QST

August 1973
75 Cents

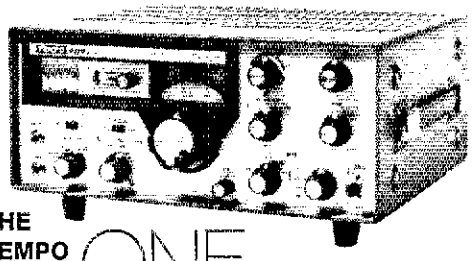
devoted entirely to Amateur Radio

OFFICIAL JOURNAL OF THE ARRL

the tempo line

...a reputation built on quality and value

IN LESS THAN THREE YEARS THE TEMPO LINE HAS ESTABLISHED A SOLID REPUTATION FOR FIRST RATE PERFORMANCE AT A REASONABLE PRICE. WHETHER YOUR INTERESTS LIE IN HIGH FREQUENCY SSB OR VHF/UHF FM, TEMPO DESERVES YOUR SERIOUS CONSIDERATION. YOU WILL NEVER BE SORRY.

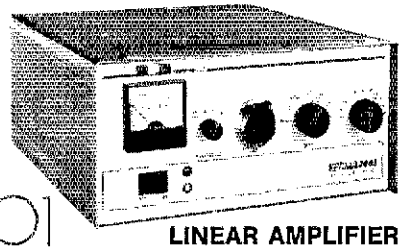


THE TEMPO ONE SSB TRANSCEIVER

Look at the specifications . . . look at the price tag . . . ask any of the thousands of Tempo ONE owners about its reliability . . . and the reason for its unparalleled popularity will be obvious. The Tempo ONE is now the proven ONE.

FREQUENCY RANGE: All amateur bands 80 through 10 meters, in five 500 khz. ranges: 3.5-4 mhz., 7-7.5 mhz., 14-14.5 mhz., 21-21.5 mhz., 28.5-29 mhz. (Crystals optionally available for ranges 28-28.5, 29-29.5, 29.5-30 mhz.)
SOLID STATE VFO: Very stable Colpitts circuit with transistor buffer provides linear tuning over the range 5-5.5 mhz. A passband filter at output is tuned to pass the 5-5.5 mhz. range.
RECEIVER OFFSET TUNING (CLARIFIER): Provides ±5 khz. variation of receiver tuning when switched ON.
DIAL CALIBRATION: Vernier scale marked with one kilohertz divisions. Main tuning dial calibrated 0-500 with 50 khz. points.
FREQUENCY STABILITY: Less than 100 cycles after warm-up, and less than 100 cycles for plus or minus 10% line voltage change.
MODES OF OPERATION: SSB upper and lower sideband, CW and AM.
INPUT POWER: 300 watts PEP, 240 watts CW
ANTENNA IMPEDANCE: 50-75 ohms
CARRIER SUPPRESSION: −40 dB or better
SIDEBAND SUPPRESSION: −50 dB at 1000 CPS
THIRD ORDER INTERMODULATION PRODUCTS: -30 dB (PEP)
AF BANDWIDTH: 300-2700 cps
RECEIVER SENSITIVITY: ½μv input S/N 10 dB
AGC: Fast attack slow decay for SSB and CW.
SELECTIVITY: 2.3 khz. (−6 dB), 4 khz. (−60 dB)
IMAGE REJECTION: More than 50 dB.
AUDIO OUTPUT: 1 watt at 10% distortion.
AUDIO OUTPUT IMPEDANCE: 8 ohms and 600 ohms
POWER SUPPLY: Separate AC or DC required. See AC "ONE" and DC1-A.
TUBES AND SEMICONDUCTORS: 16 tubes, 15 diodes, 7 transistors

TEMPO "ONE" TRANSCEIVER	$349.00
AC/ONE POWER SUPPLY 117/230 volt 50/60 cycle	$ 99.00
DC/1-A POWER SUPPLY 12 volts DC	$110.00
VF-ONE EXTERNAL VFO	$ 99.00



THE TEMPO 2001 LINEAR AMPLIFIER

Small but powerful, reliable but inexpensive, this amplifier is another top value from Henry Radio. Using two 8874 grounded grid triodes from Eimac, the Tempo 2001 offers a full 2 KW PEP input for SSB operation in an unbelievably compact package (total volume is .8 cu. ft.). The 2001 has a built-in solid state power supply, a built-in antenna relay, and built-in quality to match much more expensive amplifiers. This equipment is totally compatible with the Tempo One as well as most other amateur transceivers. Completely wired and ready for operation, the 2001 includes an internal blower, a relative RF power indicator, and full amateur band coverage from 80-10 meters. PRICE: $545.00

YAESU

... a name proven through world-wide use. ... now available at Henry Radio. Come in, phone or write for complete specifications. We ship almost every where.

