Take a rig on your vacation. Traffic: W7GHT 266, AC7P 82, N7APC 70, W7JMH 29, KA7CQI 12.

MONTANA: SCM, Robert Leo, W1RL — Candidates for Montana year of the year W1RL award are: K7WNE K7CCZ WA7PZO WA7MUL. They were submitted by their clubs. W7TGU is new QTS. New IMN section net certificate to N7ANT. Contests: 7 Land QSO party 30 June-1 July; IARU Radiosport, 14, 15 July; No Am Sprint CW 9 Sept. W7GHT continues putting out FB IMN newsletter. W7IBX uses el keyer. N7AIT WAS. N7ARA after rare DX. Lots of news in BARK newsletter (Red Lodge area) - held a yard sale, held simulated disaster test, lot of 0161 rpt work. IMN May QTC 105, QNI 185. K7ABV reports good DX & May Bike-a-Thon 2 and 40 meter help. In April IMN had QNI 617, QTC 80, W7LR DX 111, BGD 21, W7LW 219, F7WVW V88R. Traffic: (May) W7LR 10, W7DB 6, W7JMX 6, W7HAH 5, W7LBK 4. (Apr.) W7TGU 45. (Mar.) W7TGU 92.

OREGON: SCM, Dale T. Justice, K7WWR — SEC:

Net	Time/Day	Freq.	QNI	QTC	Sess. Mgr.
W7HLF	Section net reports				
AREST	0000Z Dy	3993.5	464	138	31 W7HLF
BSN	0045Z Dy	3908	548	32	31 WB7PDU
JCARES		147.06	119	73	9 W7VSE
WCN	0300Z Dy	3702	361	174	31 K7ZIG
1676	0230Z Dy	146.76	888	94	31 K7KVV

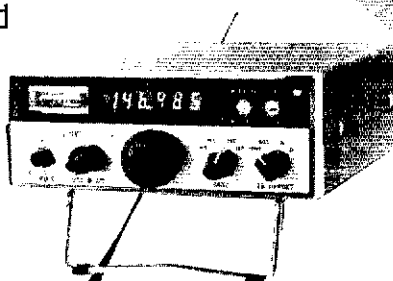
W7LT and K7BT copied the Armed Forces Day messages. Appointments: W7LNE as EC for Tillamook County. Umpqua Valley ARC elected WB7TOZ as pres. and provided communications for a warthon. Good view ARC also provided walkathon assistance. Traffic: (May) W7VEG 1040, K7KVV 510, WA7IHS 318, K7NTS 274, W7BEG 236, WB7OEX 123, KATAUZ 56, K7OPW 51, W7HLF 36, K7WWR 31, W7LT 13. (Apr.) W7VSE 810, K7KVV 467, WA7IHS 273, K7NTS 251, WB7OEX 78, KATAUZ 60, W7HLF 55, WB7BOG 44, K7OPW 38, W7XJ 27, K7WWR 24, W7LT 10, WB7OJ 8, W7LNE 6. (Mar.) WB7OJ 8.

WASHINGTON: SCM, Bob Klepper, W7IEU — Nets reporting for May are: NTN, QNI 1264, QTC 57; ESN, QNI 348, QTC 20; WARTS, QNI 3283, QTC 384; NWSSBN, QNI 603, QTC 41; WSN, QNI 455, QTC 233; SCARES (Apr/May) QNI 207, QTC 0; W7TAB finds it hard to stay inside and QNI WSN and QNI W7IEU find it hard to stay outside. QM AEP having fun with new TS-200. KA7AVH is the first QTS-II in the Section how about the rest of you Novices? If interested contact me. Sorry to report the following SKs: W7WVW W7UZU WA7JDB. K7TT reports BEAR Rptr has good coverage from BC to Columbia River and from Pacific Ocean to East of Cascade Mts. WB7QWC improved signal on 75 with new antenna, now working on 40 mtr antenna. K7GZO has over 40 BEARS signed up in ARES. Was glad to meet many of you again at the Yakima and Wenatchee Hamfests and hope to

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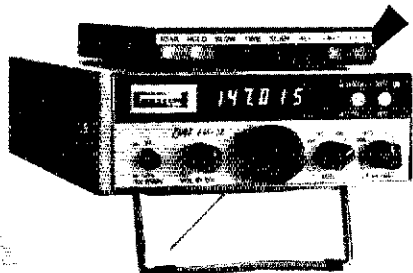
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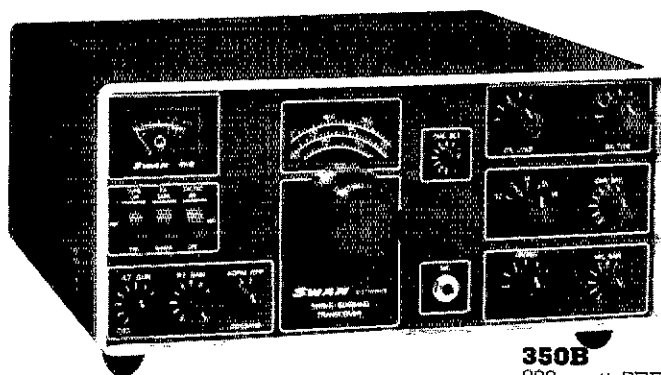
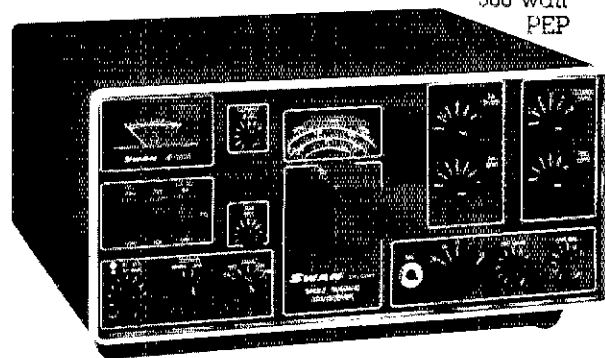
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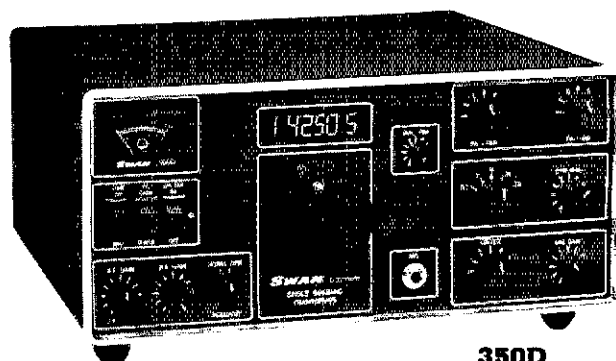
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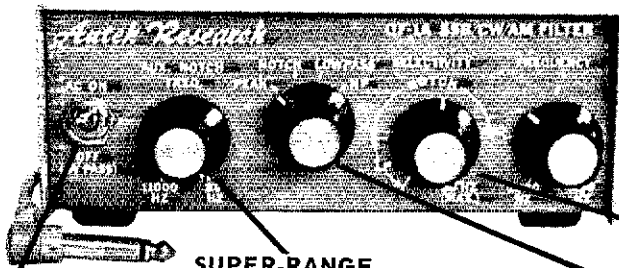
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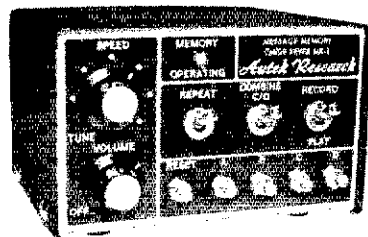
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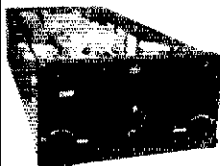
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see many more at the Tacoma Hamfair Aug 18-19. Also appreciated the response we received at the Clark City Hamfair ARRL/ARES Forum. Spokane Dial Twisters have gone on vacation from club mtgs until Sept, but still have nets every Sun, at 5 PM on 3915 kHz. I'm proud to report that after many years of persuasion, my son is now KA7ENC. Clark City's ARC Rocking Chair Copy reports WB7FDE, EC for Clark City, did outstanding work in organizing the Diabetes Bikathon in her area. Central Washington ARC reports good results with 2FM on the Mahawa motorcycle race, now looking for help on the Repeater for Beasley Hill. K7NZV helped with communications for the Norwegian parade in Ballard. W7LG planning fund raising drive for the Port Angeles Repeater. West Seattle ARC was represented by WA7RVA N7CY WA7UK WA7WU WA7NXP & WB7UQQ in providing communications for West Seattle Track Meet. KL7JEB has been appointed by RASC as delegate to PSCSRC. K7VNI WB7AUP WB7DSA & WA7RUB put the MBARC truck and gear in shape for their entry into the Blossom Time Parade. W7WDX club members are looking at a new design for name badges. Traffic: W7AK 1137, W7DZX 868, KL7JEB 505, N7AFZ 194, W7DKZ 183, K7GXZ 149, N7AJ 130, WB7PSP 121, WA7BDD 99, WB7EBP 91, WA3WPY 78, K7RBR 65, W7LUP 52, W7GB 42, W7IEU 41, W7EBU 33, KA7AWH 29, W7BLN 22, W7ZEV 22, N7AFY 21, WB7FDE 17, W7LG 17, W7APS 14, W7FJZ 14, K7AJT 10, K7NZV 6, WA7TWB 5, W7ERH 3, K7VNI 2, WB7QWC 1.

### PACIFIC DIVISION

**EAST BAY:** SCM, Bob Valilo, W6RGG — Asst. SCMs: K6UWR W6ZF VE2AVQ/W6. PSHR for May: W6OA. It is with deep regret that I record the death of W6AW. His contributions to Amateur Radio were manifold, and he will be missed. K6PJ active on ten, and has renewed his League membership thru 1988. N6CY on leave from USNA at Annapolis and active from home once again. New officers of the Northern California Contest Club are: W6BEF, pres.; W6XX, vice pres. Contest Chmn; N6XJ, secy/treas.; N6SF, K6BL, N6BK, Dirs. K6ARE, in addition to his other duties, has achieved membership in DXCC. Many East Bay Section clubs participated in Armed Forces Day this year with their members operating from NPG at Skaggs Island. Some of the clubs represented were: NCCC, SARO, SARS, N6SZ recently had eye surgery. WB6NBR recovering from a broken foot. WB6QED working to put SARS 450 rpt back on the air. Alameda County RACES will provide communications over the 50 mile route of the YMCA Centennial Relay in July. Welcome back to the bands to long-time contester and DXer, W6BSY. Traffic: W6OA 283, N5MR 67, W6UGS 56, WB6UZX 19, N6AXH 9.

**NEVADA:** SCM, Leonard M. Norman, W7PBV — SEC: K7ZAU. The worked 25 Nevada Amateur Radio Certificate issued by the Southern Nevada Amateur Club is exhausted and no new printing is scheduled as the Amateur population is not as sparse as it was 30 years ago when the number one certificate was issued to W7JU. W7OK was issued the first worked 25 FM stations in Nevada in 1968. WA7YES is in hospital. WA7INE back on the air on 2-M. WA7JOO hearing himself on Moon bounce. N7AKX active handling traffic on cw. K7ZOK busy getting his ham shack in order after moving into new QTH. Traffic: N7AKX 119.

**PACIFIC:** SCM, Pat Corrigan, KH6DD — SEC: KH6CKJ. EC-Hawaii: AH6K. EC-Mauri: KH6H. EC-Kauai: KH6JIB. EC-Guam: K6GJIC. Please contact these fine folks to help in emerg. prep. I am pleased to be able to resume office to serve the Pacific membership and ask that you let me hear from you on any matter of interest or concern. My gratitude to N7HR for a job well done and for his continuing support. We all wish him well. KH6DQ says anyone who has not had a QSL Bureau that he would have received prior to Dec 31/77 better get a legal size SASE to him now. Oct. 30, 1979 old ones will go. City Hall Rpt back on with autopatch thanks to KH6JPL & Co. EARC cautions against abuse. KH6S CHL JPL and gang put Kalawao Civ. back on for the county hunters and stirred excitement. Thanks and Aloha to KH6JAC, net mgr. PTN, who headed East. Traffic: KH6JJP 17.

**SACRAMENTO VALLEY:** SCM, Norman Wilson, N6JV — SEC: WB6GFJ. ASGM: W6NJJ. The J.I. Sabin Pioneer RC has a new ham hotline. Dial 484-7388 for the latest update on amateur activities in the Sacto area. W6ZM was the speaker at a special meeting of the North Hills RC. WB6EEM is the Section Emergency Coordinator. All emergency reports and inquiries should be sent to him at 1205 E. 2nd St., Apt 204, Marysville, CA 95901. The Yuba-Sutter ARC had a special AREC drill. New officers for the J.I. Sabin PRC are: WB6DQP, pres.; W6TEE, vice pres.; K7HKL, secy.; WA6NDZ, treas.; W6ZV and W6VTV, dirs. N6WR was the banquet speaker at the Fresno Hamfest. The River City ARC and their "sister club" the Surrey ARC (BC) are having interclub nets on 40 meters. Traffic: W6RSP 47, WB6GFJ 34, W6DEF 21, W6SX 12.

**SAN FRANCISCO:** SCM, Mark Nelson, AA6DX — SEC: N6RM. WB6EUG reports new shack all to himself. W6RM has returned from KH6Iland. K6PB has Delta Loop for 2500 kHz. 120 feet. W6RKH has 22 ARES members on SF roster. K6GEM is a proud papa. New Prexy for NCCC is WA6VEF. WB6SXJ and WA6ICB both have new Kenwoods! The VHF log from N6CT shows excellent 6M openings. W6NL sure has no problems in finding traffic! W6KXG has new linear. RFI problems? Contact WB6IP, a favorite presentation at many a club meeting. W6RNL acted as NCS for the Far West Repeater Assn. during Avenue of the Giants Marathon. 18 members participated. DXpedition in planning stages by AA6DX, off to the Pacific! Traffic: W6NL 434, WB6AMP 233, W6RNL 162, K6PB 141, K6TP 119.

**SAN JOAQUIN VALLEY:** SCM, Charles McCannell, W6DPD. SEC: W6TAB. Asst SCMs: WA6YAK, WA6HIN, WB6TJ. W6GTH is the new EC for Tulare County. WB6WVC is the new EC for Kern County. Newly 2 ECs from SJC reported in the Jan. SET. Lets have more reports for the October SET. Eight SUV stations made the NCN Honor Roll for Apr. K6YR has worked 100 countries from his mobile. Kudns to WB6KUU and the Fresno ARC on a successful Hamfest. W6MUV and WB6NZI are on 2-meters. AA6R made DXCC. WA6CYN has a TS120s. N6AYI K6PKO and W6DPD have FT625RDs. W6JUK and W6DPD have IC211s. WB6ITM has an HR6. W6AMFU General, W6HRN Advanced. K6BDK made Extra. NCN-17 for May QNT 429, QTC 345. NCN/VE for May QNT 1347, QTC 314. Officers of QCVVA Central Valley Chapter are: W6UZ, pres.; WB6VM, 1st vice pres.; W6MEL, 2nd vice pres.; W6BYH, secy.;

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<b>ATLAS</b> 350XL Xcvr \$799	Galaxy V Mk III Xcvr 259	NCX-3 Xcvr 169
350XL/Braille dial 749	AC-35 AC ps 65	NCX-5 Xcvr 279
350-PS AC supply 149	AC-400 AC ps 75	NCX-A AC supply 69
210X Xcvr 475	SC-35 Speaker 15	<b>NYE VIKING</b>
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AR-117 AC ps/VOX 69	FM-210 2m FM Xcvr 89	SSK-1K Keyer 69
200CS/VX-5 AC ps 99	AC-210 AC ps/amp 19	<b>REGENCY</b>
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BPS-200 AC ps \$ 89	<b>GONSET</b>	HR-2MS 2m FM Xcvr 129
<b>CLEGG/SQUIRES-SANDERS</b>	GC-105 2m AM Xcvr \$ 69	HR-220 220 FM Xcvr 189
56'er 6m AM Xcvr \$ 69	901A AC supply 29	HR-440 450 FM Xcvr 239
418 DC supply/mod 29	<b>HAL</b>	AR-2 2m FM amp 69
Interceptor VHF Rcvr 139	RVD-1005 \$295	EC-175 Counter 199
22'er FM series 25 49	<b>HALLICRAFTERS</b>	<b>ROBOT</b>
031 AC supply 49	SX-122 SW Rcvr \$225	70 Monitor \$229
<b>COLLINS</b>	SR-400 Cyclone II 399	70A Monitor 249
51S-1 SW Rcvr 1495	SR-400 Cyclone III 475	80 Camera 229
75S-1 Ham Rcvr 299	P-500AC AC ps 75	80A Camera 249
75S-3 Ham Rcvr 450	FPM-300 Xcvr 299	400 Converter 549
75S-3B Ham Rcvr 675	HA-1 Keyer 49	<b>SBE</b>
75S-3B Rcvr (round) 750	<b>HAMMARLUND</b>	5B-34 Xcvr \$239
32S-1 Transmitter 325	HQ-110A Ham Rcvr \$149	<b>SPECTRONICS</b>
32S-3 Transmitter 675	HQ-150 SW Rcvr 139	DD-1 Dig (Yaesu) \$ 99
32S-3 Xmtr (round) 750	HQ-170A Ham Rcvr 179	DD-1K Dig (Kenwood) 99
30L-1 Linear 495	S-100 Speaker 15	SC-30 Counter 99
30L-1 Amp (round) 695	S-200 Speaker 19	SC-250 Counter 99
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312B-4 (Round) 249	HW-12 75m Xcvr 75	14U 2m FM Xcvr 199
KWM-1 20-10m Xcvr 199	IB-1100 Freq counter 149	<b>SWAN</b>
516E-1 KWM-1 DC PS 75	IM-17 Utility VOM 29	117B AC supply \$ 65
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136B-2 Blanking 100	3750 Xcvr \$995	160X 160m Xcvr 299
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516F-2 AC supply 149	<b>ICOM</b>	270B/SS16B Xcvr 349
MP-1 DC supply 99	IC-211 2m Xcvr \$549	350B Xcvr 449
CC-1 Carrying case 69	IC-230 2m FM Xcvr 229	14A DC conv 39
<b>COMDEL</b>	IC-245 2m FM Xcvr 299	350C Xcvr 249
GSP-11 Speech proc \$ 79	IC-21A 2m FM Xcvr 175	350C Xcvr 299
<b>DENTRON</b>	DV-21 Dig VFO 149	400 Xcvr/VFO/ps 199
80-10AT Tuner \$ 39	IC-22A 2m FM Xcvr 149	500 Xcvr 309
Super Tuner Plus 99	IC-502 6m SSB Xcvr 189	500CX Xcvr 389
160-10AT-3kw tuner 159	IC-202 2m SSB Xcvr 199	700CX Xcvr 459
MT-2000A Tuner 189	IC-3PA 12v supply 49	750CW Xcvr 499
160-VX 160m Xcvr 119	<b>ITC</b>	117C AC supply 65
<b>DRAKE</b>	Multi-2000 2m Xcvr \$299	117XC AC supply/spkr 95
2B Ham Rcvr \$179	<b>JOHNSON</b>	HF-700S Xcvr 499
2C Ham Rcvr 189	Valiant I \$139	PSU-3A AC ps 129
2AC Xtal cal 9	275w matchbox/SWR 119	600T Transmitter 399
R-4 Ham Rcvr 269	Kw matchbox/SWR 199	600R Custom Rcvr 349
R-4A Ham Rcvr 289	<b>KLM</b>	600R/SS-16B Cus 399
R-4B Ham Rcvr 339	Multi-2000 2m Xcvr \$369	600SP Patch 59
R-4C Ham Rcvr 439	Multi-2700 2m Xcvr 529	250 6m Xcvr 199
4NB Blanking 49	<b>KENWOOD</b>	VX-2 VOX 29
FL-500 Fritter 35	TS-820 w/dig \$750	WM-6200 VHF meter 49
MS-4 Speaker 19	TS-820S Dig Xcvr 799	404 Hand mic 15
FS-4 Synth 175	TS-520 Xcvr 499	2020 Xcvr \$599
SW-4A SWL Rcvr 225	TS-520S Xcvr 575	<b>TEN-TEC</b>
SPR-4 SW Rcvr 349	VFO-520 VFO 89	Omni-D Xcvr \$769
SSR-1 SW Rcvr 249	AT-200 Tuner 119	Triton II Xcvr 399
SC-2 2m conv 69	TY-506 6m Xcvt 169	252G AC supply 99
SC-5 6m conv 69	JR-599 (Trio) Rcvr 249	262M AC supply 99
GPS-1 Conv ps 19	R-599D Ham Rcvr 375	670 Keyer 75
TR-4 Xcvr 389	TR-500 6m Xcvt 549	KR-50 Keyer 89
TR-4C Xcvt 449	TS-700SP 2m Xcvt 549	<b>VARITRONICS</b>
RV-4C Remote VFO 99	TR-7400A 2m FM Xcvt 289	FM-208B Booster \$ 39
TR-7/dig/300 Hz 1095	TR-2200A 2m FM Xcvt 139	PA-50A 2m FM HT 49
2NT Transmitter 99	MFJ	HT-2 2m FM HT 79
T-4XC Transmitter 449	4F1 Tuner \$ 49	<b>WILSON</b>
AC-3 AC supply 65	<b>MIDLAND</b>	1402 2m FM HT 129
AC-4 AC supply 89	13-510 2m FM Xcvt \$269	1405 2m FM HT 149
DC-4 DC supply 85	<b>MOTOROLA</b>	1405 HT/TTP 179
MN-4C Matchler 119	T-1670A AC ps \$ 79	WE-800 2m FM Xcvt 349
MN-2000 Matchler 175	<b>NATIONAL</b>	T-15NC Charger 24
AC-10 AC ps 39	NC-300 Ham Rcvr \$169	WC-14 Charger 12

<b>YAESU</b>	FT-101EE/fan 529	FL-101 Xmtr 425
FT-901DM Xcvt \$995	SP-101B Spkr 19	FRG-700B SW Rcvr 449
FT-901DE Xcvt 895	FT-7 Xcvt 389	YC-221 Dig disp 79
SP-901 Spkr 24	FT-7B Xcvt 529	FT-227R 2m FM Xcvt 369
FT-301D Xcvt 699	FP-4 AC ps 29	FT-2 Auto 2m Xcvt 149
FT-1012D Xcvt 629	FR-101S Rcvr 359	200R 2m FM Xcvt 189
FT-101E Xcvt 599	FR-101 Dig Rcvr 469	

(1) This list was prepared from an inventory taken on the date shown left. The quantities vary. In some cases there are several of one item, others, maybe only one. Due to the lead and distribution time of this publication some of the items may have already been sold by the time you see this ad. On the other hand, due to the number of trades we are involved in each day, some items are in stock that are not listed. When ordering state more than one choice, if possible. (2) ALS reserves the right to sell power supplies and accessories only with matching transmitters or transceivers, depending on our stock situation. (3) To insure quality, our used gear is serviced and made ready for shipment after we receive your order. Please allow 5 to 10 working days delay in shipping your order. (4) No trades on used gear.

The following are NEW Close-outs, Overstock merchandise, New displays, Demos, etc. Most are factory-sealed, all carry New warranties. Limited quantity. First come, first served. Most Close-outs available at Milwaukee only. Terms of sale: Payment in full with order, Mastercharge, or BankAmericard (Visa); no trades.