FT-101	Transceiver	649.00
FTdx-401	Transceiver	599.00
FL-2100	Linear Amp with tubes	339.00
YC-355D	Digital Counter	289.00
FV-101	External VFO	99.00
SP-101P	Speaker/patch	59.00
SP-101	Speaker	19.00
FV-401	External VFO	99.00
SP-401P	Speaker/patch	59.00
SP-401	Speaker	19.00
YD-844	Dynamic microphone	29.00
XF-3C/30C	C.W. filter	40.00
FA-9	Fan	19.00
MMB-1	Mobile bracket	9.00

Prices subject to change without notice.

Henry Radio

11240 W. Olympic Blvd., Los Angeles, Calif. 90064 213/477-6701
931 N. Euclid, Anaheim, Calif. 92801 714/772-9200
Butler, Missouri 64730 816/679-3127

Savoy

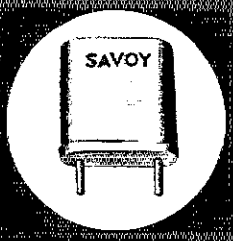
BASSETT

High efficiency mobile and portable antennas for all amateur bands, CAP, MARS, CB, SECURITY, PUBLIC SERVICE, MARINE, AND GOVERNMENT USE.

- **2-6-10-15-20-40-75**
- ***Identical size, cost, and appearance***
- **FULLY ADJUSTABLE TO FREQUENCY IN FIELD**
- **Low weight, low drag, high strength fiberglass**
- **Polished chrome brass standard ⅜-24 thread**
- **High gain collinear on 2 meters**

MODEL DGA-2M

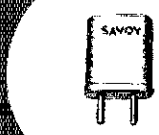
$29.50 postpaid in U.S.A.



$3.75

Postpaid in U.S.A.

TYPE 900 A TYPE 901



HIGH ACCURACY CRYSTALS

FOR OVER 30 YEARS

Either type for amateur VHF in Regency, Swan, Standard, Drake, Vartronics, Tempo, Yaesu, Galaxy, Trio, Sonar, Clegg, SBE, Genave.

Quotes on request for amateur or commercial crystals for use in all other equipments.

Specify crystal type, frequency, make of equipment and whether transmit or receive when ordering.

BASSETT VACUUM TRAP ANTENNA SYSTEM

Complete packaged multi-band antenna systems employing the famous Bassett Sealed Resonators and Balun from which air has been removed and replaced with pure helium at one atmosphere. Operating bands are indicated by model designation.

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MODEL DGA-204075	$79.50
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BASSETT VACUUM BALUN

The famous sealed helium filled Balun employed with the DGA Series Antenna Systems. Solderless center insulator and easily handles more than full legal power *while reducing unwanted coax radiation.* Equipped with a special SO-239 type coax connector and available either 1:1 or 4:1.

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Savoy Electronics, Inc.

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Tel: 305-566-8416 or 305-947-1191

New FPM-300, a low-priced, versatile, compact SSB/CW transceiver with latest high performance FET and integrated circuits plus extended coverage.

hallicrafters

This new radio, with built-in AC-DC power supply, is compactly designed with modular construction techniques for effective and reliable service in fixed, portable and mobile use for amateur, Civil Defense, CAP, MARS, RACES and other utility HF Communications Services.

The new transceiver has premium type glass epoxy printed circuit board construction for greater reliability, routine maintenance and features the latest state-of-the-art solid state devices throughout. The All-American made radio, priced at only $595, is also equipped with a unique integrated circuit speech compressor design for extended "talk power" plus many other built-in features – all good reasons why you should be talking with a Hallicrafters.

For additional data see your Hallicrafters distributor or write or phone:

The Hallicrafters Co., 600 Hicks Road, Rolling Meadows, Ill., 60008 U.S.A.
Phone: 312/259-9600

You should be talking with a Hallicrafters.

QST

AUGUST 1973

VOLUME LVII NUMBER 8

PUBLISHED MONTHLY, AS ITS OFFICIAL JOURNAL, BY THE AMERICAN RADIO RELAY LEAGUE INC., NEWINGTON, CONN., U. S. A. OFFICIAL ORGAN OF THE INTERNATIONAL AMATEUR RADIO UNION

OFFICES

225 Main Street
Newington, Connecticut 06111
Tel.: 203-666-1541

Subscription rate $7.50 per year postpaid, U.S. funds, U.S. & Possessions; $8.50 in Canada; $9.00 elsewhere. Single copies, 75 cents. Foreign remittances should be by international postal or express money order or bank draft negotiable in the U.S. and for an equivalent amount in U.S. funds.