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<b>ALLIANCE</b> HD-73 Rotor \$154 109	<b>reg. NOW</b>	13-510A 2m FM synth Xcvt 399 349	<b>reg. NOW</b>
<b>AR TECHNICAL</b> Datong CW filter \$179 99	<b>reg. NOW</b>	13-509 220 FM Xcvt 179 159	<b>reg. NOW</b>
<b>ATLAS</b> 350-XL Xcvt 1195 995	<b>reg. NOW</b>	13-513 220 FM synth Xcvt 449 299	<b>reg. NOW</b>
350-XL/DB6-XL Dig Xcvt 1424 1199	<b>reg. NOW</b>	<b>NYE</b>	<b>reg. NOW</b>
350-PS/302 Console 458 359	<b>reg. NOW</b>	250-25-3 500w tuner/relay \$212 139	<b>reg. NOW</b>
305 Remote VFO 155 129	<b>reg. NOW</b>	250-25-4 500w tuner 202 139	<b>reg. NOW</b>
DMK/XL Mobile mt 65 49	<b>reg. NOW</b>	DFS-5K Dig selector - Whamo \$199 89	<b>reg. NOW</b>
311 Xtal oscillator 135 119	<b>reg. NOW</b>	EC-175 175 MHz counter 449 299	<b>reg. NOW</b>
210X Xcvt 810 549	<b>reg. NOW</b>	<b>SIGNAL ONE</b>	<b>reg. NOW</b>
215X Xcvt 765 519	<b>reg. NOW</b>	2.4 KHz lower SSB filter \$ 30 15	<b>reg. NOW</b>
215X/NB Xcvt/blanker 810 549	<b>reg. NOW</b>	<b>SILTRONIX</b>	<b>reg. NOW</b>
220-CS AC supply 155 129	<b>reg. NOW</b>	FC-1 5 KHz-40 MHz counter \$169 89	<b>reg. NOW</b>
<b>CES</b>	<b>reg. NOW</b>	<b>SPECTRONICS</b>	<b>reg. NOW</b>
800-YS Scanner, FT-227R \$ 99 69	<b>reg. NOW</b>	DD-1K Kenwood display \$169 99	<b>reg. NOW</b>
225 Encoder mic 44 29	<b>reg. NOW</b>	SC-30 30 MHz counter 169 99	<b>reg. NOW</b>
<b>CIR</b>	<b>reg. NOW</b>	SC-250 250 MHz counter 219 149	<b>reg. NOW</b>
Astro 200 Xcvt \$995 699	<b>reg. NOW</b>	<b>STANDARD</b>	<b>reg. NOW</b>
Astro 200/CW flit 1045 749	<b>reg. NOW</b>	C-6500 Shortwave Rcvr \$379 279	<b>reg. NOW</b>
Astro 200A Xcvt 1095 749	<b>reg. NOW</b>	Horizon 2 2m FM Xcvt 298 169	<b>reg. NOW</b>
Astro 200A/CW flit 1145 799	<b>reg. NOW</b>	<b>SWAN</b>	<b>reg. NOW</b>
BPS-200 AC supply 135 108	<b>reg. NOW</b>	350B Xcvt \$649 449	<b>reg. NOW</b>
SPR-200 Spkr console 295 236	<b>reg. NOW</b>	350D Xcvt w/dig 749 499	<b>reg. NOW</b>
MIC-STA Desk mic 38 29	<b>reg. NOW</b>	HF-700S Xcvt 699 499	<b>reg. NOW</b>
<b>COLLINS</b>	<b>reg. NOW</b>	PSU-3A AC supply 179 139	<b>reg. NOW</b>
MM-2 Boom mic/earphone 240 199	<b>reg. NOW</b>	100MX Xcvt 699 579	<b>reg. NOW</b>
<b>DENTRON</b>	<b>reg. NOW</b>	ST-1 Antenna tuner 189 129	<b>reg. NOW</b>
4V 40-10m vertical \$ 84 49	<b>reg. NOW</b>	ST-2 Ant tuner w/meters 249 189	<b>reg. NOW</b>
160AT 160m tuner 59 49	<b>reg. NOW</b>	WM-6200 6 & 2m wattmeter 87 59	<b>reg. NOW</b>
160-10AT Ant tuner 129 99	<b>reg. NOW</b>	WM-1500 Wattmeter 74 59	<b>reg. NOW</b>
160-10AT-3kw Ant tuner 229 179	<b>reg. NOW</b>	PS-20 AC supply 179 129	<b>reg. NOW</b>
Jr. Monitor Ant tuner 79 49	<b>reg. NOW</b>	FC-76 40 MHz counter 169 99	<b>reg. NOW</b>
MT-2000A Ant tuner 199 159	<b>reg. NOW</b>	SS-16 16-pole filter kit 99 69	<b>reg. NOW</b>
MT-3000A Ant tuner 349 299	<b>reg. NOW</b>	14C DC module 119 89	<b>reg. NOW</b>
GLA-1000 Linear 379 299	<b>reg. NOW</b>	<b>TEN-TEC</b>	<b>reg. NOW</b>
Clipperton L Linear 599 499	<b>reg. NOW</b>	Omni-D Xcvt w/digital 1069 899	<b>reg. NOW</b>
MLA-2500B Linear 899 764	<b>reg. NOW</b>	252M/D Power supply 119 99	<b>reg. NOW</b>
DTR-2000L Linear 1199 999	<b>reg. NOW</b>	262G Power supply w/VOX 139 99	<b>reg. NOW</b>
<b>DRAKE</b>	<b>reg. NOW</b>	252G Power supply 109 89	<b>reg. NOW</b>
R-4C Receiver \$699 575	<b>reg. NOW</b>	251 12v 10A power supply 85 59	<b>reg. NOW</b>
1-4XC Xmtr & AC-4 ps 849 699	<b>reg. NOW</b>	<b>WILSON</b>	<b>reg. NOW</b>
MS-4 Speaker 33 25	<b>reg. NOW</b>	1402 2m FM HT \$254 189	<b>reg. NOW</b>
L-4B Power supply only 395	<b>reg. NOW</b>	1402/TTP HT w/touch tone 316 239	<b>reg. NOW</b>
7072 Hand microphone 19 9	<b>reg. NOW</b>	The following model 2m HT's are without the high/low pwr. switch & batt. LED.	<b>reg. NOW</b>
MN-4C tuner/B-1000 balun 189 129	<b>reg. NOW</b>	Mk II HT/batt/wall cgr/TTP 332 269	<b>reg. NOW</b>
MN-7 tuner/B-1000 balun 189 139	<b>reg. NOW</b>	Mk IV HT/batt/wall cgr/TTP 362 299	<b>reg. NOW</b>
WH-7 Wattmeter 89 69	<b>reg. NOW</b>	Note: High/low switch may be installed on Mk II/IV by AES for \$20.00.	<b>reg. NOW</b>
1525EM Encoder mic 49 39	<b>reg. NOW</b>	M-320 3 el 20m beam 149 129	<b>reg. NOW</b>
UV-3 3-band (Old Price) 995 795	<b>reg. NOW</b>	DB-33 3 el 15/10m beam 149 129	<b>reg. NOW</b>
<b>GALAXY</b>	<b>reg. NOW</b>	<b>YAESU</b>	<b>reg. NOW</b>
R-1530 Rcvr w/spkr 1610 895	<b>reg. NOW</b>	FT-901DM 160-10m Xcvt 1459 1149	<b>reg. NOW</b>
<b>HY-GAIN</b>	<b>reg. NOW</b>	FT-901D Xcvt 1259 995	<b>reg. NOW</b>
3750 Xcvt DEMO 1895 1295	<b>reg. NOW</b>	FT-901DE Xcvt 1259 995	<b>reg. NOW</b>
<b>ICOM</b>	<b>reg. NOW</b>	FT-101FE Xcvt 759 659	<b>reg. NOW</b>
IC-701 Xcvt/ps/mic 1699 1249	<b>reg. NOW</b>	SP-101B Speaker 25 23	<b>reg. NOW</b>
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IC-211 2m Xcvt 899 669	<b>reg. NOW</b>	SV-101B Remote VFO 137 129	<b>reg. NOW</b>
IC-202 2m SSB port Xcvt 289 239	<b>reg. NOW</b>	YO-101 Monitor scope 320 279	<b>reg. NOW</b>
TTH-230 Touch tone handset 99 69	<b>reg. NOW</b>	YC-601B Digital display 235 199	<b>reg. NOW</b>
IC-21 VFO Receive VFO 119 59	<b>reg. NOW</b>	FTV-650B 6m transverter 239 199	<b>reg. NOW</b>
IC-21A 2m FM Xcvt 399 199	<b>reg. NOW</b>	FTV-250 2m transverter 275 239	<b>reg. NOW</b>
IC-3PA Power supply/spkr 99 59	<b>reg. NOW</b>	FI-7 20w PEP Xcvt 499 429	<b>reg. NOW</b>
<b>KLM</b>	<b>reg. NOW</b>	FR-101S Receiver 599 449	<b>reg. NOW</b>
Force 5 Xcvt 1095 695	<b>reg. NOW</b>	FR-101 DIG Receiver 749 549	<b>reg. NOW</b>
F5PS AC ps/spkr 249 199	<b>reg. NOW</b>	FL-101 Transmitter 649 499	<b>reg. NOW</b>
Multi-2000 2m Xcvt 679 499	<b>reg. NOW</b>	FL-2100F 80-15m Linear 515 359	<b>reg. NOW</b>
PA10-60BC 220 FM amp 149 129	<b>reg. NOW</b>	SP-401PB Speaker/patch 59 49	<b>reg. NOW</b>
<b>KENWOOD</b>	<b>reg. NOW</b>	FT-625RD 6m Xcvt 895 769	<b>reg. NOW</b>
TR-7400A 2m FM synth Xcvt \$449 369	<b>reg. NOW</b>	FI-225RD 2m Xcvt 895 769	<b>reg. NOW</b>
	<b>reg. NOW</b>	FT-227R 2m FM synth Xcvt 385 299	<b>reg. NOW</b>
	<b>reg. NOW</b>	FT-227RA 2m FM synth Xcvt 399 329	<b>reg. NOW</b>

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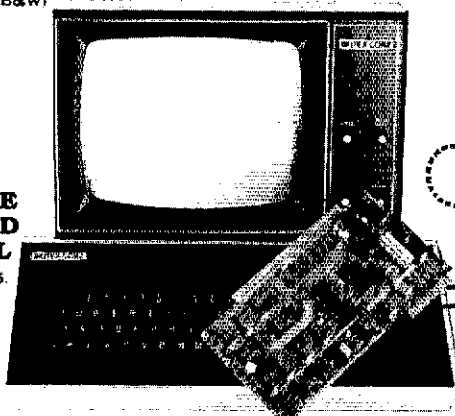
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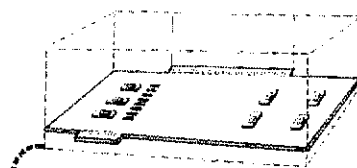
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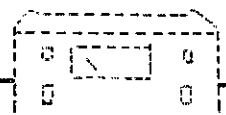
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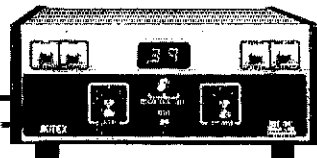


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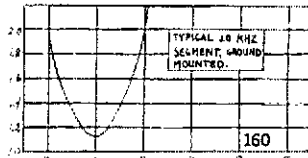
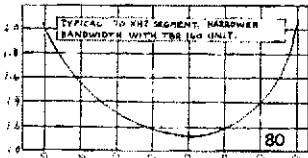
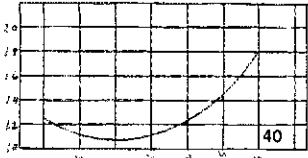
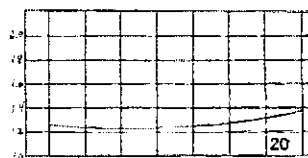
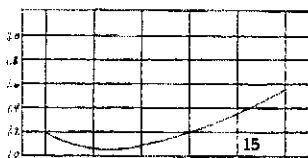
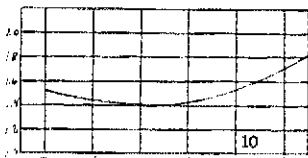
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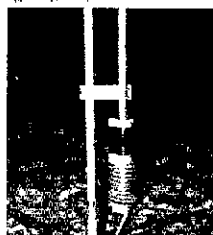
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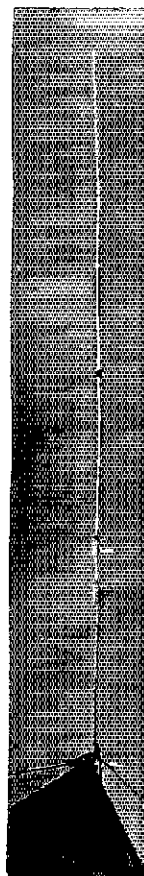
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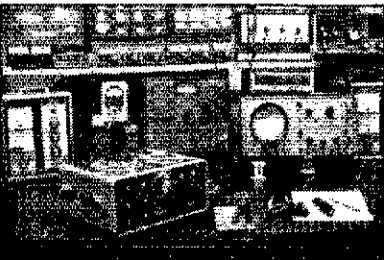
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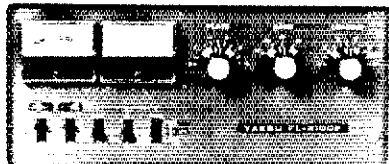
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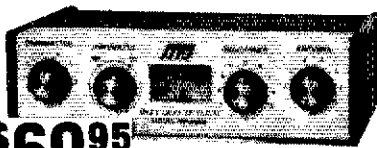
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## MFJ ANTENNA TUNERS



\$69<sup>95</sup>

NEW MFJ-940 VERSA TUNER II matches coax and random wire 1.8 to 30 MHz.

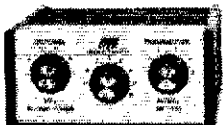
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W6TRP, treas. Traffic: N6AWH 294, W6DPD 45, K6PMG 32, W6BYB 26, W6WDL 17.  
SANTA CLARA VALLEY: SCM, Jettie Hill, W6RFF - SEC: W6BIZP. New OBS is WA6HAD who will send bulletins in Novice band. K1ES new member of SCV and will reside in Santa Clara - Welcome! W6AUC now active in six nets, an excellent traffic total. He reports OCWA picnic to be held in Milpitas Aug. 9. W6BYE new orex of the NCCC taking over from N6SF. New members of the Santa Cruz club are W6BDVY and N6BIU. The smoke should be cleared by now from all the clubs activity during Field Day and planning for next year. New FARS member is W6BKI and is ex VE3 and VO1. NCN RELAY reports the following on the honor roll: W6AFR W6R6GUA W6BHD W6BJWK W6BKRA W6KZJ K6BLT W6NMQ W6RFF W6B7QV K6YKG W6BYV N6YE and W6ZFK. SCV was second to SV section in number listed - shame! N6AWH has taken over as NCN manager due to W6IFL new job commitments. W6BYE who has printed the NCN RELAY has been charged for 40 months, has sold his prime biz - NCN members thank him for his help in making the bulletin a monthly success. PAARA's Explorer post 599 had operating station at the Scout-O-Rama and recruited some new members. K6FRK is new call and member of PAARA. PAARA meets 1st Fri of month, 7:30 PM at Menlo Park Rec Center. WVARA meets 1st and 3rd Wed at Red Cross, Los Gatos, and their Novice class students should have their tickets by now they hold spring and fall Novice classes and generate quite a few new hams each year. SPAK has a new tower and antenna on the company cafeteria and should get out better club call is W6GNKK. The following station appointments are available: ARS, OBS, GCS, OBS, OBS, GO and EC. Contact me for info or application form. Keep those cards, letters and reports coming as this is your section report. WA6HAD and RFF active during Armed Forces Day. N6XI checks into NCN. Traffic: (May) W6BYV 298, W6RFF 57, W6AUC 40, W6KZJ 32, WA6HAD 20, N6XI 1. (Apr.) WA6HAD 6.

### ROANOKE DIVISION

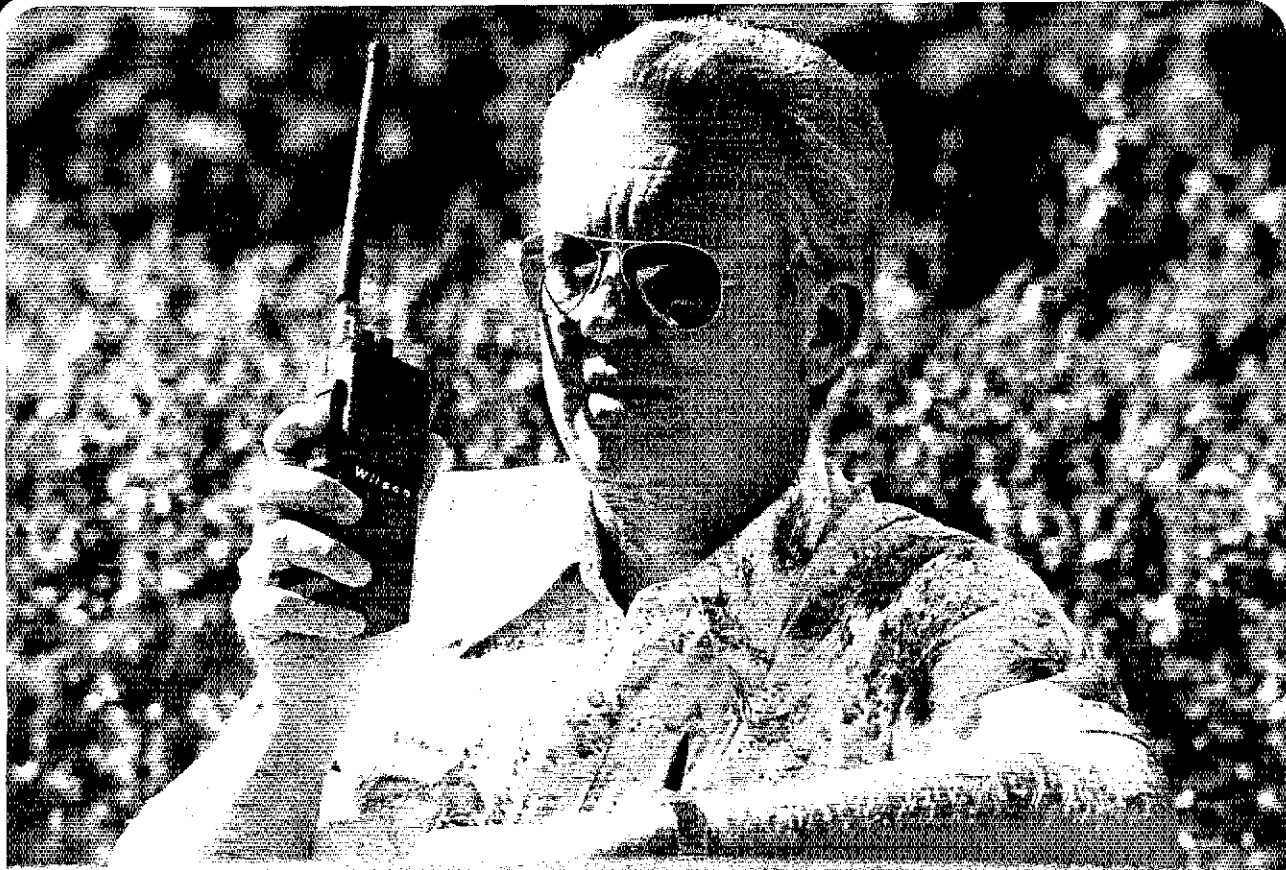
NORTH CAROLINA: SCM, Bill Parris, AAAR - STM: N4UE. SEC: K4CJZ. Many clubs very active supplying communications for Bike-a-thons and marathons all around the state including the Charlotte ARC, Cabarrus ARC, Stanley Co ARC, and the Guilford Co ARES. The sponsoring organizations have much praise for the "Ham" communications. Keep up the good work. W4GXO reports active weekly ARES net in Rockingham Co now with good local support. Carolinas Morning Net now active at 10:30 dy, on 3919, please check in. Durham net will attend again this year with good flea market as usual. Alamance ARC reports both Novice and Active classes ARS successes this quarter. W4I2I and wife W4C4TR will be moving in Chicago for a few years. Sure will be missed, all over the state. Good luck. K4FTB attended 50 year reunion of Univ. of Wisconsin class last month. Mecklenburg ARS really involved with local Red Cross now after supplying communications with Texas tornado disaster area (W4DWD & KD4E ops), and later donating \$500 to local disaster fund. N4BIG recently awarded certificate of merit by ARRL for public relations work being done in the Charlotte area. Raleigh ARS praised for donating set of League publications to state penitentiary library in Raleigh. Elizabeth ARC recently presented of Amateur Radio to public and have dressed up their newsletter with new logo. Date on Eastern NC Hamfest has been changed to Oct 7, so put it on your calendar. Traffic: (May) W4CNG 208, W4EPO 186, AB4S 153, W4MXG 92, K4VHT 86, K4MC 78, AB4V 76, KB4IZ 70, W4BWI 67, W4NYN 61, W4FMN 53, W44SRD 49, K4DHX 44, AA4R 40, W4DGFZ 37, W4AIE 36, N4ALE 31, N4UE 28, W4BCES 27, W4B4TOP 26, W44CJD 26, KK4M 25, N4AH 25, W44YU 20, W44IHG 19, W4ACY 16, W44VQZ 16, W44WFX 14, W4ABZ 12, W44CYN 12, W44SES 12, W44NAC 11, N4BFX 10, K4FTB 10, W4EHF 9, K4A1 8, W44FJM 8, W4EAT 8, W4DANTE 6, A4AO 4, W4OCZ 4, W44JNZ 2. (Apr.) W4B4ZT 67, W4B4NYN 60, W4B4W 45, N4ZH 41, N4ALE 31, W4OFO 26, A4AO 5, W4DANTE 4.

SOUTH CAROLINA: SCM, Richard McAbee, AAAR - Asst SCM: W4B4UC. STM: W4ANK. NMS: W44SJS. KD4D W4OCX. Check-ins/Traffic May. SC 85BN 1518/272, Anderson 2-M Net 639/32, Lancaster City 2-M Net 155/13, Dillon City 2-M Net 19/1. Congrats to all known up-grades. W4DFIG K44FOJ, W4D4OLV W44EDN W44PKZ K44BFX K44BFW K44FTQ. Gov. Riley signed into proclamation, week of June 17-23 as Amateur Radio Week. Due to band conditions, Carolinas Morning Net changed time to 9 AM. Congrats to K44B8X as net mgr. GNN. Anderson reports RACES drill with ARES operators. Thanks to all who send in reports. Traffic: K4ZTN 340, W44AMN 203, W44MTK 142, W44ANK 105, W44NTO 103, W44LIDK 90, W44HYL 70, K4FRX 59, W4FMZ 55, W44JNE 51, W44SJS 44, W44FV 41, W44NQL 38, W44DRT 27, A44E 16, W44DOL 15, W44BUM 14, K4EAR 14, W44EDM 14, W44HBX 11, W44VYS 10, W44AFP 8, W44FEU 8, K44CIY 6, W44EMK 5, N4AOK 4, W4DRF 4, W44OLV 3, W44FJP 2, W44NBK 2, N4EE 1.

VIRGINIA: SCM, Rick Genter, K4BXC - ASCM: Buddy Smith, W4YE. STM: W4SQO. SEC: N4NK. Chief CO: W7HU. Chief OVS: W4APGI.