Second-class postage paid at Hartford, Conn. and at additional mailing offices.

QST is available to the blind and physically handicapped on magnetic tape from the Library of Congress, Division for the Blind and Handicapped, Washington, DC 20542.

INDEXED BY Applied Science and Technology Index, Library of Congress Catalog Card No.: 21-9421

OUR COVER

W3ZKI is shown "potting" the Oscar 6 repeater prior to launch. A description of the spacecraft by W3GEY appears on page 69.

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YAESU

YOUR ASSURANCE OF PERFORMANCE & QUALITY

Amateur Price Net

F-LINE MODEL 400D/400SD

Includes 6 & 2 Meters

FR DX 400 $299.00

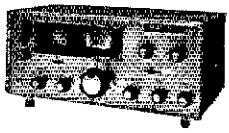
FR DX 400 SD $399.00

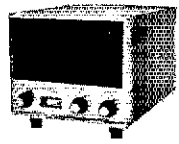
SP-400P $59.00

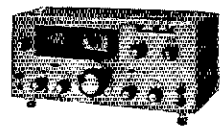
SP-400S $19.00

FLDX 400
Exciter $339.00

FL 2000B
1200 Watt Linear Amp.
$339.00







SPECIFICATIONS

FR-DX-400 RECEIVER

Mode of Operation: SSB, CW and AM (FM)
Frequency Range: 1.7-2.3Mc, 3.5-4.1Mc, 6.9-7.4Mc, 13.9-14.4Mc, 20.9-21.4Mc, (26.9-27.5Mc), 27.9-28.5Mc, 28.5-29.1Mc, 28.9-29.5Mc, (29.5-30.1Mc), (9.9-10.5Mc), (50-52Mc or 52-54Mc), (144-146Mc or 146-148Mc).
Sensitivity: SSB/CW; 0.5uV at S/S+N 10 db. AM; 1uV at S/S+N 10 db.
Selectivity: SSB/CW/AM; 2.4kc/6 db 4 kc/25 db. AM; 4 kc/6 db 7.5kc/60db. (CW; 600 cps/6db 1.5kc/60db). (FM; 24kc/6db).
Spurious Response: Better than -60 db at 14Mc
Frequency Stability: After warm up less than 100 cps. per any 15 min. or 10% line voltage, fluctuation.
T-notch Attenuation: -50db
Antenna Impedance: 50-75 ohms
Audio Output
Impedance: 4 or 600 ohms
Output: 1 watts @ 5% distortion
Power Requirement: 100/110/117/200/220, or 234 volts AC, 50 or 60 cps., approx. 50 watts
Dial Calibration: 50 kc main dial division, 1 kc reading
Calibration: 100kc or 25kc
Dimensions: 14 1/2" W, 6 1/4" H, 11 1/5" D.
Weight: Approx. 24 lbs.

SP400-P: Hand Liner Phone Patch, speaker is designed for the FT dx 400 and 401 series, single side band transceivers. Front panel: Patch switch, off and on switch, (meter level to phone line). TX and RX gain controls. Rear apron: Receiver 8/4 ohm jack, 600 ohm receiver jack, monitor null switch, balance control, line jack transmitter 600 ohm jack transmitter Hz jack.

FL-DX-400 TRANSMITTER

Frequency Coverage: 3.5-4.1Mc, 6.9-7.5Mc, 13.9-14.5Mc, 20.9-21.5Mc, (27.9-28.5Mc), 28.5-29.1Mc, (28.9-29.5Mc).
Modes of operation: SSB; Upper and lower sideband on all bands. CW; Grid block keying, VOX circuit keying. AM; Either sideband with carrier.
Dial Calibration: Main dial calibrated 0 to 500kc and 500 to 1000kc. Vernia dial calibrated 0 to 50kc and 50 to 100kc in 1kc division.
Stability: Less than 100 cycles within any 15 minutes after warm-up, less than 100 cycles with 10% change in line voltage.
Sideband Suppression: 50 db at 1000 cps.
Carrier Suppression: Better than 50 db.
Distortion Products: In excess of 30 db down.
Frequency Response: 300 to 2700 cps.
Input Power: SSB and CW-240 Watts PEP AM-100 Watts.
Output Impedance: Nominal 52 ohms adjustable with pi network.
Microphone: High impedence dynamic or crystal.
Power Requirements: 100/110/117/200/220 or 234V, 50/60 cps AC.
Dimensions: 14 1/2" W, 6 1/4" H, 11 1/5" D.
Weight: Approx. 25 lbs.

FL-2000B LINEAR AMP

Circuit: Grounded Grid
Frequency: 80 to 10 meters
Max. Input: 1000 watts DC
Plate Voltage: 2400 volt DC
Power Requirement: 115/230 volt AC, 50/60 cps.
Input Impedance: Approx. 60 ohms
Output Impedance: 50 to 100 ohms
Cooling: Forced air cooling
Tubes: 572B; 2 in parallel
Dimensions: 14 1/2" W, 6 1/4" H, 11 1/2" D.
Weight: Approx. 40 lbs.

( ) option

Here is the opportunity you have been waiting for:

- *Split frequency operation for working that choice DX and Net Operation.*
- *This is the ultimate for complete coverage with control from either the transmitter or the receiver.*
- *2 Mechanical Filters for excellent selectivity plus T notch rejection tuning.*
- *Solid State VFO for excellent stability.*
- *Clarifier for Net operation.*
- *Built in Monitor for listening to transmitted signal.*
- *100KC and 25KC calibrator -- 3 step AQC.*
- *Pick up a brochure at your Dealers and ask for Demonstration.*

FACTORY SERVICE IS AVAILABLE WHERE WARRANTY HAS EXPIRED. MODIFICATION KIT MK-160 (160M) $16.00 WITH XTAL PLUS LABOR. MODERNIZATION KIT MIR-1 FOR OLDER MODEL FT101 $40.00 PLUS LABOR. BROCHURES WITH SPECIFICATIONS ARE AVAILABLE AT YOUR DEALERS LISTED BELOW:

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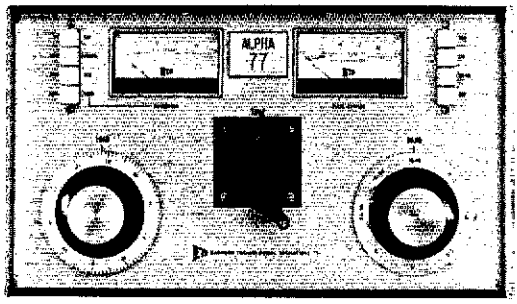
HOW RUGGED IS AN ALPHA 77?



THE ALPHA 77 IS A NO-COMPROMISE POWER AMPLIFIER BUILT FOR CONTINUOUS COMMERCIAL AND MAXIMUM-LEGAL-POWER AMATEUR SERVICE IN ANY MODE, 10 THROUGH 160 METERS

It has to be exceptionally rugged to allow E.T.O. to warrant the entire amplifier for a full year and the transformer for an *additional* full year! Here's part for the *inside story*:

- EIMAC'S FINEST GROUNDED-GRID TRIODE, the ceramic-metal 8877, with a conservative 1500 watts plate dissipation. Operating under manufacturer-recommended conditions, it delivers an outstandingly clean, sharp, legal-limit signal with only 50-75 watts drive.
- 1.5 KVA **CONTINUOUS DUTY** TRANSFORMER; tape-wound, grain oriented core for maximum efficiency and minimum bulk.
- 25 MFD, 4 KV OIL FILLED polypropylene dielectric filter capacitor.
- RUGGED BANDSWITCH: 20 ampere silver contacts, 6 KV ceramic insulation.
- MASSIVE COILS: Silver-soldered and heavily plated main tank, husky Teflon®-insulated toroids in a full pi-L network.
- 7.5 KV VACUUM VARIABLE tuning capacitor; 10 pf minimum capacitance to maintain optimum circuit efficiency at all frequencies.
- VACUUM T/R RELAYS for extremely fast, silent changeover. **Plus** electronic T/R switch for full break-in CW.
- FULL-CABINET COOLING by whisper-quiet, computer-grade, ball bearing blower. Heat is ducted out the rear.
- BATTLESHIP CONSTRUCTION using ¼" thick aluminum main end plates.

The ALPHA 77 is *loaded* with versatility, performance, and ruggedness.

PAYNE RADIO HAS THE ALPHA 77 IN STOCK
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Write or phone Don Payne, K4ID, for an illustrated brochure, operating experience, and a king-size trade on your gear.

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Section Communications Managers of the ARRL

Reports Invited. All amateurs, especially League members, are invited to report station activities on the first of each month (for preceding month) direct to the SCM, the administrative ARRL official elected by members in each Section. Radio club reports are also desired by SCMs for inclusion in *QST*. ARRL Field Organization station appointments are available in areas shown to qualified League members. General or Conditional Class licensees or higher may be appointed ORS, OVS, OPS, OO and OBS. Technicians may be appointed OVS, OBS or V.H.F. PAM. SCMs desire application leadership posts of SEC, EC, RM and PAM where vacancies exist.