Net	kHz	Time(PM)	Seas.	OTC	QNI	Mgr.
WNTN	3907	Noon	31	218	294	W4AFDV
WSBN	3947	8:10-15	62	648	1314	W4JK
VN	3880	6:30	31	117	342	W44YU
YN	3880	7:10	62	43	848	W4BFLT

It has been suggested by Hq. that the "Station Activities" column may become "Section Activities" in the near future with emphasis on groups. We are doing this now. Please let me have your comments; pro and con. The South Tidewater ARES active in Elizabeth River Run and the Armed Forces Day parade; 8 emergency msgs. were handled. The Culpeper ARA repeater is now on the air on 147.7/212. The Central VA ARES district was leader in Simulated Emer. Test (SET-79). Lynchburg ARC sponsored section-wide ARPSC meeting. The Roanoke Valley ARC held annual Hamfest with Dir. Wicker, W4ACY, and others in attendance. OCWA is organizing a chapter in the Lynchburg area. The Hampton Roads RA repeater is moving to new site. The VA Tech ARA will retain stn. on campus next year. The Rockbridge ARES provided comm. for Heart Fund. Lynchburg ARC provided comm. for VA Jr. Invitational Road Race. The Hanover ARES was active with comm. for race at Randolph-Macon college and are installing a stn. in the Sheriff's office. Patrick-Henry ARA provided comm. for local police and broadcast radio during the Martinsville 10,000 Meter Marathon. The First Colony ARES district



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1H6DX	6-Element Triband beam	.....\$225
TH3MK3	3-Element Triband beam	.....\$165
TH2MK3	2-Element Triband Beam	.....\$109
TH3JR	3-Element Triband Beam	.....\$119
205BA	5-Element 20-mtr "Long John"	.....\$230
155BA	5-Element 15-mtr "Long John"	.....\$140
105BA	5-Element 10-mtr "Long John"	.....\$89
203BA	3-Element 20-mtr beam	.....\$99
204BA	4-Element 20-mtr beam	.....\$175
204MK5	204BA to 205BA kit	.....\$79
153BA	3-Element 15-mtr beam	.....\$64
103BA	3-Element 10-mtr beam	.....\$54
402BA	2-Element 40-mtr beam	.....\$175
DB1015A	3-Element 10-/15-mtr beam	.....\$115
Hy-Quad	2-Element 10-/15-/20-mtr quad	.....\$199
64B	4-Element 6-mtr beam	.....\$39
66B	6-Element 6-mtr beam	.....\$89
18HT	Hy-Tower 80-10 mtr vertical	.....\$255
18V	80-10 mtr vertical	.....\$26
18AVT/WB	80-10 mtr trap vertical	.....\$75
14AVQ/WB	40-10 mtr trap vertical	.....\$55
12AVQ	20-/15-/10-mtr trap vertical	.....\$49
RMQ	Roof mount kit for verticals	.....\$29
203	3-Element 2-mtr beam	.....\$14
205	5-Element 2-mtr beam	.....\$18
208	8-Element 2-mtr beam	.....\$23
214	14-Element 2-mtr beam	.....\$26
2BDQ	80/40 mtr trap dipole	.....\$44
5BDQ	80-10 mtr trap dipole	.....\$79
GFG2	1/2 Wave 2-mtr ground plane	.....\$18
J-Pole	4-Bay 2-mtr stacked J-Pole	.....\$69
LA1	Heavy duty Lightning Arrestor	.....\$45
LA2	Coax in-line arrestor	.....\$7
BN86	kW balun	.....\$12

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RG-213/u MIL SPEC RG-8/u replacement	.....\$0.25/ft
1/2" Aluminum jacketed hardline	.....\$0.55/ft
Male hardline connector (PL-259)	.....\$8.00
Female hardline connector (SO-239)	.....\$9.00
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## CUSHCRAFT ANTENNAS

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ATB34	4-Element triband beam	.....\$209
A21-4	4-Element 15-mtr beam	.....\$79
A28-4	4-Element 10-mtr beam	.....\$69
A50-5	5-Element 5-mtr beam	.....\$49
A50-6	6-Element 5-mtr beam	.....\$69
A50-10	10-Element 5-mtr beam	.....\$95
ATV4	40-10 mtr vertical	.....\$67
ATV5	80-10 mtr vertical	.....\$85
ARX2	2-mtr "Ringo-Ranger"	.....\$30
ARX-450	450 MHz "Ringo Ranger"	.....\$30
A147-11	11-Element 146-148 MHz beam	.....\$29
A147-22	22-Element "Power-Pack"	.....\$86
A144-101	10-Element 2-mtr Twist	.....\$33
A144-20T	20-Element 2-mtr Twist	.....\$50
DX120	20-Element 2-mtr EME building block	.....\$40
DXK140	Stacking kit for pair DX120	.....\$5
LAC1	Coax lightning arrestor M/F	.....\$5
LAC2	Coax lightning arrestor F/F	.....\$5

CDE ROTORS HAM 4	— (New model - 15 ft rating)	\$139
Tailtwister	— (Now rated at 30 ft*)	\$189
8-Conductor Rotor Cable		\$0.15/ft

## HY-GAIN CRANK-UP TOWERS

HG-35MT2	35-ft guyed (9.5 ft* anti)	..... Write or
HG-50MT2	50-ft guyed (8.6 ft* anti)	..... call for
HG-37SS	37-ft free-standing (9 ft* anti)	..... our super
HG-52SS	52-ft free-standing (9 ft* anti)	..... price!

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HDX56	Free-standing 56-ft tower (10 ft* anti)	.....\$315	
FK2548	48-ft 25G foldover tower	.....\$545	
FK2558	58-ft 25G foldover tower	.....\$600	
FK2568	68-ft 25G foldover tower	.....\$655	
FK4548	48-ft 45G foldover tower	.....\$765	
FK4558	58-ft 45G foldover tower	.....\$840	
FK4568	68-ft 45G foldover tower	.....\$915	
*freight paid on all foldover towers)			
100-ft 25G tower (complete).....\$599			
100-ft 45G tower (complete).....\$899			

## GALVANIZED STEEL TOWER HARDWARE

3/16" EHS (3990 lb rating)	.....\$9.50/100 ft	\$90/1000 ft
1/4" EHS (6000 lb rating)	.....\$12/100 ft	\$111/1000 ft
5/32" — 7 x 7 Aircraft cable(2700 lb)	.....\$8/100 ft	
3/16 CCM cable clamps (3/16" or 5/32" cable)	.....\$0.30	
1/4 CCM cable clamps(1/4" cable)	.....\$0.40	
1/4 TH Thimble (fits all sizes)	.....\$0.25	
3/8 EE (3/8" Eye and eye turnbuckle)	.....\$5.50	
3/8 EJ (3/8" Eye and jaw turnbuckle)	.....\$6.00	
1/2 EE (1/2" Eye and eye turnbuckle)	.....\$7.50	
1/2 EJ (1/2" Eye and jaw turnbuckle)	.....\$8.00	
3/16" Preformed guy deadend	.....\$1.45	
1/4" Preformed guy deadend	.....\$1.65	
6"-dia 4-ft long earth screw anchor	.....\$10.50	
2"-dia 10-ft long heavy duty mast	.....\$30.00	
500D Guy insulator (5/32" or 3/16" cable)	.....\$0.85	
502 Guy insulator (1/4" cable)	.....\$1.55	

## BERKTEK

RG-8X Full braid, low-loss 50-ohm coax (SPECIAL)	.....\$0.15/ft
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For a quote on your antenna system or tower needs write or call:

## TEXAS TOWERS

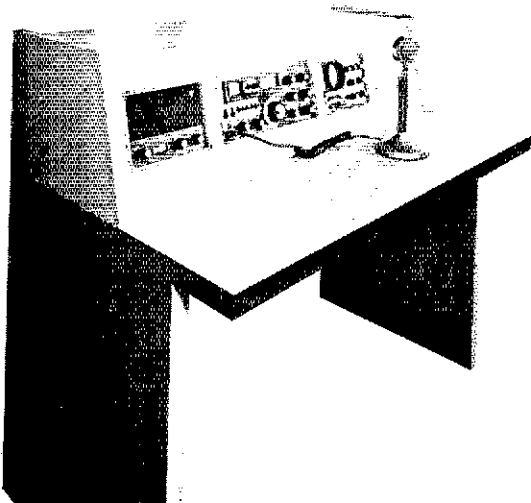
113 Starlite Drive • Plano, Texas 75074  
Open 9 AM to 6 PM Monday thru Saturday

Telephone: (214) 423-2376

A Texas Communications Products Company (TEXCOM)

\* Rohn 45G and 55G prices FOB factory in Peoria, IL; slightly higher for local shipments. Due to freight costs, foldover tower shipments west of Rocky Mountain States are 7% higher.

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Individually manufactured quality consoles. Covered with high pressure laminate. Totally enclosed equipment with concealed interconnection wiring. Color: Two-tone gray. Available for most equipment and a wide variety of arrangements. Price and product information available on request.

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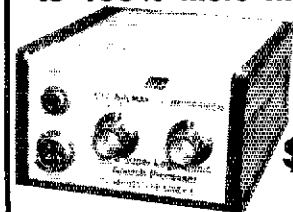


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# MFJ SPEECH PROCESSOR

Punch thru QRM with up  
to 400% more RF power



\$59.95

MFJ Super Logarithmic Speech Processor plugs between your microphone and transmitter to give you up to 400% more RF power.

Its logarithmic amplifier strengthens weak valleys, reduces peaks of speech. Active filter concentrates power, gives clean audio for maximum punch. RF filtered. 9 V battery.

Two models. LSP-520BX II (pictured) \$59.95, 4x2x6 inches, deluxe cabinet. LSP-520 BX (not shown) \$49.95, standard MFJ cabinet, 2x3x4 inches. One year unconditional guarantee.

Try it. If not delighted, return within 30 days for refund (less shipping). Order today. Call toll free 800-647-1800. Charge VISA, MC. Or mail check, money order. \$3.00 shipping.

CALL TOLL FREE ... 800-647-1800

For technical information, order/repair status, in Miss., outside continental USA, call 601-323-5869.

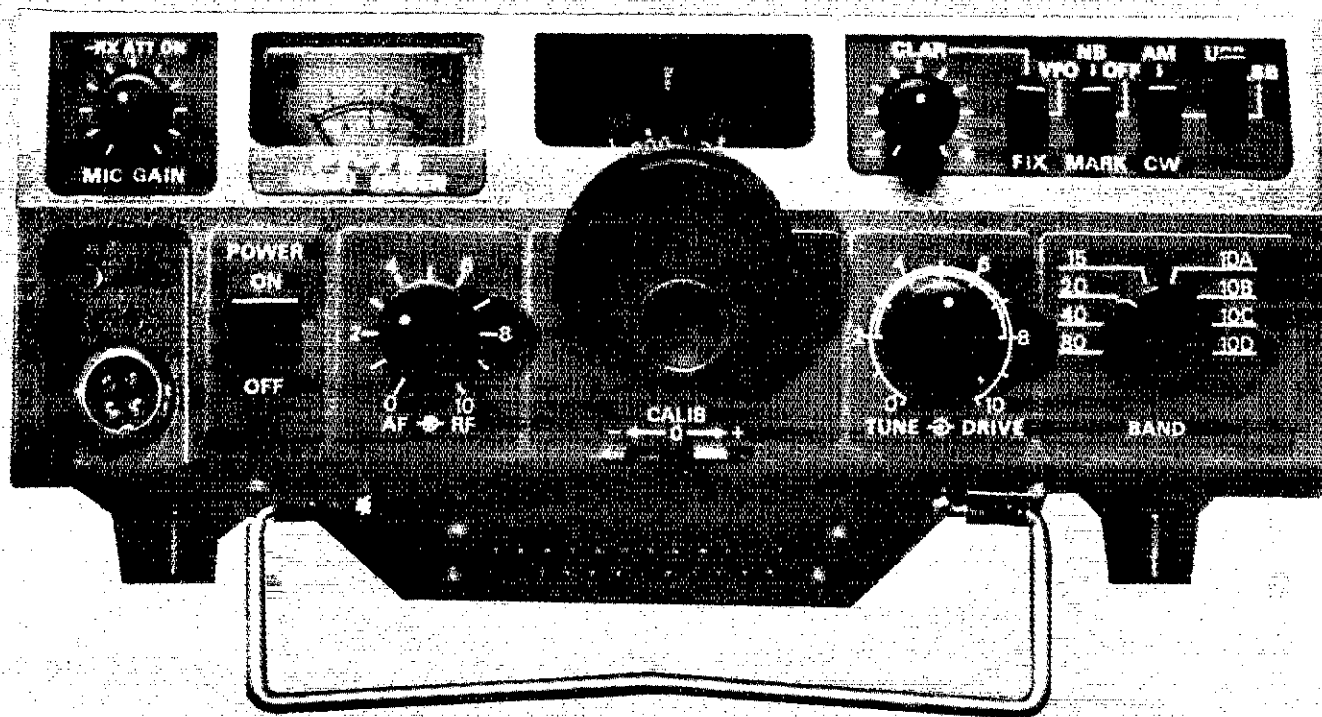
**MFJ ENTERPRISES, INC.**

BOX 494, MISSISSIPPI STATE, MS 39762



# NEW FT-7B 100 W MOBILE/BASE HF TRANSCEIVER

Enough power to drive those linears! The FT-7B is the high powered version of the popular 20 watt FT-7 that so many hams are running mobile in cars, boats, and planes around the world. Use the FT-7B as a top quality base station. New improvements include an audio peak filter (like our FT-901DM) to give you super CW selectivity, drive control, four 10M positions, full 80-10M coverage, 28.5-29.0 MHz crystal supplied (other crystals available as options), optional YC-7B Plug-in Remote Digital Readout, optional FP-12 Speaker/Power Supply Console.



## RECEIVER

**Sensitivity:** 0.5uV for S/N 20 dB  
**Image rejection:** Better than 50 dB  
**IF rejection:** Better than 50 dB  
**Selectivity:** -6 dB: 2.4 KHz, -60 dB: 4.0 KHz  
**Cross-modulation:** Better than 60 dB immunity at 20 KHz off a 20 dB input signal typical  
**Audio output:** 3 watts @ 10% THD

## TRANSMITTER

**Emission:** LSB, USB (A3j), CW (A1), AM (A3)  
**Input power:** A1, A3j; 100 watts DC  
**Carrier suppression:** Better than 50 dB below rated output  
**Unwanted sideband suppression:** Better than 50 dB @ 1000 Hz  
**Spurious emission:** Better than -40 dB  
**Distortion products:** Better than -31 dB

Paramount



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**The radio.**

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579X



# Standard C-118

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SAVE \$144

**STANDARD C-118 Compact, 2m hand-held FM Transceiver.** 1 watt, 6 channels 144-148 Mhz. Unique Crystal Saver circuit. Transmit + or -600 KHz or Simplex as well as receive simplex with one crystal per channel (18 channels with 6 crystals). Separate condenser microphone and speaker. LED "channel busy" and transmit indicators. Includes Flex antenna, Nicad battery pack, Wall charger, DC cable and crystal to operate .94 Simplex, .34/.94, and 147.54T. Approx. 2 1/4" w x 6 1/4" h x 1 1/4" d. Wt. 1.03 lbs.

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Quantities Limited. Order Direct from this Ad. Send Check or use your Mastercharge or VISA. Allow \$5.00 for UPS in the 48 States. Crystal Certificates - \$5.00 each. Phone TOLL FREE.



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Ohio WATS: 1-800-362-0290
- 621 Commonwealth Ave; Orlando, FL 32803  
Phone: (305) 894-3238  
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**AES STORE HOURS:**  
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**ASSOCIATE STORE**  
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Nationwide WATS: 1-800-621-5802

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## HI-Q BALUN

- For dipoles, vagsis, inverted vees & doublets
- Replaces center insulator
- Puts power in antenna
- Broadbanded 3-40 MHz.
- Small, lightweight and weatherproof
- 1:1 Impedance ratio
- For full legal power and more
- Helps eliminate TVI
- With SO 239 connector



\$9.95

## HI-Q ANTENNA CENTER INSULATOR



Small, rugged, lightweight, weatherproof  
Replaces center insulator  
Handles full legal power and more

\$4.95 With SO 239 connector

## HI-Q ANTENNA END INSULATORS



Rugged, lightweight, injection molded of top quality material with high dielectric qualities and excellent weatherability. End insulators are constructed in a special weaving fashion to permit winding of leaded coils or parallel wiring for tuned traps.

- May be used for
- Guy wire strain insulators
- End of center insulators for antennas
- Construction of antenna loading coils or multiband traps

\$4.95

## DIPOLLES

MODEL	BANDS	LENGTH	PRICE WITH HI-Q BALUN	WITH HI-Q CENTER INSULATOR
<b>Dipoles</b>				
D-20	20-77.5	1.90	\$24.95	\$1.95
D-40	40-155	3.80	29.95	2.95
D-75	75-140	7.60	34.95	3.95
D-150	150-70	15.20	39.95	4.95
D-300	300-35	30.40	44.95	5.95
<b>Shortened dipoles</b>				
SD-40	40-75	3.80	31.95	3.95
SD-75	75-140	7.60	29.95	2.95
<b>Parallel dipoles</b>				
PD-40/110	40-75/110-175	1.90	39.95	3.95
PD-40/150	40-75/150-210	3.80	44.95	4.95
PD-75/150	75-140/150-210	7.60	49.95	5.95
PD-150/300	150-70/300-35	15.20	54.95	6.95
<b>Dipole shorteners - only, same as included in SD models</b>				
S-40	40-75	3.80	\$11.95/pk	
S-75	75-140	7.60	\$10.95/pk	

All antennas are complete with a HI-Q Balun or HI-Q Antenna Center Insulator. No. 14 antenna wire, ceramic insulators, 100 micron antenna support rope (SD models only) is included for full legal power. Antennas may be used as an inverted Y and may also be used by MARS or NARS.

**Antenna accessories - available with antenna orders:**  
Nylon guy rope, 450T test, 100 feet \$3.99  
Lycra™ nylon rope, 1 type antenna insulators \$3.99  
1/2" x 2" x 1/2" connectors \$2.99

All prices are postpaid USA 48  
Available at your favorite dealer or direct from  
**Van Gorden Engineering**  
Box 21282, E. Euclid, Ohio 44121 Dealer inquiries invited

is recruiting in Newport News. The So. Peninsula ARC provided command and control comm. for VFW Loyalty Day Parade. The Suffolk ARES is coordinating comm. for possible radiation disaster. First Aid district conducted 3 min drill in York county. For an ARES district map, send SASE to K4BKX, address on Pg. 8, QST Traffic: (May) W4JK 586, WA4CCK 511, WB4P3N 446, W4SQ 395, K4BN 135, N4NK 337, W3BBN 323, K4NK 308, K4BKX 211, WB4DBK 197, K8LGA 175, W4UQ 159, WA4L-JI 153, K4AN 135, N4RF 133, K4GR 121, WB4FLT 118, WA4STO 110, KF4R 106, AA4CK 103, K4JM 101, K8JH 100, WA4YU 92, N4H 73, WA4FDV 67, WA4RWY 63, WA4ONR 62, W3BBQ 58, WA4RTS 58, K4EJ 56, WB4OVH 55, N5BA/4 51, N4LE 44, W4NWM 44, W4OKN 44, W4DNEI 39, N4FM 37, WB4ZNB 34, WA4ISA 33, WA4RXY 33, N4YQ 30, K8AQG 27, K84CF 26, W4DRF 25, N4AZI 24, AG4D 19, W4YVG 19, WA4YU 18, K4DBB 17, WB4KIT 17, K4VVK 17, N4FK 16, WB4MAE 14, K8A08 14, WB4DOZ 13, KA4ETG 13, WB4NEE 13, N4UY 13, W4KXE 12, N4BLX 11, WB4FTK 10, K4J 10, W4OOL 10, WA4WQG 9, N4ATT 8, WB4FNW 8, WA4PGG 8, WB4UHC 8, W4CFV 7, W4LXB 7, N3RC 7, WB4TPT 7, AB9I 6, WB4OD7 6, WB4SHK 6, W4WVQ 6, N4DW 5, W4DEUV 5, WB2JAY 5, WB4ZTJ 5, W4CEU 4, W4DGVU 4, WA4JJO 4, N4AOP 3, W4DM 3, K4TV 3, WB4LAB 3, N4SD 3, N4BH 2, W4PVA 2, K4W 2, WA4EGW 1, W4D4KUK 1, K4MLC 1, N4OT 1, W4YE 1, (Apr) WA4SIO 132, WA4JVD 58, N4RF 9, N4BJX 22, W4MFK 18, K4J 13, N4A 11, W4CFV 10, W4DAGV 10, W4LXB 7, W4Y 7, K4W 6, W4DPOZ 3, WA4QQI 3, W4TZC 4, K4BAV 2

**WEST VIRGINIA:** SCM, Karl Thompson, K8K1 - SEC; K8JF W 5TM; WA8WPW. NMS: W8YP WB8JYM WA8WPW active welcomed on new repeater in Ritchie County 147 90/30 Good coverage. Parkersburg to Clarksburg, New General in Pendleton County WB8PBG. WB8JHA passed his 3rd class commercial test and also became a high school grad. Berkeley Co. AREC Net meets on Tues at 8:30 p.m. New President of Opequon Radio Society is WA8JF. Successist State ARRL Convention held at Jackson's Mill. WV Outstanding Amateur of 1979 is WB8R. New officers of Huntington TARA are K8OM, pres; W8RCUR, vice pres; W8DBZA, secy; K8ZLO, treas. Bluefield Hamfest to be held Aug. 26.

Net	Freq	Time (Z)	ck-in	ffc.	Sess.
Hillbilly	14290	1700 Su	210	104	4
Phone	3730	2115 Dy	154	20	30
Phone	1600	2110 Dy	212	16	30
Phone	3980	2300 Dy	14	14	31
CW	3567	2300 Dy	130	46	28

Traffic: WB8TDA 112, K8KT 50, WB8JYM 47, W8JBY 42, WB8ZA 39, W8DLDY 31, W8JWX 27, W8CNP 24, WB8BMX 20, WB8AKO 18, K8ZDY 15, N8AJC 14, KM8HR 13, K8QEW 13, K8JQ 6, WB8JGN 5, W8YBQ 5, A8J 4, WA8WPW 4, W8JGS 4, W8BYJ 3.

**ROCKY MOUNTAIN DIVISION**  
COLORADO: SCM, Robert W. Poirier, K0DJ - SEC; W8GW STM; W8MCL. NM: AD0A K0C9N WB8ZQG AD0A new manager. IWN as W8HXB's workload forced his resignation. W8H7L now active on 220 MHz and trying to formulate a simplex net there. W8WYX NCS on CARWN five days a week. W8GW reports excellent two-meter operation in NM after his recent visit. W8DNNM, back from a rafting trip down the Green River, enjoying his new HW-2031. W8KHN also living it up with the TS-520S. CG program in Yuma going strong as W8YK caught the bug. Active on 220 MHz in WY. W8JIM? Oh, Oh! All who send PSR totals note that the new format as outlined in the previous CD Bulletin goes into effect with my next station activities report. Consult past bulletins or contact me for the new category breakdowns. Net traffic: (May) Columbia 31, sessions, QNI 1021, QTC 249; informals 214, QNF 1168; Hi-Non 30 sessions, QNI 975, QTC 135; informals 160, QNF 1086. Traffic: W8WYX 3187, WA8HJZ 731, WB8JBS 545, WB8HJZ 208, AD0A 155, W8LAE 140, K0DJ 73, W8EJZ 71, W8LO 69, W8NFW 68, W8QYNP 57, W8QYK 46, W8UWU 34, W8GO 37, W8GW 28, W8H9ZC 10, W8DNNM 9, (Apr) W8QUN 76.