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Southern Florida	*W4KGJ	John F. Porter	6890 S.W. 51st St.	Miami 33155
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Quebec	VE2ALE	Joseph Unsworth	163 Mgr. Bourget	Vaudreuil, P.Q.
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*Official appointed to act temporarily in the absence of a regular official

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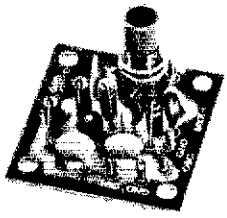

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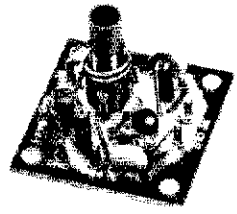

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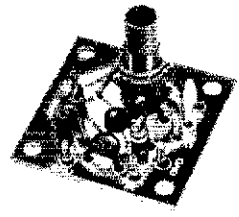

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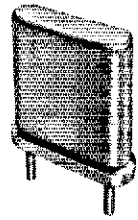

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It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. 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.

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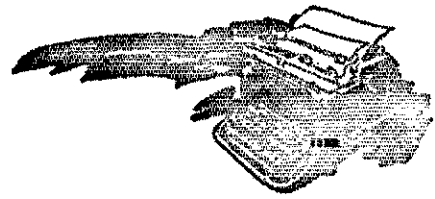


THE ATTACK ON 220

IN AN ACTION long anticipated, the Federal Communications Commission has announced its proposed disposition of the petition of the Electronic Industries Association seeking expansion of the Citizens Radio Service frequency space at the expense of amateurs. The notice was released barely in time to include a brief report in July *QST*, by last-minute replacement of one page. The full text of the proposed rule changes appears in "Happenings" this issue.

The single document combines two actions. One is a Notice of Proposed Rule Making, which specifically contemplates deletion of 224-225 MHz from amateur use and establishment therein of "a form of fixed and mobile" service. It would be called "Class E" in the Citizens Radio Service, with 40 channels of 25 kHz spacing. The second is a Notice of Inquiry which in effect says, "Yes, folks, we know very well that the 27-MHz Citizens band is a mess, but please forget about that for a moment, as we plan to take care of those problems somehow later. Meanwhile we want 224 MHz to be entirely respectable, and thus we need all your good suggestions as to what the rules should be. What kind of communication should be permitted? What limitations as to power, antennas, frequency control? Should we require automatic call sign identification? Where are we going to get the money to pay for additional administration and enforcement of rules governing 10 million predicted licensees?" And so on. Comments on these and additional points are invited by the Commission, to be supplied by September 20.

The EIA petition was filed more than two years ago. The facts that the Commission took so long in acting on it, and that the proposal is considerably less than EIA asked for (1 MHz proposed, vs. 2 requested), indicate rather positively that the FCC and staff are not at all fully convinced of the suitability of the whole idea. The extent to which they seek extensive opinion through asking many basic questions underscores that position. It is, in fact, a somewhat surprising document in that it contains as many or more arguments against the concept as it presents in support! Thus the nature and extent of comment FCC receives may well shape the outcome.

The League's response will certainly be one of strong opposition, in consonance with views earlier expressed to FCC (April 1972 *QST*, p. 81). But we believe each and every amateur and radio club concerned in this matter should also register an opinion with the Commission. An original and 14 copies is the normal requirement, but if copies are a problem, send at least an original since it will get some consideration. It is most important, however, that the statements be factual and carefully reasoned; if purely emotional, or express only a simple "no" or "opposed,' they will have little effect.

More frequently of late we are hearing, from good and true, mature and dedicated amateurs, the question whether we hams have really done the smart thing all these years, in attempting careful compliance with our regulations – only to find FCC is proposing to take frequency space away from us and give it to the most undisciplined and scofflaw group in the history of communications regulation. We see an easing of the requirements in some services (e.g., broadcasting), all the while FCC is adding restrictions to the amateur rules. But effective opposition to such confusing and certainly undesirable trends must be expressed rationally and factually, not with venom. So avoid emotional outpourings, even if that is your gut reaction. We hope you share our view that with the fast-growing development of 2-meter fm for amateur use, the band segment involved will be far better used "in the public interest" by amateurs with their established record of responsibility and self-discipline. The whole idea behind the Class E proposal is predicated on assumptions (e.g., that this service *will* be disciplined, responsible and controllable), which all the long experience with Class D demonstrates overwhelmingly to be very dubious at best.

Proponents of the frequency grab are banging the drum for it, trying to show how everyone will benefit. "Inexpensive gear for

(Continued on page 26)

League Lines . . .

It was a cliff-hanger for a while -- hundreds of repeater licensees and thousands of users uncertain right up to the last minute whether they could continue operation beyond June 30 while awaiting completed FCC action on their license applications. On the 28th, though, James Barr, Chief of the Safety & Special Radio Services Bureau (which includes the amateur division) announced a partial granting of an ARRL petition for postponement by extending the effective date of the rules to August 30.

An accelerated retirement program for older government employees has resulted in the rather sudden departure of several key personnel at FCC -- including, we regret to say, Mr. Barr himself, two days after the above action. Another is Curtis B. Plummer, Chief of the Field Engineering Bureau, which supervises our exams and keeps us on the ball through monitoring and advisory notices of infractions. A third is Kenneth W. Miller, Chief of the Emergency Communications Division, most cooperative with us in AREC and RACES matters, among others. All have ham backgrounds, and we wish them many years of pleasant QSOs.

Computer experts told us a 2% error was par for the course in conversion to data processing of our records (they must have been conservative!). Our thanks to thousands of members who accepted being part of the unlucky two per cent and had patience awaiting late arrival of QST. Only a few raised the roof, accused us of stupidity or absconding with their dues, and such. We are gradually getting out of the woods.

Lists of members up to a division in size are available to any affiliated club or a petitioning group of ten members. If you have any project in mind involving the use of a membership list, such as promotion of a convention or hamfest, director election campaign, etc., be sure to get in touch with Hq. several weeks in advance, for info on the types of addressing output available, the cost, and the time for delivery.

The Supreme Court has agreed to review some conflicting lower court decisions on the authority of federal regulatory agencies to charge for license application or issuance. This likely will stall further FCC action in its current proposal to up its own fees for several services -- e.g., $9 to $10 for the basic amateur charge.

We're once again including a window decal of the ARRL emblem with each membership renewal, after a period when they went to new members only. Several of you pointed out that trading an automobile every year or two or three requires a fresh one on hand now and then. And for good measure, we made up a special design and sent one to each Life Member.

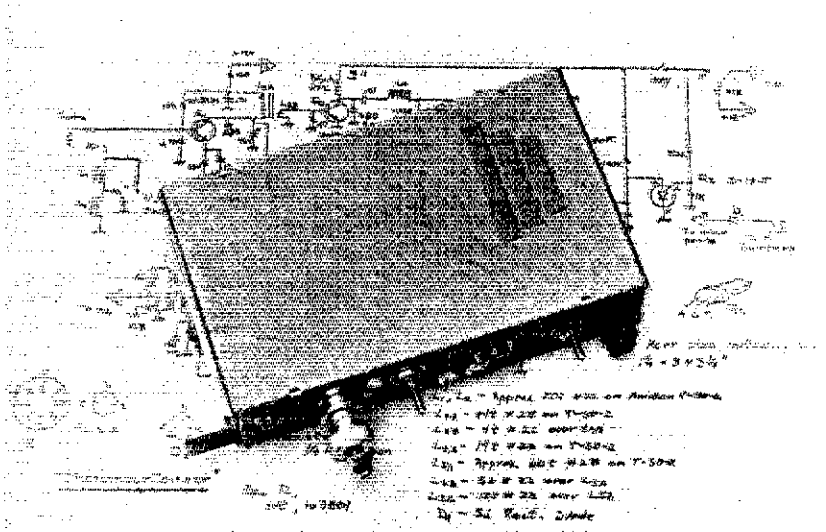
Inflationary note: The Radio Society of Great Britain has been obliged to increase its membership dues to an equivalent of about $13 yearly. And at home, Volume VI of FCC regulations, which includes the amateur rules, now costs you $3.50 from the Government Printing Office. (Plug: the ARRL License Manual is still a buck -- and you'll get it from Hq. weeks ahead of GPO delivery (or immediately, at a radio distributor).

Every now and then we receive an unsigned letter of complaint about something or other, such as the QSL Bureau. Sorry, but unless you let us know who you are, it's rather difficult for us to solve a problem. We'll respect your request for anonymity, but need to know who you are in order to help.

Ham problems are no respecters of rank. W3USS had to shut down during the Watergate inquiry when rf got into the audio system of the Senate hearing room.

One of the classier electronics magazines recently advertised, "We're looking for an Editor . . . excellant working conditions . . " We can see why they're looking!