**NEW MEXICO:** SCM, Joe T. Knight, W5PDY - SEC; W5ALR, NMS: W5DR, K5KPS. SouthWest Net (SWN) meets daily on 3585 kHz, at 1915 local time and handled 149 msg with 163 stations reporting in. New Mexico Hamrunner Net (NMRRN) meets daily on 3939 kHz at 1800 local and handled 168 msg with 117 stations reporting in. New Mexico Breakfast Club meets daily on 3940 kHz at 0700 local, handled 139 msg with 817 checkins. ARTS, 1541 msg with 211 ck-in's. Yucca Net: 12 msg with 366 ck-in's. Congrats to W5SGKQ on full scholarship to SMU School of Law. F. B. Jr in Sierra ARA. Much S&R activity this month. Traffic: W5UH 383, W5UAD 372, N5NG 284, KL7HSF 251, W5JOV 210, W5SAHH 166, K5KPS 113, W5SMY 16 and W5BGL 13.

**UTAH:** SCM, Carl R. Ruitstrom, W7GPN - SEC; W7AZBU, STM: W7OCC. Amateur radio played an important role during the annual Friendship Cruise on the Green and Colorado rivers 26-28 May. 3LC and Moab amateurs supplied communications on HF and VHF during safety and rescue. From SLC: N5ARY, W7A7AK, K7DDU, KB7EC, K7HZY, W7LUA, W7MTF, W7OKF and K7HJ. From Moab: W7AWK, K7BFS, K7BPG, K7MMO, K7OEG, W7UQM, W7VVA and W7VZC. W7A7AK manned the rescue boat. During the cruise an emergency service was performed for a person severely injured in Arches National Park, via the 1617h Moab repeater, K7QEQ. The new Ogden, 22.87 solid state repeater in test phase at Little Mtn, signing W7GPN/R. The Harrison Mtn repeater signs W7UHW/R, indicating the trend of WR call expirations. Congratulations to ex W87SGF, now K87Z, W7AZMEL, has new job with Emac and W7A7AK has new TS-120 transceiver. Traffic: K7HR 257, W7AJRC 79, W7AZMEL 72, N7DF 20, W7OCC 17, W7BE 6, W7UTM 4.

**WYOMING:** SCM, Chester C. Rianwalt, W7SDA - SEC; WA8C has two new repeaters in operation. One on two-meters and one on 440 MHz. Congratulations to the following upgrades: Advanced W7WQO in Sheridan; new Generals KA7DRB in Lander, WB7QQA in Manderston, W7UVB in Gillette, and W7WQR WB7JGA and W87VE in Sheridan. New Novices: KA7CPD KA7CWO KA7DFH KA7DJA KA7DKH KA7DKM KA7DMX KA7DNI KA7DOV (7 years of age) KA7DOH KA7DQK KA7DXJ KA7DKX KA7JXL and KA7EDX all in Cheyenne. KA7CFI formerly W7A7KZ, now back in Sheridan. Wyoming Gridwork net report: From SLC: N5ARY, W7A7AK, Jackalope net report 371 QNI, 4 QTC. Thanks for the monthly reports received could use more please. Traffic: W7IYA 294, WARGYO 158, W7SGG 38, W7SQT 6.

## A BELT BUCKLE



APPROX. SIZE 2 1/4 x 3 1/4 INCHES  
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We service what we sell, our Lab is among the finest in the country.

With it all, I'm very competitive, I will try to beat any equivalent deal you got. (and even if my price seems a few dollars higher, I assure you it is still the greatest bargain anywhere.)

So, drop me a line or phone me. Tell me what you want to get, what you have to trade in, what offers you have—I'll do the rest." TNX 73

BEN SNYDER W2SOH.



PS-30

SP-120

TS-120S

VFO-120

TS-120S, popularly referred to as "a big little rig," is a compact, up to 200 watts PEP input, all solid-state HF transceiver with such standard features as built-in digital readout, IF shift, new PLL technology and requires no tuning. It's ideal for car or ham shack use. Accessories available include the PS-30 base-station power supply, SP-120 external speaker, VFO-120 remote VFO, AT-120 antenna tuner/SWR meter, MB-100 mobile mounting bracket and YK-88CW filter.



PS-30

SP-180

TS-180S

VFO-180

TS-180S, featuring DFC\* (Digital Frequency Control, with four digitally tuned memories), is an all solid-state HF transceiver specially designed for the DXer, contest operator and other Amateurs who enjoy working the 160 through 10-meter bands. Also available is a full line of matching accessories, including the PS-30 base-station power supply, SP-180 external speaker with selectable audio filters, VFO-180 remote VFO, AT-180 antenna tuner/SWR and power meter/antenna switch, DF-180 digital frequency control, YK-88CW filter and YK-88SSB filter.

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**ORDERS:** 212-895-4777

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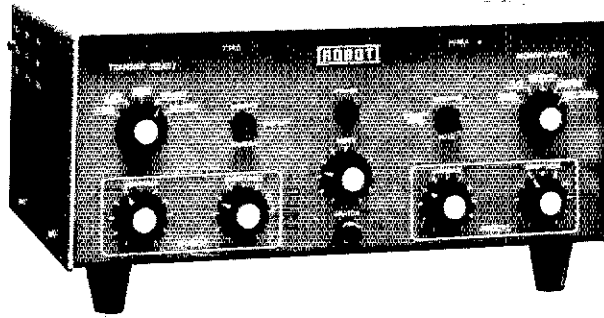
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SSTV is voice alternated with video operation.

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1-800-225-4428

## ROBOT

### SSTV EQUIPMENT

Model 400 Scan Converter .....	\$795
Slow-to-fast and fast-to-slow converter; all solid state. Shipping weight: 15 lbs.	
RCA TC1000 CCTV Camera .....	\$280
500 line resolution; 10,000: 1 ALC; ext. adj: Beam, Target Focus, vidicon position; Weight: 3 lbs. 10 oz. Comes with 16mm lens. 2 1/4" H x 4 1/2" W x 9 1/4" D. Shipping weight: 7 lbs.	
RF Modulator Kit .....	\$ 25
P.C. board, assembled and tested, for converting video to RF for input to TV receiver antenna terminals (Channel 2 or 3), with tuning tool. Requires +5V d.c. power supply. 20 ft. coax video cable with BNC connectors .....	
UHF Plus to BNC jack adaptor .....	\$2.08

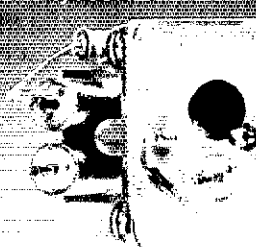
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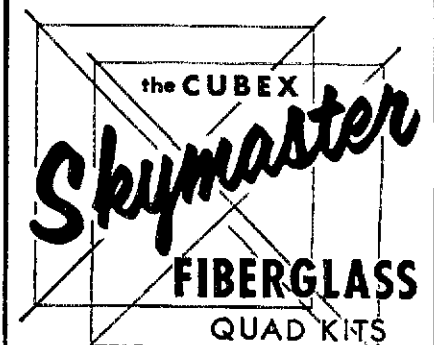
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- 16 Wraplock Spreader Arm Clamps
- 1 CUBEX QUAD Instruction Manual (Boom and wire not included)

MK III 2 EL COMPLETE "PRE-TUNED"  
QUAD ONLY \$209.95!

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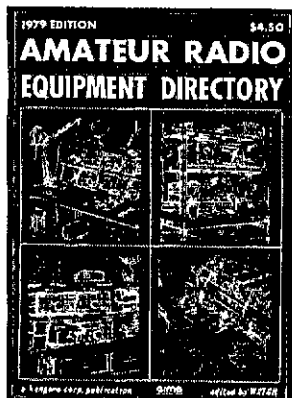


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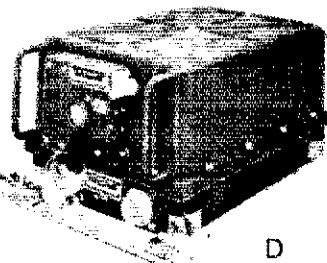
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Below are listed only some of our products. We have chosen for the most part to concentrate on high-efficiency compact antennas designed for limited-space locations, realizing that lack of space for full-sized "farms" is a major problem for many of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

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Model	Bands	Height	Price
AV-1	80-10	16"	\$89.95
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Model	Bands	Lgth.	Price
TD-1684	160, 80/75, 40	110'	\$74.95
TD-16080	160, 80/75	160'	\$59.95
TD-8040	80/75, 40	78'	\$54.95
TD-4020	40, 20	40'	\$49.95

## COMPACT SHORTENED DIPOLES

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

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

## MULTIBAND SHORT DIPOLES

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

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

## MULTIBAND FULL SIZE DIPOLES

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

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



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Dipoles	3.00
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## SOUTHEASTERN DIVISION

ALABAMA: SCM, William E. Scates, WA4JYU — SEC: K4WYT, STM: WA4JDH. New appointments: EC, Lamar Co., WB4TLC, EC, Lauderdale Co., KA4DSF. Congratulations to KA4HSN new Novice ticket, KA4DSF to General, WD4FXC to General. If you missed the Birmingham or the Mobile Hamfests, you missed two good ones. My congratulations to WD4CIQ, Birmingham chairman and to AA4F, Chairman, Mobile, for two hamfests well done. More than 380 total FCC test at Birmingham, no count as yet from Mobile. Much appreciation goes to Mr. Ditty and the Atlanta FCC staff. Alabama's loss is Tennessee's gain. N4KC is now in Nashville and B4RC will miss him. June is election month for many clubs around the state, so look for some new assignments next month; also nominations for SCM are due in July. June 1st was the opening day for the 1979 Hurricane season, so our weather watches take on a different flavor. Keep up the good work. Traffic: WA4JDH 1453, N4MD 544, KA4BUL 122, KA4OZ 102, WA4ZPZ 58, WA4JP 38, WB4EKJ 36, WD4LMJ 33, WA4BU 30, WA4JYU 23, WB4RCF 16, K4UMD 8, WA4RMP 6, WA4VEK 4, WB4TVY 3.

GEORGIA: SCM, Eddy Kosobucki, K4JNL — Asst SCM: K4VHC. SEC: K4SWJ. STM: WA3NAZ, NMs: WAHON WA4WA WB4ZQJ.

Net	Freq.	Time
G5N	3995	0700 M-S 0800 Su
G5N	3595	1900 & 2200 Dy
G5SEN	3975	1930 Dy
GTN	7118	1815 Dy
ARES	3975	1700 Su

GTN has moved from 3718 to 7118 until Oct when time changes back to EST. SEC still looking for EC in certain areas. This past spring proved that a well organized ARES system is much needed. K4GNK Grandpa again. Congrats to all who have made P5HR, GA section continues to add new members each month. WA4ZT's new shack is almost completed, after much sweat & frustrations. Summer time checkins into nets hasn't slowed down, inx to all the active hams in the section. Hats off to W4YWP for his consistent concern for his fellow man. WB4LBM has new rig & never cuts it off. W4BIA & KB4LA found FB job as OBS's. K4BAI presented a new daughter, K4ZYK given commendation at Atlanta Hamfestival for the 11 years of code & theory classes he conducted in the area. Almost 500 of his students received tickets. WD4ODR now Extra Class. G5N Bulletin real super. WA4RWS WA4LE & N4JV helping South Georgia G5N coverage. WA3NAZ made BPL. SCM still needs Club Bulletins for steady flow of info. Traffic: WA3NAZ 296, WA4WA 207, WB4ZO, L201, WD4ADV 199, W4PIM 197, AA4TT 111, W4GH 85, W4HON 63, K4JNL 43, W4BFAS 39, K4EV 45, KB4LA 34, WA4CZM 26, N4UZ 26, W4BIA 21, N4BHX 17, WA4ZHC 5, K4BAI 4.

NORTHERN FLORIDA: SCM, Frank M. Butler, Jr, W4RHH — SEC: AA4FG, STM: N4WA, NM: WD4LUG WD4PDK. New appts.: WD4FJE as OBS. Congrats to WA4CRI & WD4HIF on making BPL again. SNCs earned by WA4IWW and WAQCP on NFPN; by WD4HXS, WD4HIF and WD4NXY on CFN; by WN4IIV on FPTN; and by WB4TZR on FAST Net. A good crowd enjoyed the picnic May 27 at Chipley. Awards given to WB4VHK N4AXJ 414K, K4BDY, K44DC, WA4SHN and WA4CMCX. L. WA4DM now AEC. WA4ETD now ECAN. WA4PMU qualified for DXCC. EC, WA4ZGJ regarding ARES Nets in Escambia County. WD4HDT/WD4HIF conducting Novice Class for PARC. WB4GKV Extra; N4BOY K44DKT & WD8I PB General. K4RZM prepared directory of all Bay County amateurs. K44B acquired new Omni-D for CW; WB4RI5 has a new FT-227R. Orange Park ARC helped with comm. during sailboat regatta. K4ZDS and WD4MDM set up ham radio display at Boy Scout Jamboree in Jax. W4JL and WD4IGQ also assisted. W4OTS aided station in distress in Caribbean recently. WB4BTQ and WD2XZ4 providing new message service for Flagler County served clients. N4KX submitted detailed comments to FCC in RFI inquiry. New Brooksville repeater will be on 146.715/15. WD4MND K4ZC WA4A5N K9AJN K4FID & K4CVO supported foot races on 2-m. Three Pasco County ARES Local Nets now NTS affiliated. NMs are WB4IDT for 2-m cw; AA4FG for 2-m fm, and WD4KX1 for 6m am. Severe weather put FMN in emergency session twice last month. Traffic: (May) WD4HIF 528, WA4CRI 358, N4WA 251, WD4IQ 163, W4MGO 141, WB4TZR 137, WD4HXS 133, WB4QBB 121, W4FZX 120, WD4NXY 120, WB4RIS 119, W4NL 114, WD4PDK 103, WA4ST 102, AA4FG 97, K4HNS 94, W4K4F 63, K4JNL 61, W4BIA 64, WA4EYU 54, WD4DNC 44, WD4LUG 43, W4RH 43, K4FU 26, W4MVG 24, K4BT 23, W4KIX 20, W4ZGINA 17, WB4OO 17, WB4DTS 16, W4GHU 13, K4B4 12, WA4CLY 9 (Apr.) WD4LUG 69, WA4LDM 61, WA4STZ 46, K4B4 7.

SOUTHERN FLORIDA: SCM, Woodrow Huddleston, K4SCL — Asst SCM: W4KGJ. SEC: AA4WJ. New appointments: WBBZY/4OTS OBS OO-2. Up-grading reported. WD4HMC to Advanced, WA4JPV to Extra and new call: KM4G. Summer static has set in and N4KB reports turning his TCC skeds over to W1N1JM because of bad condx on 80 meters. Management of All Florida Phone Net (CFN) shifted from W4WNY to WA4NBE June 1st. CFN management will go to Northern Florida July 1st. Elections for IFTN manager will be June 24th. The big events for our community in the event of a big disaster. On May 24th lightning took out of the 3 Sheriff's repeaters in Largo. Radio Amateurs responded promptly to the call for help and within 30 minutes established a countywide network of 53 stations ready to supplement Sheriff's communications. FCC Tampa okayed the idea of using Amateur Radio for non-amateur traffic on a temporary emergency basis. Very little traffic was handled, but the net stayed active about 2 1/2 hours until normal communications were restored. On April 28th Clearwater ARES provided communications for a 20 mile walkathon for the benefit of Largo Junior Packers. Over 100 walkers finished. On May 3, 4, and 5, CARS assisted International Sertoma Clubs, holding a regional convention in Clearwater. Stations par-

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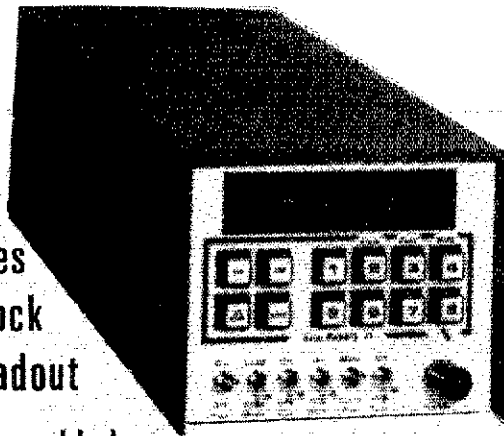
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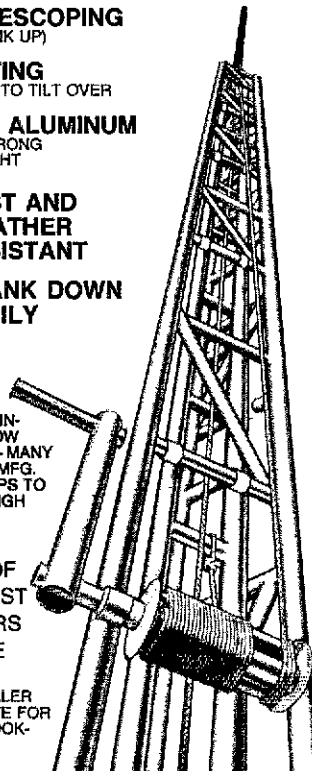


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SWEEP WIDTH	144-148	142-149, 995 or only the mHz segment you select on mHz switch.	complete band or mHz you want	adjustable eg. 146-148 144-146; 146-147	scans the mHz seg. selected by the mHz switch	same as Midland	145, 35, 147.99
SCAN CONTROLS	2 mini toggle switches mounted on rig. LOCK switch may be mounted on mic.		2 mini toggle switches mounted on rig.	1 mini toggle switch mounted on mic or rig.	2 mini toggle switches mounted on rig.	same as Midland	1 mini toggle switch mounted on mic or rig.
PRICE PER KIT	39.95		39.95	34.95	39.95	39.95	34.95
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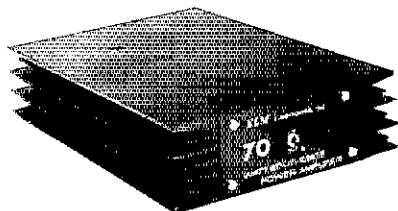
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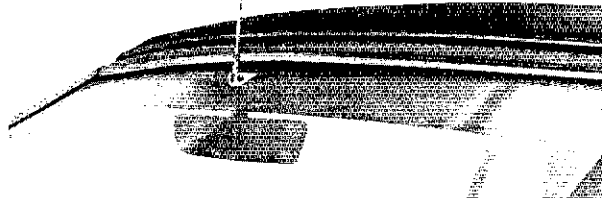
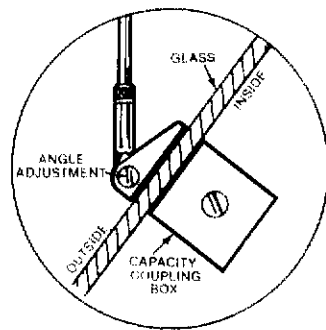
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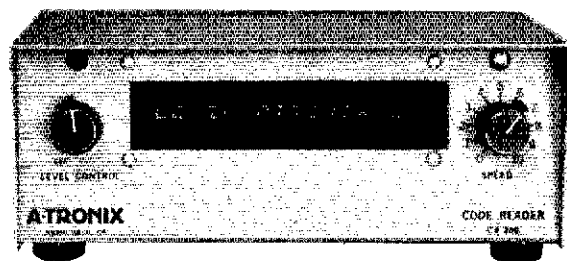
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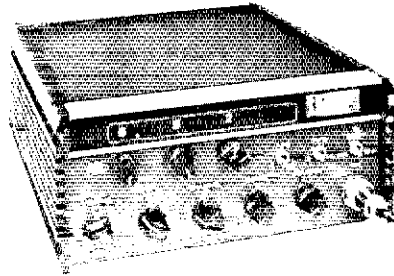
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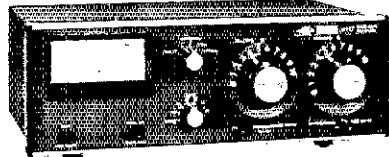
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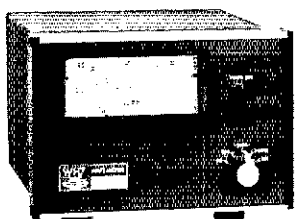
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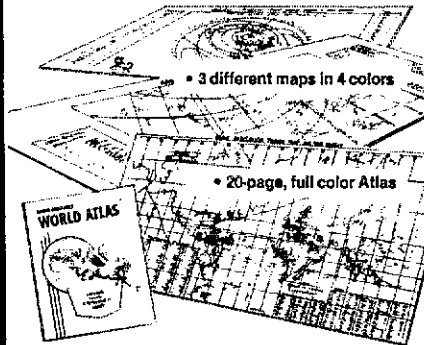
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**SOUTHWESTERN DIVISION**  
ARIZONA: SCM, Willard Haskell, AC7D — Don't forget the Southwestern Division 1979 Convention in Oct '79 (19, 20 and 21). Lets have a big turn out. Watch QST for details. WA7JPG has been released from the hospital and is at home recuperating. (Keep the RF away from that pacemaker). On April 28, the Hulapai AHC, all who are ARCS members, took part in a Bike-a-thon for Cystic Fibrosis. 1300 riders participated in many of our counties. Participated were: K7ZMA KB7AG WB7ULD WB7RYR WB7AWR W7KAX WB7NCN WA7OPQ WB7BVV and WA7YXC. Congratulations on new calls: KA7DSO KA7DSP KA7DXC KA7DXG KA7DXN KA7DXE and KA7DXO. The ARC, Phoenix announced that VE2US7 one of their training instructors, upgraded from Novice to EXTRA in one day. Congratulations! The Tucson Repeater Assn. provided communications for the 50th Annual JC's Fireworks Display. An amateur radio station was on display. This was sponsored by the OPRC. These events were held at the Pima County Fairgrounds. If you are interested in the ARRL EC Program, contact your SCM. We need representatives in many of our counties. Congratulations to W7KAX W7KSF WB7HT W7MCF W6MWF and WB7O for the outstanding communication support provided during the James Gordon Bennett Balloon Race. Many countries participated. You will read more about this event, as a complete article has been forwarded to ARRL for publication by W7KAX, EC, Mohave County AZ. A-10 QNI 879, QTC 165, SWN QNI 163, QTC 149; Cactus QNI 1216, QTC 71. Traffic: W7EP 273, K7MC 99, K7NTG 90, K7UXB 89, WA7KOC 49, K7NMQ 36, W7EH 8, WA7WEB 8, WA7NXL 5, K7JKM 4, WB7NJY 2.

**LOS ANGELES:** SCM, Perry Masterson, KD6C — As this report is being written, the June heat wave is in its prime and taking its toll in operating time. Even the antenna work is slowing down. W5INH reports his 204BA is not up for that reason. W5BWG reports he now has 261 confirmed with 247 worked. W5EKU6 reports a new HTTY traffic net is now going on 3635 kHz at 2230 PDT. Needs more QNI (whatever that is). It's nice to hear some HTTY news. I was beginning to think there was no RTTY in this section worth talking about. Send me more reports, as there are many RTTY fans. N6PZ has a new 5B200 and a Dentron Super Tuner. Lets watch his traffic count grow now. The Downey Amateur Radio club worked the Bike-a-thon June 3. N6VI is now operational on 220 and 432 MHz. He is running more emergency systems. I hope he can use them for the next emergency tests which come up in the fall. Will advise more on this subject this summer. W6EJJ, our Director, conducted a Division League Officials meeting June 2, it was well attended. There are many important events happening and your voice to the director is essential in helping him represent you in the Councils of ARRL. The OD's have been active again. From their reports, it seems that the illegal operators are increasing. Thanks for the club reports received this month. Let me hear from you relative to your amateur activities. Every one in the section is interested. Traffic: W6EO 236, W6RP 205, W6L 187, W6LVO 65, W5EKU6 60, W6OCM 28, W6BWG 23, K6CL 5, 6 8.