Don't forget to write FCC concerning 220 -- see previous page.



The Micromountaineer

Miniaturization in a Simple 40-Meter CW Transceiver

This tiny 40-meter cw transceiver measures only 1-1/2 × 3 × 5-1/4 inches. The key paddle is visible at the lower left of the case. Power output is approximately 500 milliwatts.

BY WES HAYWARD,* W7ZOI

ALTHOUGH SLOW in coming, the QRP boom has now grown to the status of being a major ham activity. Much of the QRP-related popularity is derived from the relative compactness of the equipment, leading to ease of portable operation. However, little of the gear described in amateur literature has been as small as might be desired, especially in critical portable applications. The first step toward miniaturization is simplification, and this approach was emphasized in the design of an earlier portable package.[1] In that machine, some degree of design simplicity was realized by using crystal control of the transmitter. Since this was consistent with the thermal and mechanical stability requirements of the unit, the operational hardship was tolerable. In the unit described here, we go one step further with full advantage of crystal control being taken in both the transmitter and the receiver.

In formulating a design philosophy it is enlightening to consider the practices which dominate operation in our present-day cw bands. Almost everyone has a VFO and the typical operator assumes implicitly that this is the case. If an operator calls CQ, he listens for answers only on or very close to his transmitter frequency. Similarly, he rarely answers a CQ unless he can transmit on a frequency close to that of the station being called. A little thought soon convinces one that it is redundant for the portable operator to have receiving capabilities on frequencies where he cannot transmit. Hence, when crystal control is used in the transmitter, minimal capability is lost by using the same crystal for receiver control. This is easily realized, of course, with a direct-conversion approach to the receiving function. Great simplification results and such an approach is the basis for the 40-meter transceiver described in this paper, a total station using only five transistors and a single integrated circuit.

Fig. 1 is a schematic diagram for the "Micromountaineer." Q1 serves as the crystal oscillator for both transmitter and receiver control, while Q2 is a keyed rf power amplifier. The transmitter circuit is essentially identical to the unit described earlier[2] except for the VXO modification. Some minimal frequency offset capability is necessary; if it were not available, the portable operator might miss a station calling him exactly zero beat with his crystal oscillator. With most crystals, the two toroidal coils inserted in series with the crystal will yield a shift of 0.5 or 1 kHz. The values of L1 and L2 are derived experimentally.

The basis of the receiver is a CA3028A product detector of the type described by DeMaw.[3] This detector was chosen over the many other options available for reasons of economy and the relatively high conversion gain available. The additional

*7700 S.W. Danielle Ave., Beaverton, OR 97005.

[1] Hayward and White, "The Mountaineer — An Ultra Portable CW Station," *QST*, August, 1972.

[2] See footnote 1.

[3] DeMaw, "Solid-State Product Detectors," *QST* for April, 1969.