**SAN DIEGO:** SCM, Arthur R. Smith, W6INI — SEC: W6INI, STM: N6GW, Asst SEC: N6RD, WD6CSS is new EC for Southern Dist. of San Diego County. Our thanks to retiring EC, WA6UAZ for 2 1/2 years of outstanding service. WA6ZKC reports that Palomar ARCA traffic net handled 42 messages during May. It operates nightly at 2000, local, on W6GAI, 146.13/73. San Diego County's Board of Supvrs amended its zoning ordinance to allow hams to construct antennas to the full FCC limit of 200 feet. W6GCG led the fight with good support from hams at the hearing. ARCS members provided communications for a mass casualty drill (aircraft accident) in La Mesa in April. Taking part were WD6AOZ W6INI W6QLJ N7PF N6RD W6SIF and W6TET. Volunteers are needed to support emerg. communications for Calif. Dept. of Forestry for Red Flag Alert patrols. Contact WD6CSS WB6HFE W6INI or W6GCG for info. Correction on SANDRA meeting time. It's still third Wed. WB6LMB has been apptd QTS. WA6EYX reports theft of his FM2015R #3985. New hams: KA6FTM KA6FTN KA6FTO KA6FTP thru Escondido ARS licensing class. Traffic: WA6UAZ 543, WB6PVH 204, WA6AMK 99, WB6MLB 93, K6HAP 73, W6HUJ 71, N6AT 65, W6SSKU 28, N6GW 26, W6BBDV 22, W6GUFY 17, W67SUA 2.

**SANTA BARBARA:** SCM, D. Paul Gagnon, N6MA — WA6YT went from Novice to Tech. WB6CVI went from General to Advanced. WA6YB (aircraft accident) in La Mesa in April. Taking part were WD6AOZ W6INI W6QLJ N7PF N6RD W6SIF and W6TET. Volunteers are needed to support emerg. communications for Calif. Dept. of Forestry for Red Flag Alert patrols. Contact WD6CSS WB6HFE W6INI or W6GCG for info. Correction on SANDRA meeting time. It's still third Wed. WB6LMB has been apptd QTS. WA6EYX reports theft of his FM2015R #3985. New hams: KA6FTM KA6FTN KA6FTO KA6FTP thru Escondido ARS licensing class. Traffic: WA6UAZ 543, WB6PVH 204, WA6AMK 99, WB6MLB 93, K6HAP 73, W6HUJ 71, N6AT 65, W6SSKU 28, N6GW 26, W6BBDV 22, W6GUFY 17, W67SUA 2.

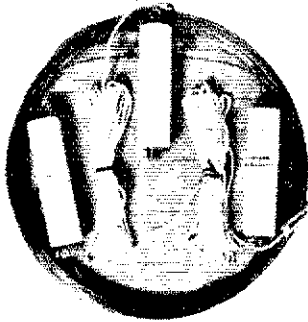
**WEST GULF DIVISION**  
NORTHERN TEXAS: SCM, Phil Clements, K5PC — Asst.

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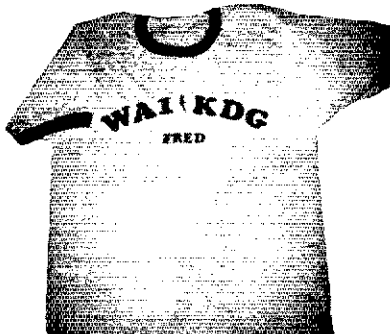
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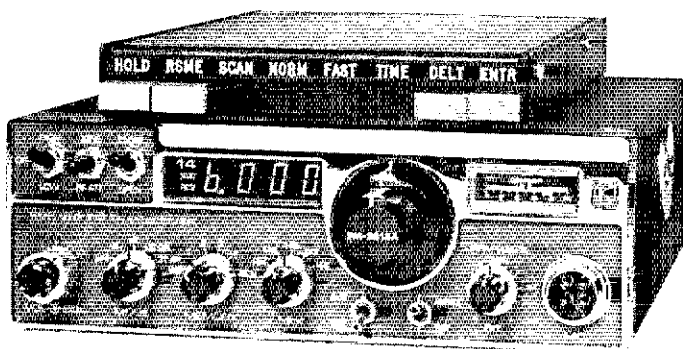
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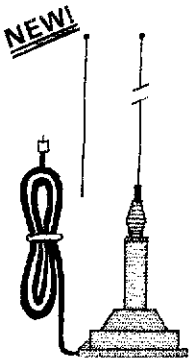
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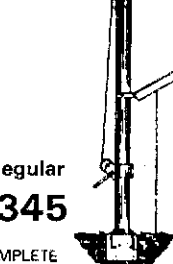
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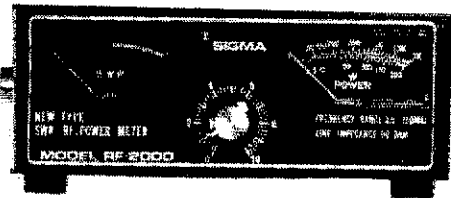
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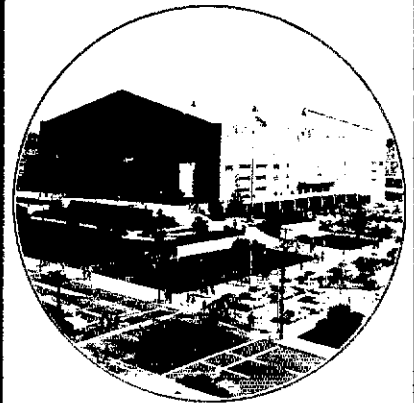
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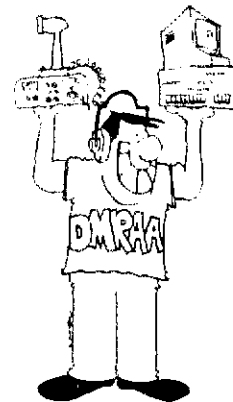
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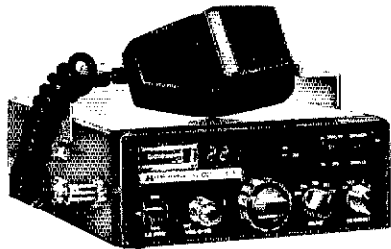
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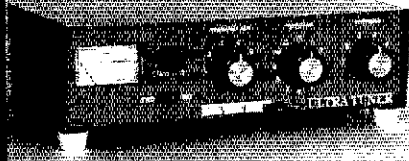
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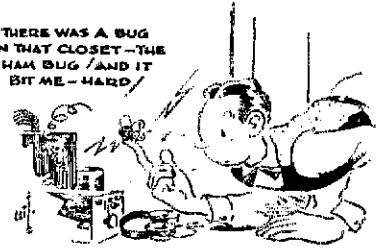
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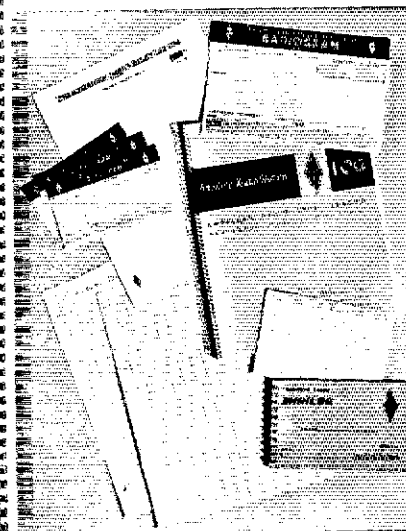
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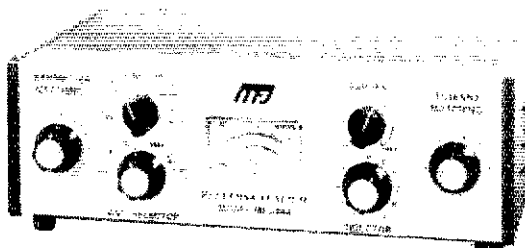


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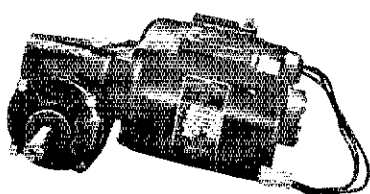
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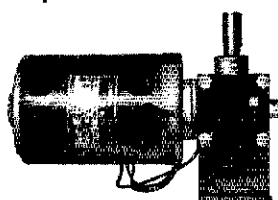
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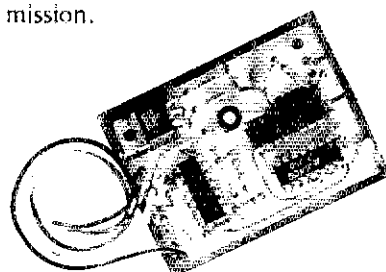
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SCM: AE5C, STM; W5VMP, NMs: AA5J & AE5I, SEC: NSWB. The tornado season is now behind us, and it's time to focus our attention to the hurricanes and the Oct. SET and the part that ARES and NTS must play in each. I hope that each and every EC in the section is planning some kind of a drill for SET week-end. Let's make this one the biggest and best yet! WB5PJV won first Texoma Hamarama scholarship-\$2000-congrats and best wishes! WD5GFP rpts new hams in Titus Co. area-KA5s FGH FGI FGJ FGK and FGL. Grayson Co ARES group assisted CG Flotilla 51 in mail show. Hamcom 79 was huge success - be sure to make this one next year. WA5ZNZ new EC-Dallas Co. NSWB is revising and improving the Section Emergency Plan. WB5JBP has computed the Dallas RACES roster. K5LD trims away "deadwood" from roster. Dallas ARC has new 3 freq. repeater in emer. trailer for use in disasters and public service work. Attn all ARES members and ECs-emergency services seminar at Texoma Hamarama in Oct. Pls try to make the meeting. PSHR for May: WB5SDD AA5J WB5LAT AE5I K5SOR WB5ORE (Apr.) BPL: W5TI WD5COE (Apr.) Traffic: (May) W5TI 628, WB5SDD 484, K5OUK 149, AA5J 148, WB5BKM 140, K5MC 139, WB5LAT 93, WA5INJ 70, W5CTZ 64, W5VMP 66, AC5Y 61, N5BT 48, AE5I 37, K5SOR 34, WA5OFD 30, WB5UHO 22, WB5YK 20, W5YK 8, KA5EQ 7, K9M 6, K5PC 6, AE5U 4, WB5KTC 3, WD5GFP 2, N5AWG 2, WA5EZ 36 (Apr.) WD5COE 966, WB5ORE 78, WD5HHK 29, WB5KJ 3.

**OKLAHOMA:** SCM, Leonard Hollar, WA6FSN - The number of Local Net reports on the increase, showing operation on many of the repeaters, also Direct Frequencies. So look around, with condx like they have been, anything can happen. As soon as we can, will try to prepare a list and pass around. The Oklahoma City YLs have started a YL net on 1676 repeater each Thurs. at 9:00 PM. OU club making plans to assist Norman PD with football traffic and other problems during home games. They can use your help. WB5AOH getting a 20 acre antenna farm ready. KA5BXO Novice to General, WB5TUJ Advanced. Woodward has been busy with Public Service, Road Runner Race and other, classes, and manning their own Radar during Weather Alerts. Hugo has been helping a "Bike-a-thon" also a 10,000 meter run. K5OWK on Red Cross Board at Ardmore. WA5UJF EC and active in Red Cross at Enid. WD5ETB working with CD and Red Cross in Caddo Co. W5FKL been off with rig trouble. To better help during emergencies, we must have laid the groundwork before hand. Contact your Red Cross and CD and demonstrate what you can do. GET Acquainted. May Traffic up from April. Traffic: (May) WB5MVR 586, K5JGZ 384, WB5NKC 339, W5REC 279, WB5NKD 278, K5OWK 224, W5RB 173, W5BYC 70, WA5OUV 49, WB5EQY 44, W5SUG 42, WA5FSN 33, K5CAY 31, WB5AXH 28, W5VOR 24, WB5OCZ 19, WB5YXU 18, WB5YU 15, WB5EL 15, WD5IFB 14, K5MGD 14, KA5DRB 12, WD5ETB, W5HGHI 7, W5FKL 4, WB5OVT 4 (Apr.) K5OWK 419, WD5GLD 17, WB5OCZ 13.

**SOUTHERN TEXAS:** SCM, Art Ross, W5KR - Asst SCM: N5TC, SEC: WD5CZL. Net-Mgrs-at-Large: N5TC (phone), WA5RKU (CW), OOs reporting this month: WB5CIT K5DL. QVSS reporting this month: WB5CIT N5AJQ N5AF OBS W5KLV made BPL again, the 24th consecutive month! That's a whole bunch of dedication! OTS K5RVF traveled to El, GM and GW: had eyeball QSO with EI9Q and landline QSO with G3AWD. OTS K5HZR reports 40-meter daytime traffic nets having propagation problems, with some messages requiring two to three relays to get 300 miles. OCIOVS WB5CIT has F1-7B mobile for HF. WD5JIS reports Brenham ARC provided communications for "Run For Fun" on May 12 in Brenham. OTS K5DG says KA5FCZ, son of KA5CWR, is new Novice in Rio Grande Valley. ECIOVS WA5RVT has new TS-120S for emergency and mobile use. CHARRO (Brownsville) members had busy month: KA5DMH and KA5DRP to General; WD5CLI and WD5GLD used WR5AOZ repeater to provide emergency communications for Brownsville Police during a power blackout when the police lost power to their repeater. Amateurs visiting in the Rio Grande Valley can have eye-ball QSOs every Sat at coffee in Harlington at Roweway Inn 8:30 AM and in Brownsville at Gourmet Corner at 10:00 AM. Williamson County ARC bulletin reports WD5GWD, WD5GWA and KA5EVA is new Novice there. Traffic: (May) W5KLV 701, K5HZR 243, WA5VBM 203, WA5RKU 196, W5SBE 195, N5TC 139, WB5YDD 117, W5MMI 93, K5PF 84, AK5M 58, WB5CIT 41, W5BGE 34, K5QEW 30, WA5RVT 17, W5SPD 16, AE5X 16, W5KR 14, WB5UYV 12, K5DG 11, WD5JIS 6, K5RVF 2 (Apr.) K5QEW 32, WB5UYV 10, WD5IEB 5, AE5X 6.

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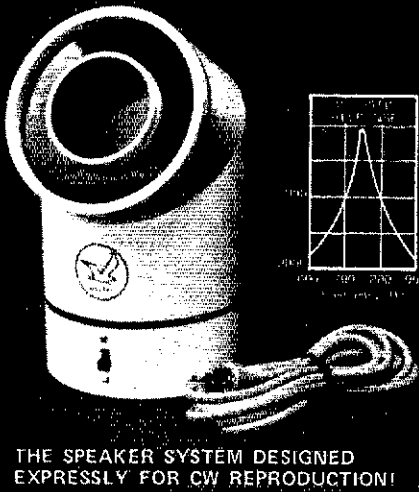
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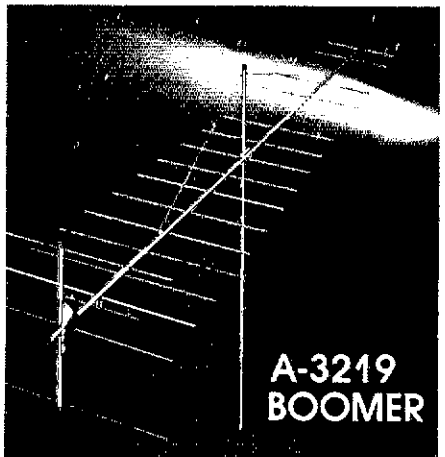
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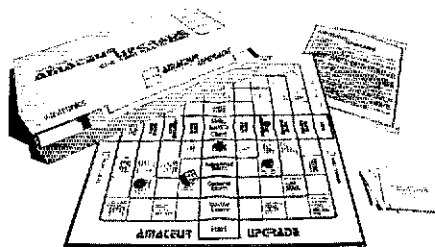
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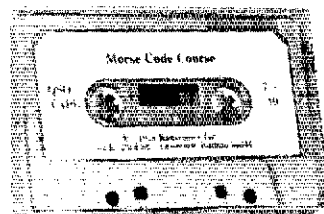
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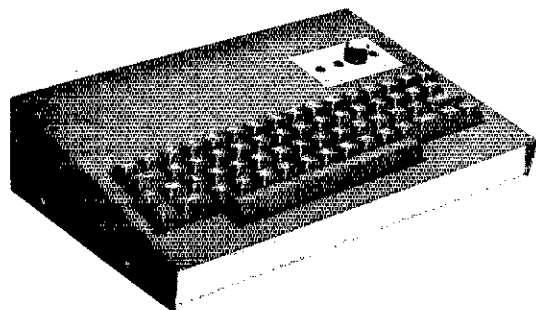
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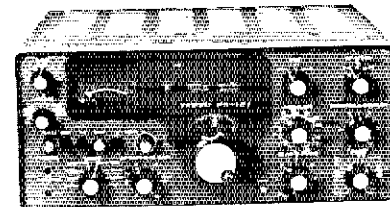
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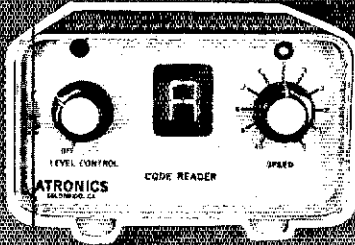
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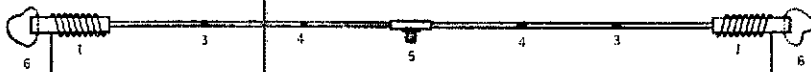
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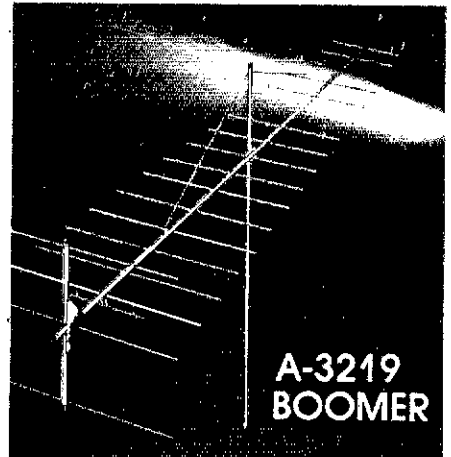


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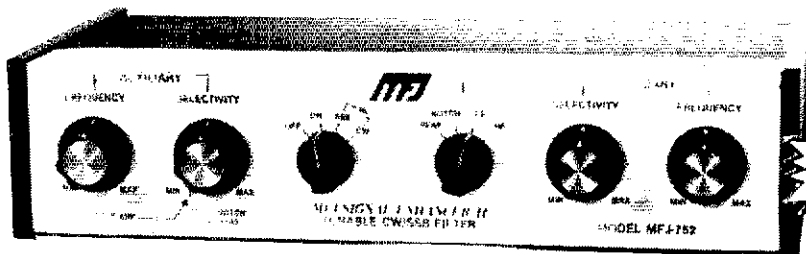
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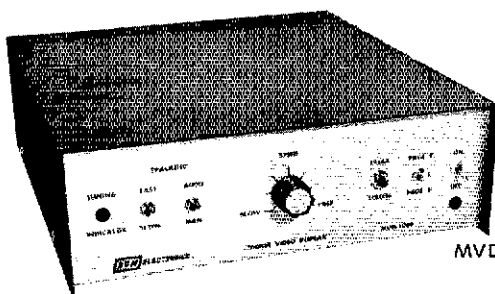
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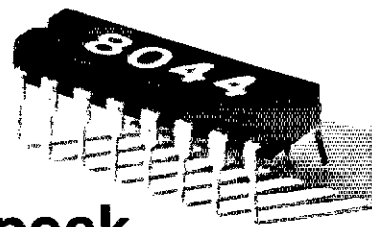
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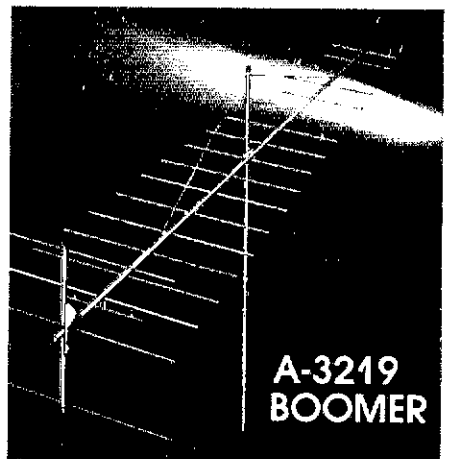
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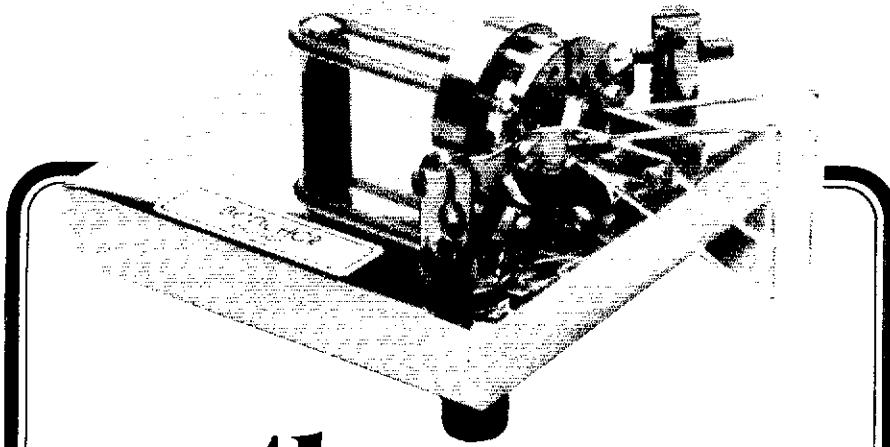


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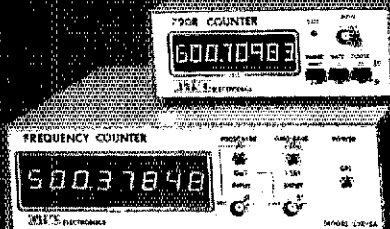
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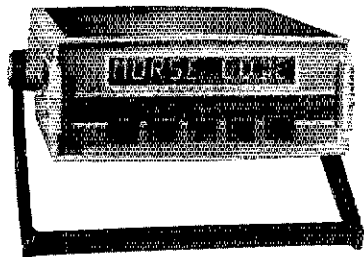
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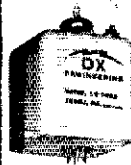
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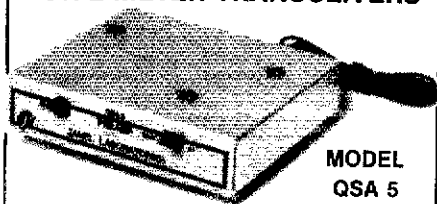
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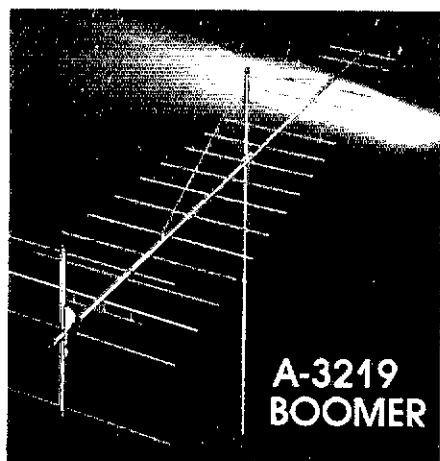
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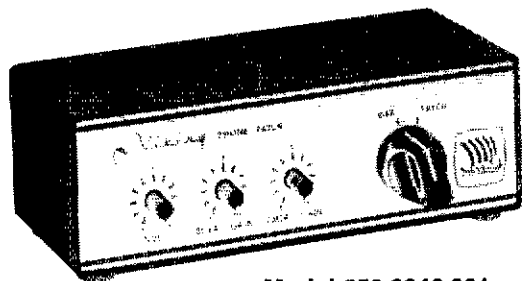
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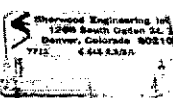


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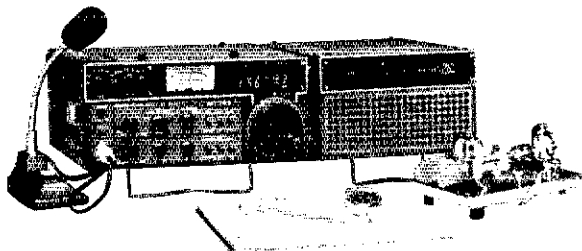
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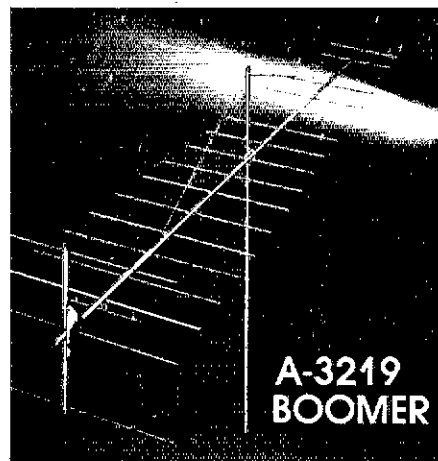
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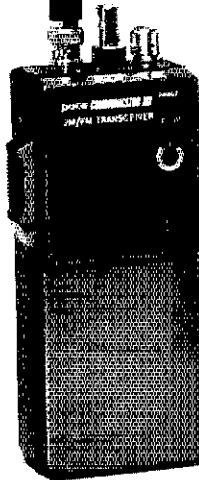
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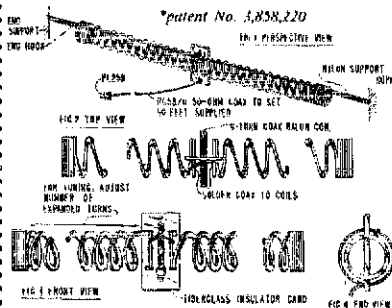
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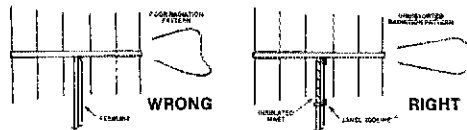
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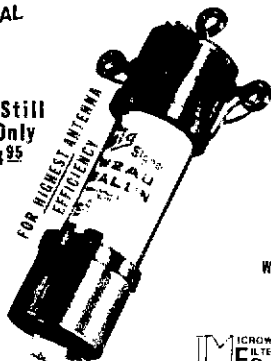
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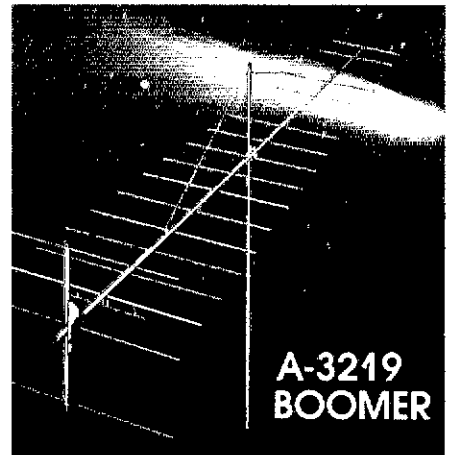
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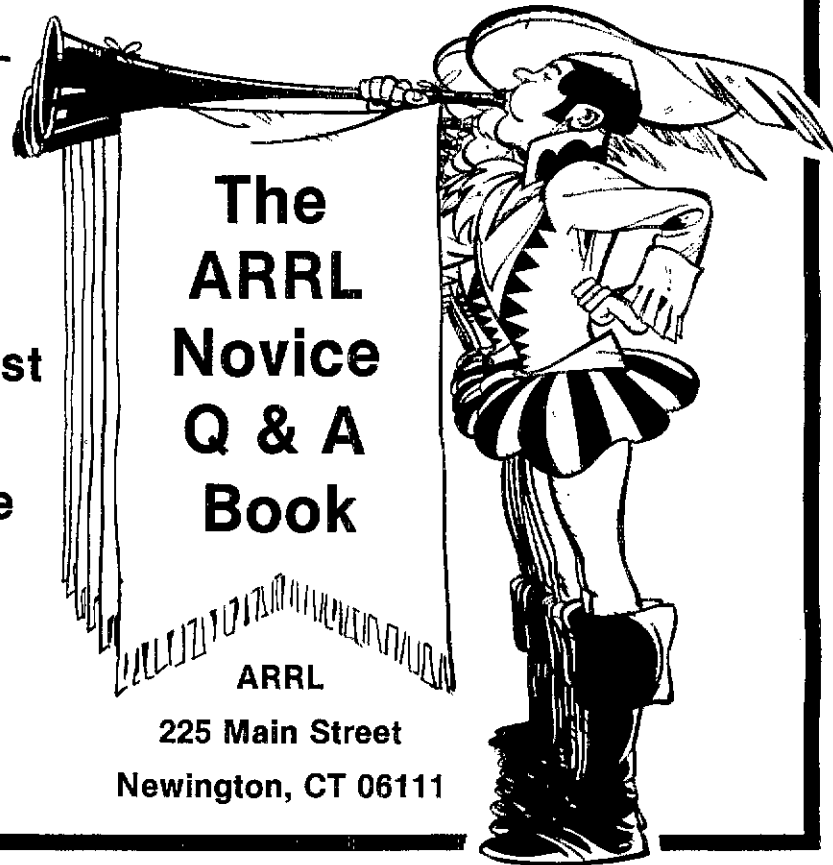
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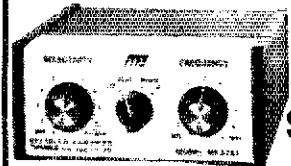
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**2ND Annual electronic flea market and swapfest** sponsored by Suffolk County Radio Club Inc., to be held Sept. 9, 1979 (rain date Sept. 16) on the grounds of Oddfellows Hall, Jayne Blvd., Port Jefferson Sta., L.I., NY. Buyers \$1.50, sellers \$2. There will be prizes and refreshments will be available. Talk-in on .52 and .94 and on 223.5 MHz. Directions: L.I.E. to Route 112 then north to Route 347, follow signs two blocks to Jayne Blvd. Tickets and Information: WA2SDI, 516-234-9376, Floyd E. Davis, 25 Hemlock St., Central Islip, L.I. NY 11722.

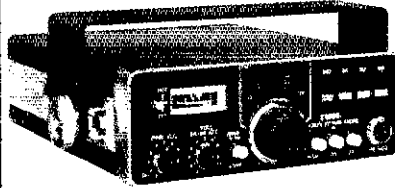
**KENTUCKY** — The Bluegrass Amateur Radio Club will host its annual Central Kentucky ARRL Bluegrass Hamfest August 12, 1979 starting 8:00 A.M. at Fasig Tipton Sales Paddock, Newtown Pike, Lexington, Kentucky. Talk in 146.16/76 MHz, Forums, indoor exhibits, prizes, paved fleamarket area. Admission \$2.50 advance, \$3 at door. Fleamarket space \$2 extra. For information contact Edward Bono WA4ONE, 2077 Dogwood Drive, Lexington KY 40504.

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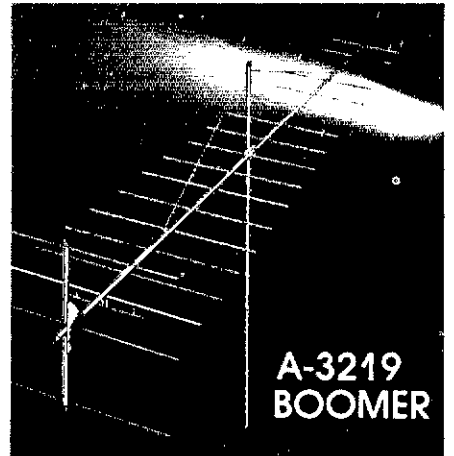
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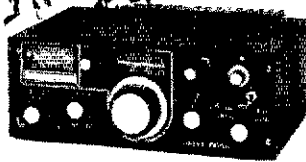
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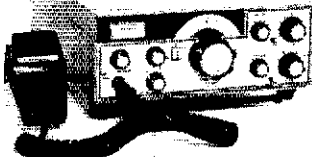
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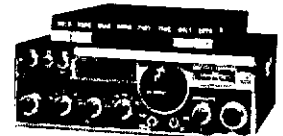
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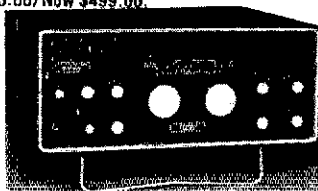
**Alda 105 Transceiver** 10-80 Mtrs. 250 Watts SSB power. All Solid-State. Regularly sells for \$615.00/Now \$499.00.



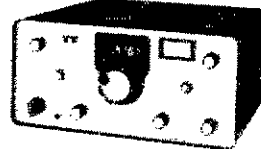
**Model 544 Digital Transceiver.** 3.5-30 MHz. 8 pole crystal filter 200 Watts SSB. Regularly sells for \$869.00/Now \$782.00.



**KDKFM2016A Transceiver** 1000 Channels — LED Readout. Reg. \$369.00/Now \$319.95.



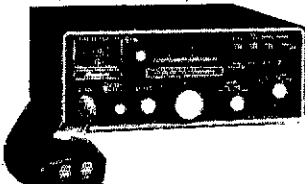
**Swan 102BX Transceiver.** Dual PTO's 235 Watts SSB & CW. 1.8-30 MHz I.F. Passband Tuning. Tunable Notch filter, much, much more. Regularly sells for \$1,195.00/Now \$1,075.00.



**Century 21 Transceiver.** 70 Watts CW, SSB. Digital Readout. Regularly sells for \$399.00/Now \$359.10.



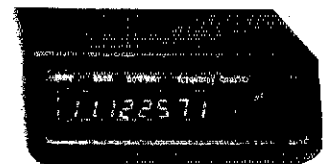
**NDI HC-1400 Transceiver** 800 Channels. 25/5 Watts Memory. Reg. \$399.00/Now \$319.95.



**Swan Astro 150 VRS Tuning** 10-80 Mtrs. 235 Watts SSB. Fully Microprocessor Controlled frequencies. Regularly sells for \$925.00/Now \$775.00.

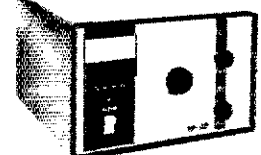


**Henry 2KD-5 Linear.** 80, 40, 20, 15 Mtrs. 2 kW PEP \$945.00.

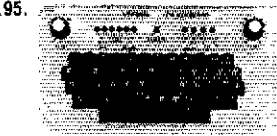


**DSI Frequency Counters Kit** \$99.95/Wired \$149.95.

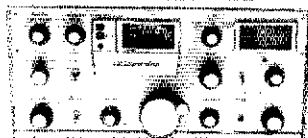
**Swan 100MX Solid-State** 10-80 Mtrs. 235 Watts SSB Power with noise blanker. Regularly sells for \$699.95/Now \$580.00.



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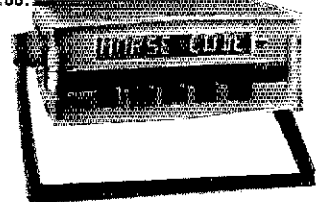


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August 26th Tickets: \$1.50 advance — \$2 at gate. Contact: Martin Schwamberger, WB9TNQ, 1051 Northfield Drive, Aurora, IL 60505.

THE 14th Annual Melbourne, Florida Hamfest will be held Friday, September 7 from 6 to 11 P.M. and Saturday and Sunday September 8 and 9 from 9 A.M. to 5 P.M. in the air-conditioned Melbourne Civic Auditorium located on Hibiscus Boulevard. Donation is \$3.50 per person. Full program includes forums, meetings, swap tables, commercial exhibits, prizes, etc. Talk-in on 25/85 and 52. Sponsored by the Platinum Coast Amateur Radio Society. For more information write P. O. Box 1004, Melbourne, FL 32901.

THE Annual Bluefield Hamfest, Bluefield, WV will be held Sunday, August 26. Indoor and outdoor flea market space will be available for individuals and dealers. Prizes. For more information contact Bill Fisher, 420 Union Street, Bluefield, WV 24701. Talk-in on 16/76 and 52 simplex. See you there.

24TH ANNUAL York County Hamfest on Sept. 2nd Rain or Shine, 8:00 A.M. to 4:30 P.M. Registrations \$3, XYLs and children free. Tail-gaters \$1. With tables, under roof, with power \$5, by advance registration only. Fly-ins right on the site at York Airport at Thomasville. Hamfest held at US 30 Drag-A-Way at Airport 10 miles west of York on US 30. Talk-ins 146.37/97 147.93/33, 147.87/27, 146.52/52. Saturday night campers welcome (no facilities). Full service cafeteria, clean rest rooms. Contact LeRoy Frey, K3POR, 170 S. Albermarle St., York, PA 17403 Phone 717-854-1203.

QST and CQ 1950-1975 issues for sale. Send s.a.s.e. if ordering 73, Ham Radio, or other QST and CQ issues. One dollar minimum order and all issues cost 25c each including USA shipping. Send chronological list and full payment to W6LS, 2814 Empire, Burbank, CA 91504. Available issues and refund sent within one month.

CINCINNATI Hamfest: 43rd Annual — Sunday September 16, 1979 at Strickers Grove on State Route 128, one mile west of Ross, (Venice) Ohio. Exhibits, prizes, food and refreshments available. Fleamarket (radio related products only), music, good fellowship, hidden transmitter hunt and sensational air show. Admission and registration \$4. For further information: Lillian Abbott-K8CKI, 1424 Main Street, Cincinnati, OH 45210.

HAM-CENTRAL, August 5th (raindate August 12th), Mt. Sinai Elementary School, Rt. 25A, Mt. Sinai, Long Island, just east of Port Jefferson. Helicopter Fly-In, CW contest, W2LH, antenna expert direct from Dayton, Novice, ARRL, and club tables. Great food. Tailgaters, dealers welcome. Talk-in on 144.71/145.31 and 146.52. Call 516-744-6260 or 516-924-8438 for information, or see July QST Hamfest Calendar. Sponsored by Radio Central Amateur Radio Club.

FALL Classic Radio Exchange: September 30! S.a.s.e. for Newsletter: K8SJ, 2386 Queenston, Cleveland, OH 44118.

ARRL Roanoke Division Convention & Hamfest: Fourth Annual Tidewater hamfest-computer show-flea market will be held in the Norfolk, VA Cultural and Convention Center SCOPE October 20 & 21, 1979. Open at 9:00 AM. ARRL meetings, DX, Traffic forums, plus a cw contest are scheduled. FCC exams are planned for amateur upgrading Saturday 9-12 AM. A special feature will be a dinner cruise and banquet on the Spirit of Norfolk Cruiseship Saturday Night. Advance registrations \$2.50 (s.a.s.e.), \$3.50 at the door. Flea market tailgate spaces \$3 day. Cruise and banquet \$16 person, \$30 couple. Tickets and information — TRC P. O. Box 7101, Portsmouth, VA 23707.

THE 5th annual Jonesboro Hamfest will be held Aug. 18 and 19, at the Craighead County Fairgrounds located in Jonesboro. Awards include a Yaesu FT1012D, FT202R, and many others. Advance tickets \$2 each or three tickets for \$5. Dealer displays and an enlarged flea market are included in this years hamfest. Camping available for both tents and campers. Talk in on 146.01/146.61, 52 direct, and 3.995. For details, map, QSL: Hamfest, Box 613, Jonesboro, AR 72401.

FINDLAY Hamfest: Don't miss this Superfest! We're second only to Dayton in Ohio. We've got one of the largest Swap & Shops you'll ever see. Admission tickets still only \$1.50 in advance and \$2 at the park. Awards include the new Kenwood TS-120S. See you at Riverside Park in Findlay, Ohio just 45 miles south of Toledo on Sunday, Sept. 9th. For advance tickets and further info send s.a.s.e. to Clark Foltz, W8UN, 122 W. Hobart Ave., Findlay, OH 45840.

THE SANGAMON Valley Radio Club of Springfield, IL holds its Fourth Annual Hamfest on Sunday, Sept. 23rd — Sangamon County Fairgrounds, New Berlin, sixteen miles west of Springfield. Indoor display and covered pavilion. Randy Rowe NØTG talks on Navassa DX-pedition! Exhibits, kids activities and food available. Overnight camping. Awards include: Atlas RX110/TX110, power supply. Tickets: \$1.50 advance, \$2 gate. Information: John WA9KRL, S.V.R.C., 1025 South Sixth, Springfield, IL 62703.

IF you missed the Clipperton DXpedition show at the LIDXA Hospitality Suite in Dayton in 1978, come to Warren, Ohio, Hamfest on 19 August.

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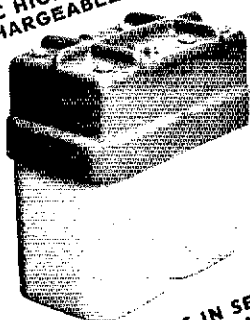
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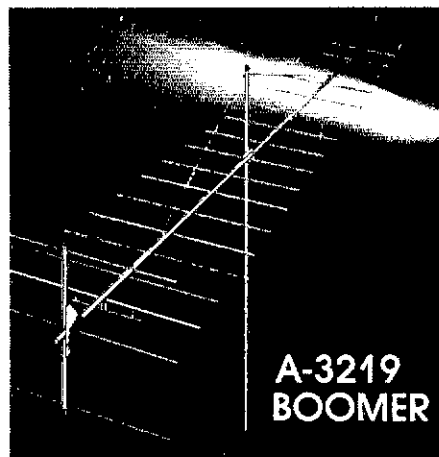
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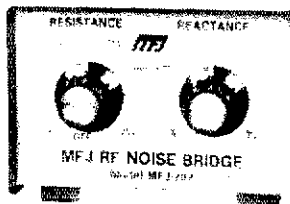
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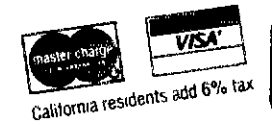
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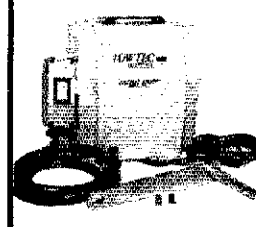
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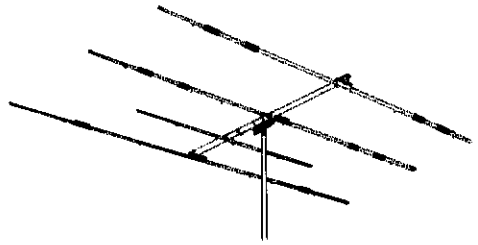
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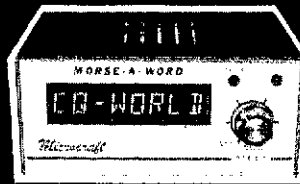
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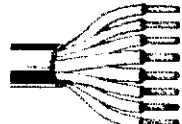
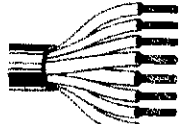
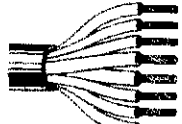
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	100	1.8	5.9	
	200	2.6	8.5	
	300	3.3	10.8	
	400	3.8	12.5	
8214 25c/ft.	50	1.2	3.9	
	100	1.8	5.9	
	200	2.6	8.5	
	300	3.3	10.8	
	400	3.8	12.5	
8237 21c/ft	100	2.0	6.6	
	200	3.0	9.8	
	400	4.7	15.4	
	900	7.8	25.6	
	8267 25c/ft	100	2.0	
200		3.0	9.8	
400		4.7	15.4	
900		7.8	25.6	

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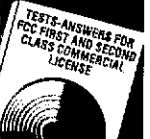
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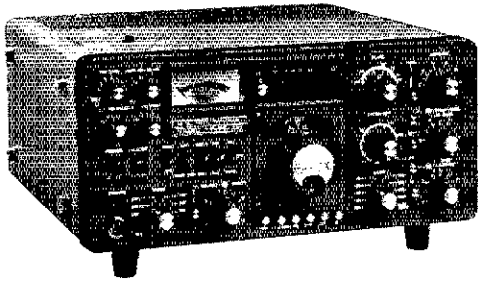
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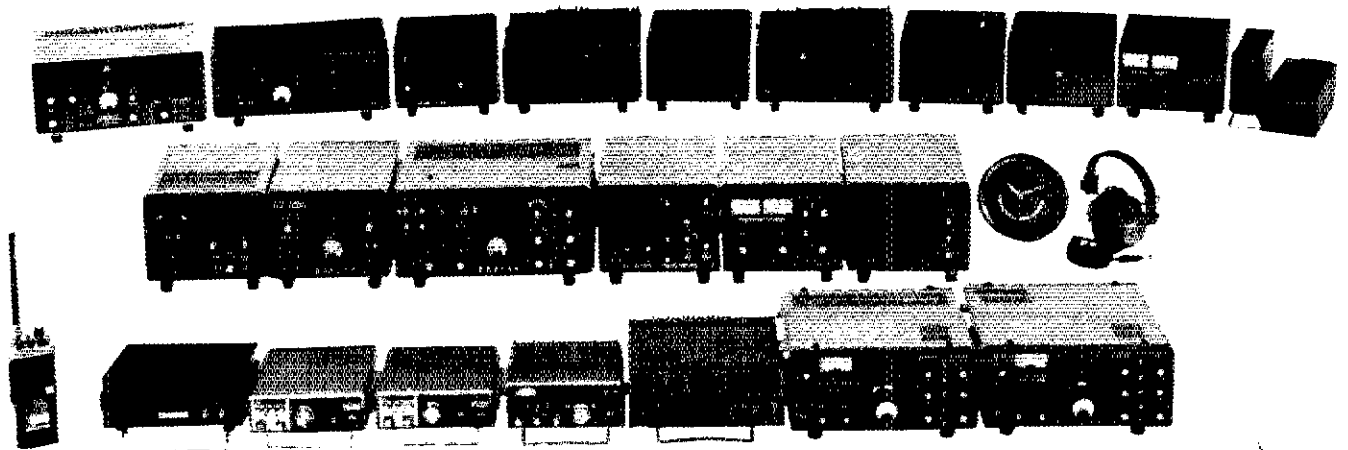
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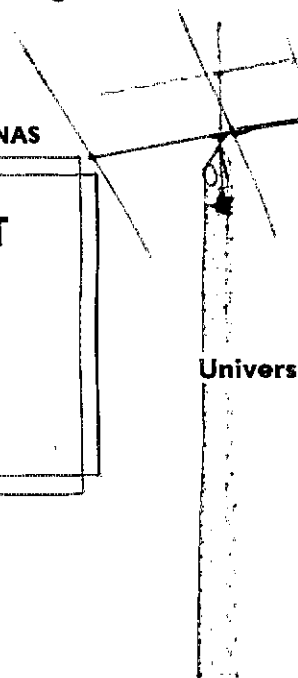
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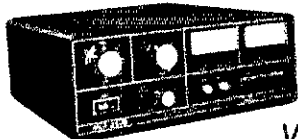
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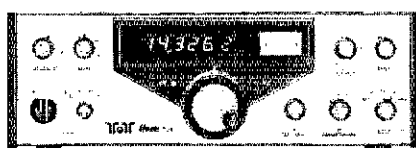
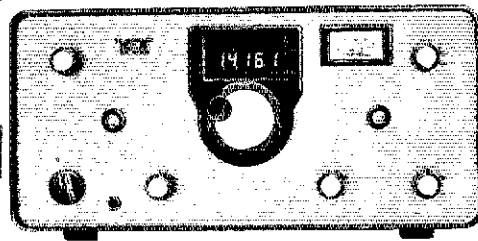
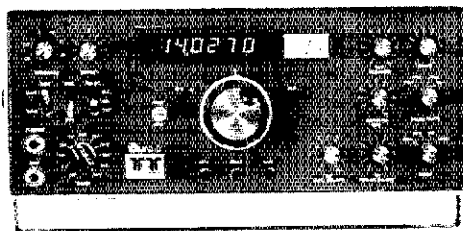
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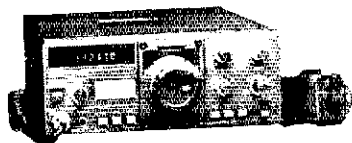
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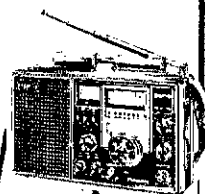
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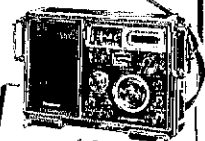
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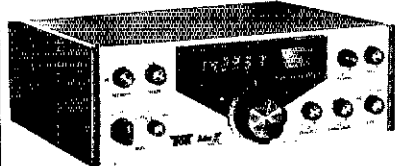
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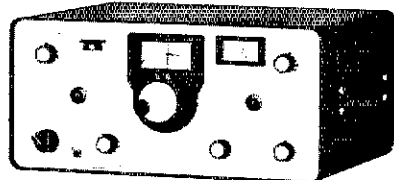
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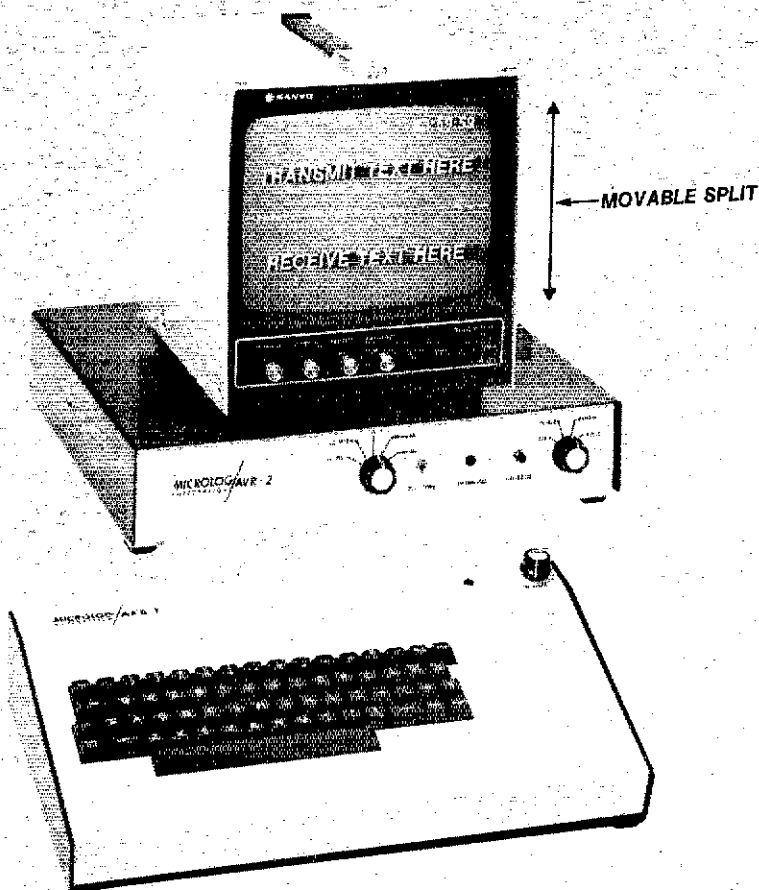
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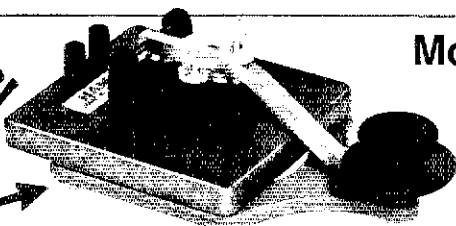
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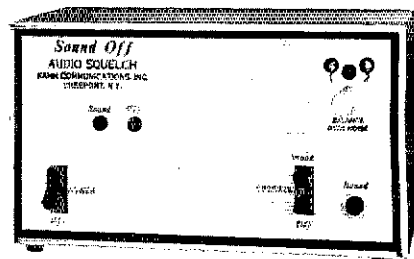
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**SELL** — HW-8 with p.s., excellent. \$125. Swan 350C \$225. WB7VCX, 605 5th St. NE, Montgomery MN 56069.  
**WANTED:** Swan MB-80A, W7TO. 307-674-9213.

**FOR SALE:** Instructograph Model 500 with tapes — \$75. WA2VCN, 214 W. Walnut St., Oneida, NY 13421.

**TS-520S**, \$600. Hy-gain 18-ATVWB 10-80M vertical, \$80. JJ-38 and AMECO cpo. \$15. All new; all prices firm; add shipping. G. C. Hartman, Esquire, 1517 Cedar Cliff Drive, Camp Hill, PA 17011.

**RTTY** mainline TTL \$70. T282 C/GR 100W am 200 to 400 mc. xmt'r \$55. General Radio 1391-B and 1391 ps. Pulse sweep generator \$60. WVV recvr G.M. 550 built in scope \$45. AN-UXH 2A FAX. set \$75. W4ONN.

**WANTED:** Pierson receiver model KE93. John Shiels, W30KP, 3212 Chestnut Street, Murrysville, PA 15668.

**FOR SALE:** Tektronix Oscilloscope 531 with 53/54 dual trace 30 Megahertz and steel dolly \$325. Ben Waigand, WA7YSO, POB 1158, Nampa, ID 83651. Tel. 208-466-3387.

**WANTED:** Manual for Tektronix Oscilloscope Type 585. Ben Waigand, WA7YSO, POB 1158, Nampa, ID 83651.

**WANTED:** Hallicrafters SX-146 receiver. State condition and price. Jay Thornhill, R. no. 2, Hoschton, GA 30548.  
**POWER** supply parts commercial grade 3000VDC 3/4 amp transformer, chokes, capacitors, variac. New pair 3-400Z sockets, chimneys. Vacuum capacitors. Lots of small parts send s.a.s.e. for list. W6VZB, Willard Wehe, P. O. Box 3319, San Leandro, CA 94578.

**FOR SALE:** Black face Tempo one & p/s with spkr. Matching rig is immaculate, used only a few hours. "Silent Key" has extra 10M rock \$465, Heath H.W. 101 p/s & 0104 mike spotless & works perfect. Wired by a pro. \$375. with p/s & mike — no spkr. Both rigs have manuals. Call T. Bruno 201-494-8350 collect, serious buyers only. Prices firm WA2AET 48 Sherdens Ave., Metuchen, NJ 08840.

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**COLLINS** Filters: F455FA05 \$110, F455FA08 \$75, F455FA21 — \$50, F455J05 — \$75. W8ZR, 414-532-6643.

**FOR SALE:** Ten-Tec Argonaut 509 QRP transceiver and model 251 power supply, mint condition, original cartons, manual. \$280. Dan Statkus, KA3CZC, 4700 Naples Ave., Beltsville, MD 20705. 301-937-6521.

**KENWOOD** TS-820S transceiver; 820S VFO plus SP-820 speaker, mint, guaranteed, original cartons, \$1075. Pace Communicator II 2M/m synthesized transceiver; 5/8 Larsen magnetic antenna, mint at \$345. W3NV, 8258 Brittany Place, Pittsburgh, PA 15237. Phone: 412-366-0277.

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**WANTED** Alive: Heathkit SB-610 Monitorscope, ICOM IC-22S, autopatch equipment. Advise price and condition. I ship (UPS). K4RN, Box 23191 Lexington, Kentucky 40523.

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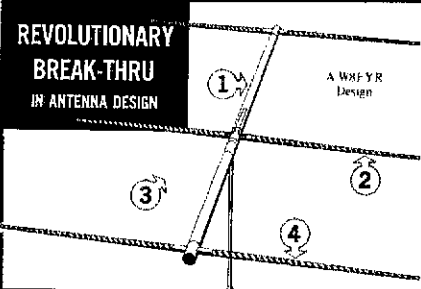
**FOR SALE:** SX88 has broken oscillator band switch W3IXO 412-775-6139.

**SELL:** Heath: SB-610 \$90, SB-620 \$115, SB-650 \$145, SB-400 w/xtal pack \$230, SB-301, SB-600 w/cw filter, 10 meter xtals \$220, or all for \$775. mint. W2NXC, 1244 Crim Rd., Bridgewater, NJ 08807. 201-725-5093.

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I first was a ham in 1932 at the age of 16 (W6GKO). I was off the air for 36 years until 1/1/78 when I felt the super urge to get back on the air, so got a ticket. It was like yesterday. My CW skills, perfected in those days, came back easily. I'm now having a ball meeting old friends and new, proudly report that I'm transmitting with a new solid-state TEN-TEC OMNI-D!

The reports I get with a Hustler vertical (behind a hill) are great. Can work almost everyone I hear, mostly on 15-40-80 and 10 meters. I transfer my OMNI-D from my shack to car and work CW with 200 watts input when I travel on the road to my clients in Central and Northern California . . . I worked a JA-8 the other day with a 589 report while going south on Highway 5. Then later worked four East Coast hams CW mobile with nice reports, too.

I find the receiver most selective and versatile and the digital frequency display is accurate and a pleasure to use.

Am enclosing a recent photo of me and the OMNI-D in my shack. With best wishes for a great TEN-TEC sales year!

Sincerely, Rolph Stoddard, W6TWO

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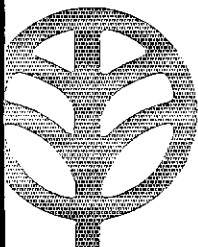
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## AT-120 and AT-180

**Antenna Tuners recommended  
for TS-120S and TS-180S  
All Solid-State HF Transceivers.**

**Why is the use of an antenna tuner so much more important with the TS-120S and TS-180S all solid-state HF rigs than with transceivers having tube-type final amplifiers?**

Tube-type final amplifiers generally handle a broader range of load impedance than a transistor final. However, RF power into the antenna system will decrease with an increasing impedance mismatch, and tube life may even be shortened if the mismatch is extreme. Transistor final amplifiers, on the other hand, require a 50-ohm nonreactive load for efficient power transfer and are not very tolerant of high SWR. Therefore, protection circuits are used in the TS-120S and TS-180S to reduce RF power output significantly under high-SWR conditions, thus preventing damage to the solid-state devices.

In the TS-120S, an SWR detection circuit detects reflected-wave voltage, which is then amplified and applied to the ALC circuit as a protective voltage to control power output. Thus, as SWR increases, RF power output decreases continuously.

In the TS-180S, the final amplifier functions normally up to an SWR of 3:1, at which point the protection circuit drops RF power output significantly.

Using an antenna tuner such as the AT-120 to match the TS-120S or the AT-180 to match the TS-180S will lower the reflected power at the transceiver to avoid detection by the protection circuit, thus enabling the transceivers to produce full RF power output and even with rigs which have tube final amplifiers, we recommend an antenna tuner (such as the AT-200 to match the TS-520 or TS-820 Series) for optimum coupling to antennas with high SWRs.

**A major advantage of using an all solid-state rig such as the TS-120S or TS-180S is the elimination of final-amplifier tuning and loading. It's great to be able to switch bands, dial up any frequency, and transmit immediately, especially when operating mobile or in a contest or chasing DX. Isn't this advantage lost if an antenna tuner has to be used?**

We recommend using an antenna that has a low SWR (below 1.5:1) and that presents a proper impedance match (50-ohms) to the transceiver. Then the full advantages of using an all solid-state rig can be realized. Furthermore, the antenna will be more efficient, and power will not be reflected back to an antenna tuner.

However, many antennas are not broad enough to cover an entire band, and may have an SWR below 1.5:1 in just a portion of the band. The antenna may be cut for resonance in the middle of the portion of the band that is mostly used. When operating outside this portion, where SWR exceeds 1.5:1, the antenna tuner should be switched in.



AT-120



AT-180

Therefore, with a well-designed antenna, the antenna tuner may be switched out for most operating, and the full advantage of using a no-tune all solid-state rig may be realized. But for those occasions when operating in the band portions where the antenna is not resonant and reactance increases or when, for some reason, the antenna develops a high SWR or a poorly matched antenna is used, the antenna tuner should be switched in to obtain full RF power output.

During those occasions when the antenna tuner is needed with an all solid-state rig, it would probably be advantageous with a tube-type rig also for optimum power transfer to the antenna system. With a tube-type final, plate tuning and loading adjustments would be required in addition to adjusting the antenna tuner. With an all solid-state transceiver, only the antenna tuner would need adjusting during those occasions when it is required.

**What are the primary features of the AT-120 and AT-180 antenna tuners?**

The AT-120 antenna tuner is very compact (only 6 inches wide, 2-3/8 inches high and 6-1/4 inches deep) - perfect for mobile mounting with the mounting bracket provided - and operates on 80 through 10 meters. It consists of an antenna coupler and an SWR meter (which can be illuminated). Although much smaller, it complements the appearance of the TS-120S.

The bandswitch has a "THROUGH" position for switching the AT-120 out of the circuit. Input impedance (to the transceiver) is 50-ohms and output impedance (to the antenna system) covers 20 to 300 ohms, unbalanced. It handles 150 watts (120 watts on 80 meters). The SWR meter measures from 1.0:1 to 10.0:1.

The AT-180 antenna tuner matches the TS-180S (same height) and consists of a through-line watt and SWR meter, antenna selector switch, and, of course, an antenna coupler.

It operates on 160 through 10 meters, with a 50-ohm input impedance and an output impedance of 10 to 500 ohms (10 to 400 ohms on 160 meters), unbalanced. Switches allow up to 20 or 200 watts of forward or reflected power to be measured. (It is not intended for use at the output of a linear amplifier.) UHF-type connectors are provided for the input, two antenna outputs, and a dummy load, and a standoff connector is provided for a wire feedline.

With both tuners, the "R TUNE" (for resistance component) and "X TUNE" (for reactance component) controls are adjusted alternately with a CW carrier applied until minimum SWR or reflected power is obtained.

that doesn't eat!) On Aluma, Tri-ex, or Hy-Gain towers. The following accepted: Video equip, photo equip, ham gear, CB 40 ch. gear, stereo equip, Robot SSTV equip, old time radios or scanners. Robert D. McClaran Sales, P. O. Box 2513, Vero Beach, FL 32960, 305-723-4793.

FOR SALE: Kenwood TV502, \$165. Want: Dynaco MKII, MKIII, & PAS3X, WB4HFL, P. O. Box 1932, Raleigh, NC 27602. 919-772-4285.

WANTED: Mechanically sound Swan TV-2, A, B, C WA1DCI, 7 Millstone Circle, Andover, MA 01810. 617-475-7064.

SWAN 500C, XC117AC, VX-2, Shure 444: \$400. 508 VFO: \$120. RTTY Model 15, 14, 14TD and stands: Heath HO-10 scope: \$45. U ship. RTTY pickup only. John, WB6WIV, 714-842-9142 evenings.

COMPUTER — Processor technology Sol w/32K RAM. Basic, WProc, game programs, books, cables, etc. One year old. Perfect condition. Cost \$2900, sell \$1900. Mike Parsons, Wellborn FL 32094. 904-963-3456 after 8 P.M.

HX-10 transmitter \$115. W6TF 7335 Donna Ave., Reseda, CA 91335 213-881-1009.

DRAKE R-4B, T-4XB, AC-4, and MS-4, all excellet, \$699 UPS prepaid. R-4B alone, \$299. prepaid. Bob Blaney, W9FRU, R. R. 4, Decatur, IN 46733.

WANTED: FT-101E (1st production model) serial no. 1-1000. Exc-Good condx. W6RQZ, 1330 Curtis, Berkeley, CA 94702.

HENRY 2K-4, Mint, \$975; Collins 312B4, \$225; 32S1 \$350; 75S3, \$395; MPI/351D-2, \$75. R. Schaaf, Box 301, DePere, WI 54115. 1-414-532-6643.

WANTED — Hallcrafters HT-33A In good operating condition, WB5NOQ 4215 Hamilton St., Big Spring, TX 79720. 915-267-7274.

COLLINS wanted: S-Line, 30L1, any condition. W9QYH 1605 Ridge Rd. Green Bay, WI 54304.

ICOM 211, absolutely mint, \$550; Bird 43 wattmeter, new WID 1000H and 100C slug: \$185. Money order or certified check. WA6OMC 209-478-9092.

FOR SALE: Drake 2-C, speaker with Q-Mult., Drake 2NT and Kantronic Freedom VFO, all with manuals — \$325. Heathkit DX-35 with VFO-1 \$35 and HW DX-40 with VFO-1 \$40. Jim Ballard, WDBKTH, Box 4, Caseville, MI 48725. 517-856-2468.

PRINTED circuit boards available for all QST construction articles beginning with December 1978. Low prices. Quantity discounts for club projects. S.a.s.e. for list. Daniel Gravereaux, N1ZZ, 602 Carter St., New Canaan, CT 06840.

QST and CQ past 20 years, \$75 fob Richmond (approx. 200 pounds). W4AX RFD 4 Box 71, Glen Allen, VA 23060.

SELL Yaesu Station, FT-101E, manual, fan, cw filter, new finals, matching speaker, YC-601 Digital Display, D-104 Microphone, Dentron Super-Tuner, Autex QF-1A filter, Ham key and Deluxe "Presentation" Vibroplex "bug" with 24K gold plated base top. Also RF-2000 SWR-RF power meter, all in excellent condition, now in daily use. \$900 firm. WB5WDG. 2423 Canterbury, Muskogee, OK. 74401.

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HEATH SB-610 \$90. SB-620 \$110. Both mint. All i/s, manuals. Want Kenwood TS-900, PS-900, K2EGI/N2EG.

FOR SALE: Atlas 210x, 220-GS console power supply, DD-6 digital dial, and VX-5 vox. Recent factory update. \$400 You pick up. K9GEL 11100 Springmill Rd., Carmel, IN 46032. 317-846-1207.

FOR SALE: HW-104, cw filter, power supply. Recent factory update. \$400. You pick up. K9GEL 11100 Springmill Rd., Carmel, IN 46032. 317-846-1207.

WANTED: SB200 and ICOM-IC 22A state price and condition. Jim Williams, WA5BBR, 3901 Lavey Lane, Baker, LA 70714.

FOR SALE: Collins 75A3 receiver S/N-319. Good condition. \$200. Mark Thompson, WB9QZB. 321 Hitchcock St., Baraboo, WI 53913. 608-356-5951.

KWM-2 plug in relays notch filter 518-F2 overhauled retubed \$650. SB 101 HP 23 B overhauled retubed \$275. SB 650 checked serviced \$135. SB 104A cw filter power supply speaker mike \$500. K4AA, Horse Shoe, NC 28742 704-891-4953. Cert. check, ship prepaid.

SOLAR Cells — 4 V, 4 inch diameter, 2 amps \$6.75, 10 for \$65. WB0DFS, 1742 Dowd, St. Louis, MO 63136. 314-622-6667.

IC701 PS/MFJ Versa Tuner MFJ 9-41/Dentron W2 wattmeter/dummy load/Drake LP 3300 filter/B&W window antenna/Vibroplex key! MFJ cw filter/all new Mar. 78! \$1475. Firm/Local pick up only — WA2J8Z Ray 212-548-5954, 8:30 to 9 PM.

PRIOR year(s) call books. Buysell. S.a.s.e. for prices. WB1ASX.

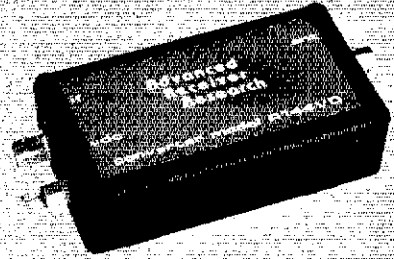
COLLINS R-390A, like new, sell or trade, make offer, call 208-233-7297, John Wilson, 1406 E. Poplar, Pocatello, ID 83201.

MOTOROLA HT-200 or PT-200 receiver and transmitter boards. Receivers tested, \$50 a set or trade. Call 208-233-7297, John Wilson, 1406 E. Poplar, Pocatello, ID 83201.

BOOK Wanted: "The Father of Radio," Autobiography of Lee De Forest, Wilcox and Follett Co. Chicago (1950). State price and condition. WA6OPE.

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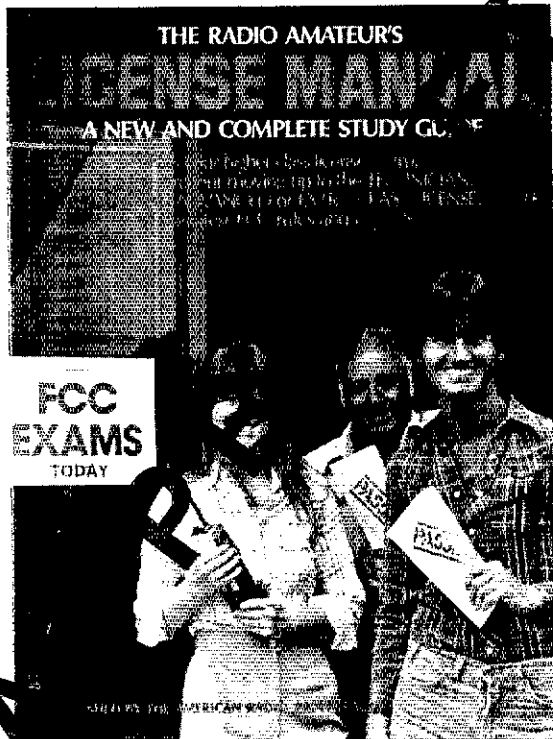
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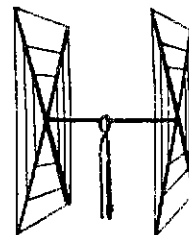
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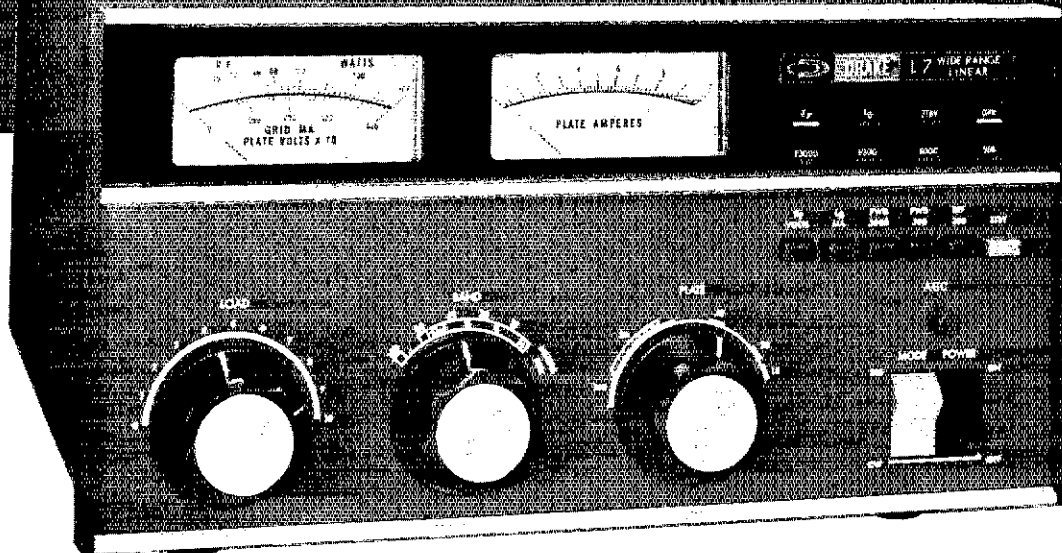
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\*10 meter coverage available only on export units.

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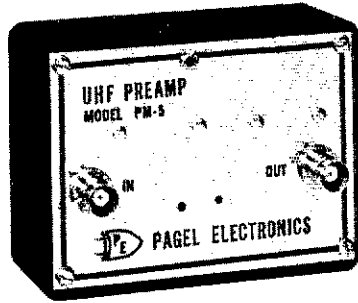
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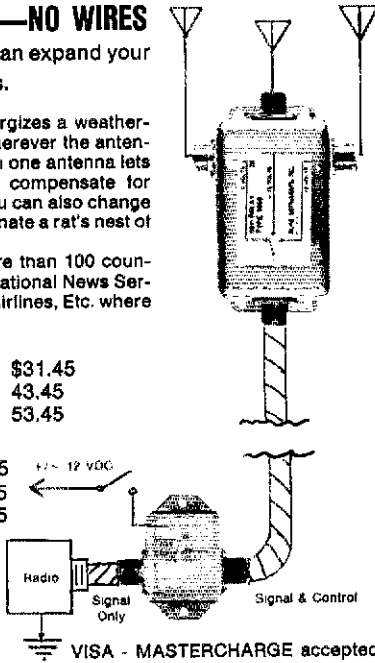
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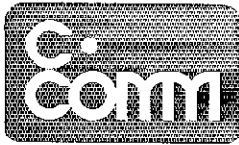
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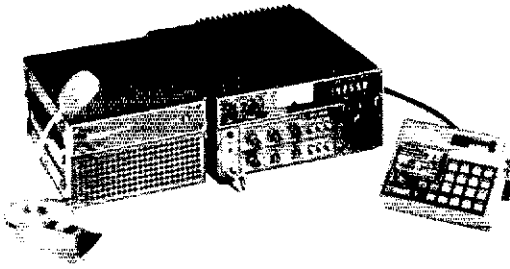




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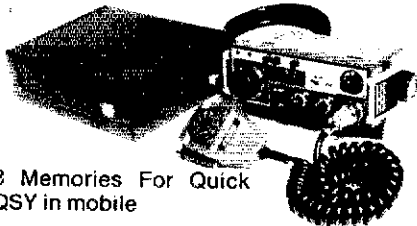
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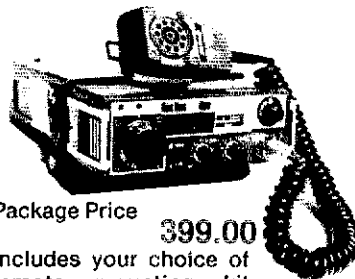
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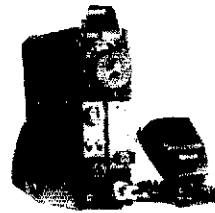


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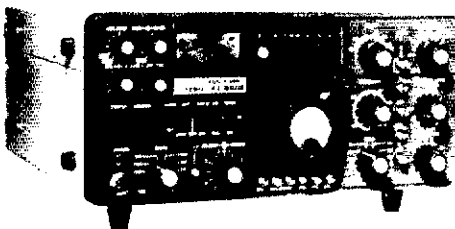


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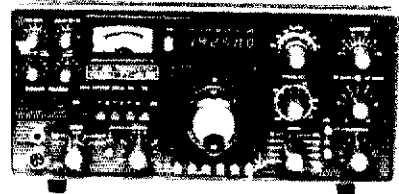
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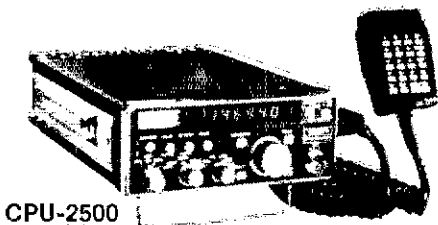


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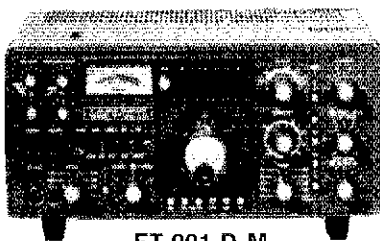
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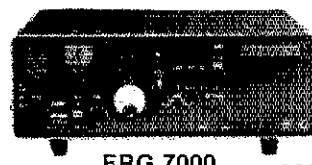


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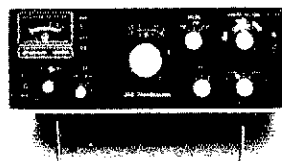
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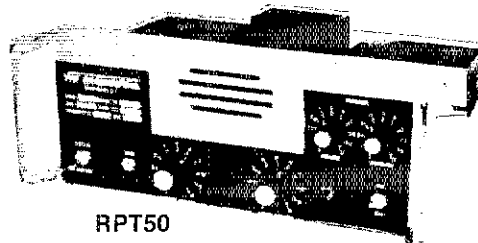
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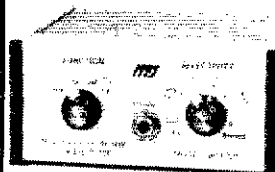
PS-2 Weather-proof center insulator \$ 5.95  
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All prices plus \$1.50 UPS charge.

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# MFJ SUPER CW/SSB FILTERS



\$59<sup>95</sup>

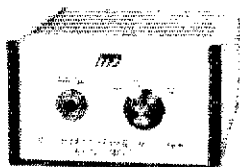
MFJ-721 SUPER SELECTOR CW/SSB FILTER gives 80 Hz BW, steep SSB skirts, noise limiting. CW Filter gives 80 Hz BW. No ringing. 8 poles give super steep skirts (60 dB down one octave from center freq. of 750 Hz). No tunable filter can match performance. BW: 80, 110, 150, 180 Hz. Reduces noise up to 15 dB.

SSB Filter improves readability. Reduces splatter, hiss, static, noise, hum. IC active filter has 375 Hz highpass cutoff; 2.5, 2.0, 1.5 KHz (36 dB/octave) lowpass cutoffs.

Works with any rig. AM, SSB, CW. Plugs into phone jack. 2 watts for speaker. Inputs for 2 rigs. Speaker and phone jacks. Phones disable speaker. OFF bypasses filter. 9-18 VDC, 300 ma. 10x2x6 in. Optional AC adapter, \$7.95.

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

Simulated stereo for CW lets ears, brain reject QRM. Yet, hear off frequency calls.



\$44<sup>95</sup>

THIS NEW MFJ-720 DELUXE SUPER CW FILTER gives you 80 Hz BW that is 60 dB down one octave from center frequency. 8 poles give super steep skirts with no ringing for razor sharp selectivity that no tunable filter can match. Bandwidths: 80, 110, 180 Hz. Center freq.: 750 Hz. Up to 15 dB noise reduction.

Noise limiter. Plugs in phone jack. 2 watts for speaker. 2x4x6 inches. Requires 9-18 VDC, 300 ma. Optional AC adapter, \$7.95.



\$29<sup>95</sup>

EACH



THE CWF-2BX SUPER CW FILTER AND SBF-2BX SSB FILTER are same as in the MFJ-721, less speaker amplifier, noise limiter. Plus in rig to drive phones or connect between audio stage for speaker operation. 9 V battery. 2x3x4 in.

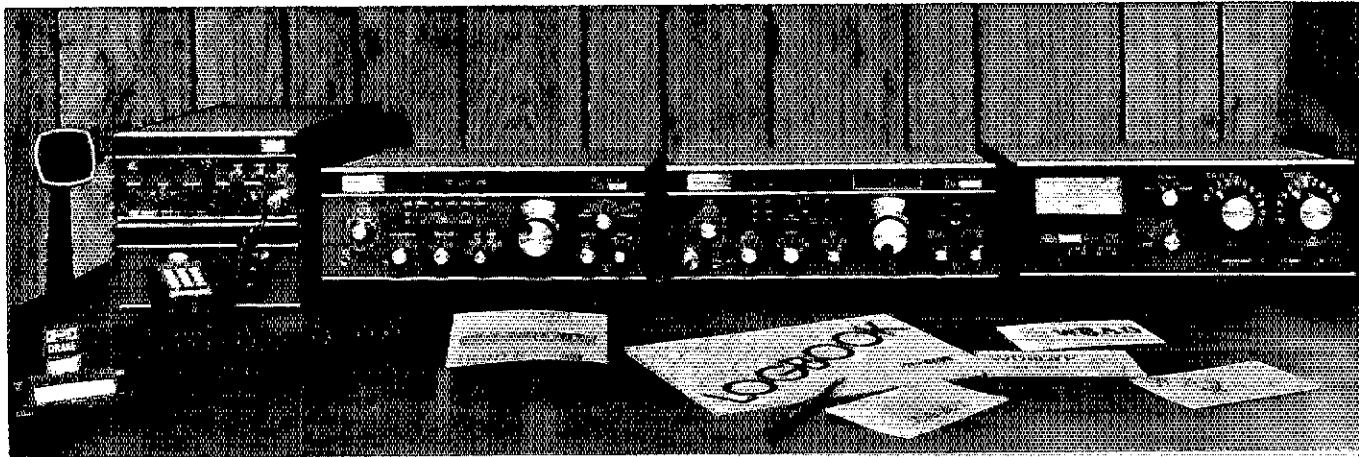
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For technical information, order/repair status, in Miss., outside continental USA, call 601-323-5869.

**MFJ ENTERPRISES, INC.**

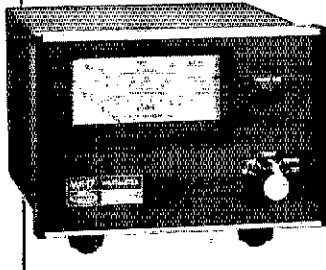
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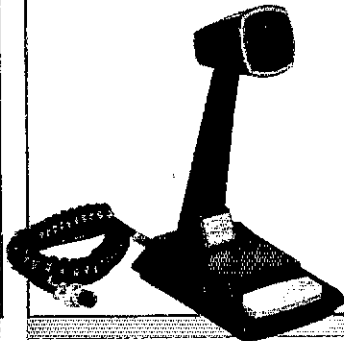
## Drake WH-7 Directional RF Wattmeter



### Model 1514 Drake WH-7

- 1.8-30 MHz coverage • Through-line, versatile, lab accuracy, low cost • Removable coupler for remote metering • Includes four calibrated scales: three for rf power from QRP to high power (0-20, 0-200 and 0-2000 W full scale) and one for direct reading VSWR • Line impedance: 50 ohm resistive • Power: 2000 W continuous • Accuracy:  $\pm$  (5% of reading + 1% of full scale) • Size: 5.3"H x 6.9"W x 7.5"D (13.5 x 17.5 x 19 cm) • Wt: 3 lbs (1.4 kg)

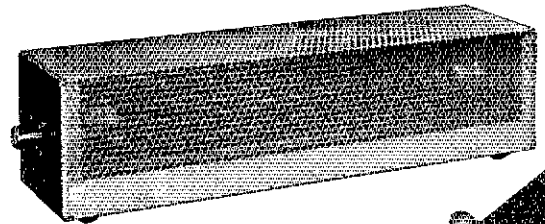
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### Drake 7077

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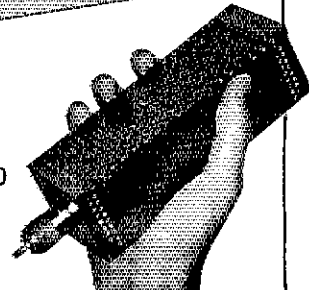
## Drake "Dry" Dummy Loads



Drake  
DL-1000

no oil  
required

Drake  
DL-300



### Model 1551 Drake DL-1000

- 1000 watts for 30 seconds, with derating curve to 5 minutes. Designed to accept Drake FA-7 cooling fan for extended high power operation • VSWR of 1.5:1 max. 0-30 MHz • Provided with SO-239 coax connector, and rubber feet for desk or bench use • Size 14 x 3.6" (35.6 x 9.1 cm). Wt. 2 lbs (910 g)

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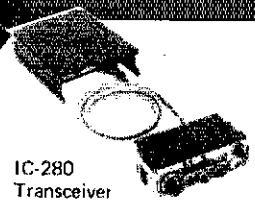
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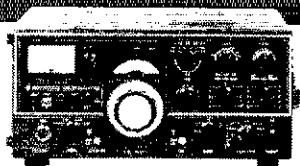
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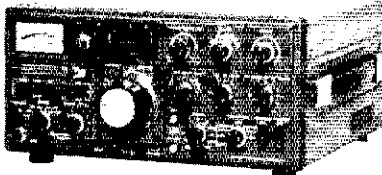
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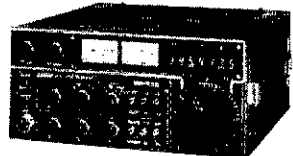
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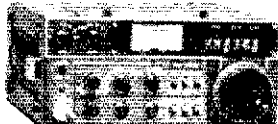
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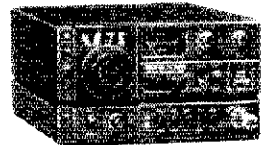
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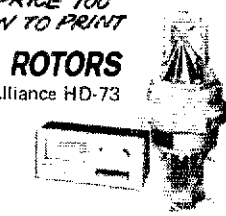
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# Webster radio, inc.

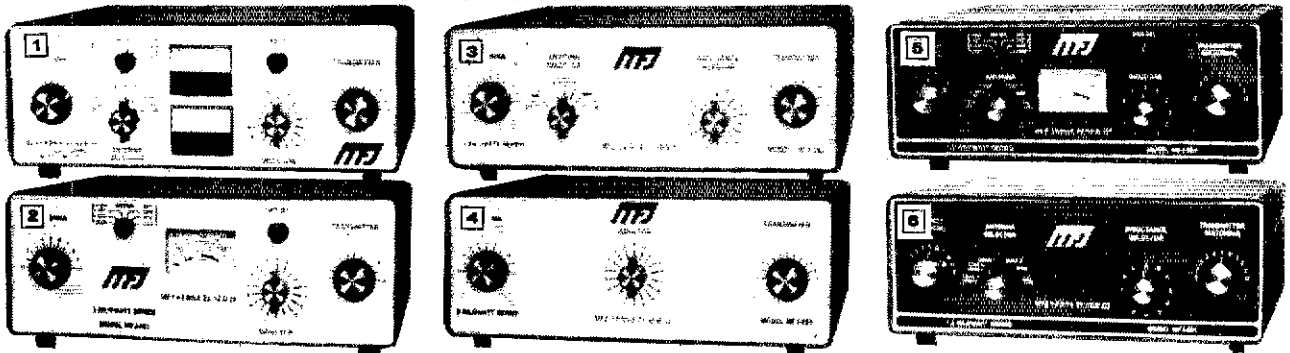
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# New MFJ 3 & 1.5 KW Versa Tuners

Run up to 3 KW or 1.5 KW PEP and match everything from 1.8 thru 30 MHz: coax, balanced line, random wire. Built-in balun.

3 KW VERSA TUNER IV's

1.5 KW VERSA TUNER III's



## NEW MFJ KW VERSA TUNERS HAVE THESE FEATURES IN COMMON

These 6 new MFJ KW Versa Tuners let you run up to 3 KW or 1.5 KW PEP (depending on the model) and match any feedline continuously from 1.8 to 30 MHz: coax, balanced line or random wire. Gives maximum power transfer. Harmonic attenuation reduces TVI, out of band emissions.

All metal, low profile cabinet gives RFI protection, rigid construction, sleek styling. Black. Rich anodized aluminum front panel. 5x14x14 inches.

Flip down stand tilts tuner for easy viewing.

Efficient, encapsulated 4:1 ferrite balun. 250 pf, 6000 volt capacitors. 18 position dual inductor, 17 amp, 3000 V ceramic rotary switch (3 KW version). 12 position inductor, ceramic rotary switch (1.5 KW version). 2% meters. SO-239 coax connectors, ceramic feedthru for random wire and balanced line. One year limited warranty. Made in U.S.A.

### 3 KW VERSA TUNER IV's

#### 1 MFJ-984 3 KW VERSA TUNER IV

**\$299<sup>95</sup>** **EXCLUSIVE RF AMMETER**  
insures maximum power to antenna at minimum SWR. Built-in dummy load.

This is MFJ's best 3 KW Versa Tuner IV. The MFJ-984 Deluxe 3 KW Versa Tuner IV gives you a combination of quality, performance, and features that others can't touch at this price.

An exclusive 10 amp RF ammeter insures maximum power to antenna at minimum SWR. A separate meter gives SWR, forward, reflected power in 2 ranges (2000 and 200 watts).

Versatile antenna switch lets you select 2 coax lines thru tuner and 1 thru or direct, or random wire, balanced line or dummy load.

A 200 watt 50 ohm dummy load lets you tune your exciter off air for peak performance. Efficient, encapsulated 4:1 ferrite balun.

#### 2 MFJ-981 3 KW VERSA TUNER IV

**\$199<sup>95</sup>** **Accurate meter gives SWR, forward and reflected power in 2 ranges: 2000 and 200 watts. 4:1 ferrite balun.**

The MFJ-981 3 KW Versa Tuner IV is one of MFJ's most popular Versa Tuners. An accurate meter gives you SWR, forward and reflected power in 2 ranges: 2000 and 200 watts. Encapsulated 4:1 ferrite balun.

#### 3 MFJ-982 3 KW VERSA TUNER IV

**\$199<sup>95</sup>** **Antenna switch lets you select 1 coax thru tuner and 2 coax thru tuner or direct, or random wire and balanced line.**

The MFJ-982 3 KW Versa Tuner IV gives you a versatile 7 position antenna switch that lets you select 1 coax thru tuner and 2 coax thru tuner or direct, or random wire and balanced line. Encapsulated 4:1 balun.

If you already have a SWR/wattmeter, the MFJ-982 is for you.

#### 4 MFJ-980 3 KW VERSA TUNER IV

**\$169<sup>95</sup>** **Heavy duty encapsulated 4:1 ferrite balun for balanced lines.**

The MFJ-980 is MFJ's lowest priced 3 KW Versa Tuner IV but has the same matching capabilities as the other 3 KW Versa Tuner IV's.

Features an efficient, encapsulated 4:1 ferrite balun for balanced lines.

### 1.5 KW VERSA TUNER III's

#### 5 MFJ-962 1.5 KW VERSA TUNER III

**\$169<sup>95</sup>** **SWR, dual range forward and reflected power meter, 6 position antenna switch, encapsulated 4:1 ferrite balun.**

The MFJ-962 1.5 KW Versa Tuner III is an exceptional value. An accurate meter gives SWR, forward and reflected power in 2 ranges (2000 and 200 watts).

A versatile six position antenna switch lets you select 2 coax lines thru tuner or direct, or random wire and balanced line. Encapsulated 4:1 balun.

Black front panel has reverse lettering.

#### 6 MFJ-961 1.5 KW Versa Tuner III

**\$149<sup>95</sup>** **6 position antenna switch lets you select 2 coax lines thru tuner or direct, or random wire and balanced line.**

The MFJ-961 1.5 KW Versa Tuner III gives you a versatile six position antenna switch. It lets you select 2 coax lines thru tuner or direct, or random wire and balanced line. Encapsulated 4:1 ferrite balun.

If you already have a SWR/wattmeter, the MFJ-961 is for you.

Black front panel has reverse lettering.

FOR YOUR NEAREST DEALER OR FOR ORDERS

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Why not visit your dealer today? Compare these 3 KW and 1.5 KW Versa Tuners to other tuners. You'll be convinced that its value, quality and features make it a truly outstanding value. If no dealer is available, order direct from MFJ and try it. If not delighted, return it within 30 days for a prompt refund (less shipping). Charge VISA, MC. Or mail check, money order plus \$10 shipping/handling.

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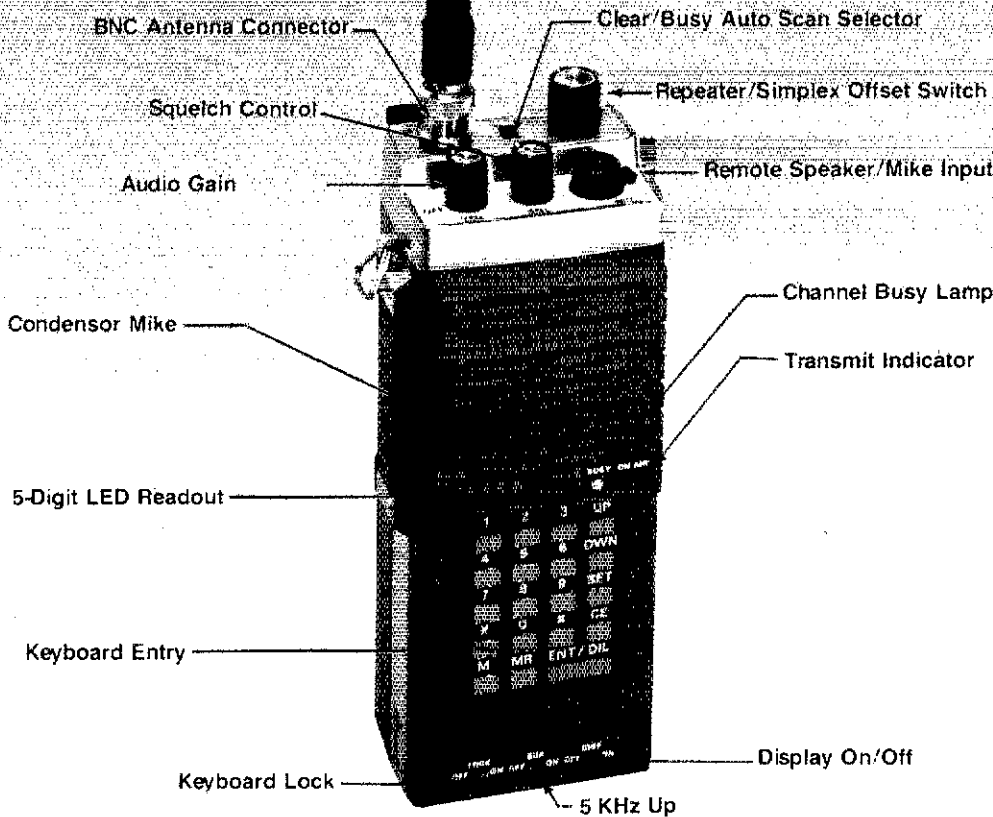
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# TS-520SE



## "Cents-ability" in a quality HF Rig!

The TS-520SE is an economical new version of the TS-520S... the world's most popular 160-10 meter Amateur transceiver. Now anyone can easily afford a high quality HF transceiver, providing 200 watts PEP input on SSB and 160 watts DC on CW!

The TS-520SE is a high-quality 160-10 meter SSB/CW transceiver intended for ham-shack use. The following changes were made to produce the new "SE" model:

- Replaced the heater switch with a CW/WIDE/NARROW bandwidth switch, for use with the optional CW-520 500-Hz CW filter. A big improvement for the CW operator!
- Removed DC converter terminals. Now it operates strictly on 120 VAC and is not intended for mobile use.
- Removed transmitter terminals. Now it is strictly a 160-10 meter SSB/CW transceiver. [DC-5 Digital Display is optional].



Ask your Authorized Kenwood Dealer about the amazing TS-520SE... and its surprisingly affordable price!

*...partner in amateur radio*

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See Kenwood's "Tech Talk" in this issue for information on using antenna tuners.