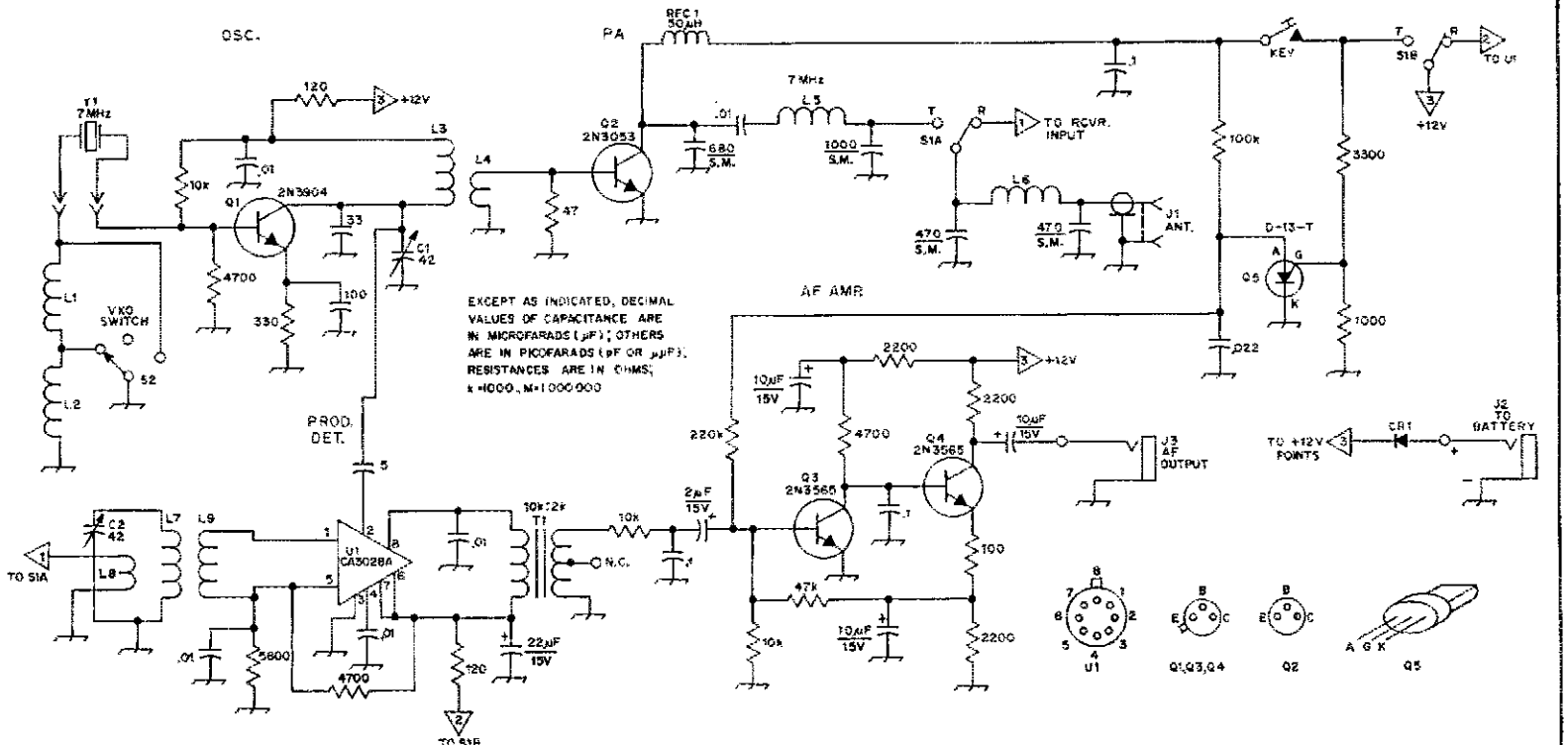
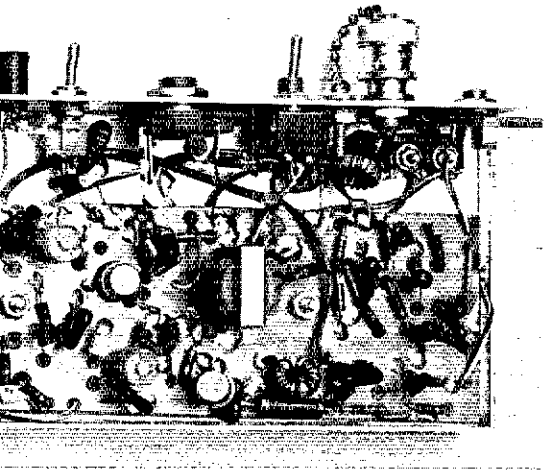


Fig. 1 — Schematic diagram of the Micro-mountaineer mini-transceiver. Fixed-value capacitors are discussed in the text. Resistors are 1/4-watt composition.

C1, C2 — Subminiature ceramic trimmer, 42-pF maximum.
CR1 — Silicon rectifier diode, 50 PRV, 500 mA.
J1 — BNC chassis-mount coax connector.
J2, J3 — Phone jack.
L1, L2 — 20 turns No. 22 enam. on Amidon T-50-2 toroid core (Amidon Assoc., 12033 Otsego St., N. Hollywood, CA 91607).
L3 — 44 turns No. 28 enam. on T-50-2 core.
L4 — 4 turns No. 22 enam. over L3 winding.
L5, L6 — 14 turns No. 22 enam. on T-50-2 core.
L7 — 60 turns No. 28 enam. on T-50-2 core.
L8 — 5 turns No. 22 enam. over L7 winding.
L9 — 10 turns No. 22 enam. over L7 winding.
S1, S2 — See text.
T1 — Miniature 10,000-ohm to 2000-ohm af transformer. Center tap not used.
U1 — RCA integrated circuit.
Y1 — 7-MHz crystal (see text).



Interior view of the W7ZOI transceiver. The key paddle and related microswitch are visible at the upper right of the photograph. Double-sided pc board is used for the main assembly.

audio gain needed is provided by a simple two-stage amplifier, Q3 and Q4. The station is completed by Q5, a General Electric type D-13-T programmable unijunction transistor operating as a side-tone oscillator. Receiver muting is provided by removing the operating voltage from the detector during transmit periods.

The key, which is built into the transceiver, is a small microswitch. It is actuated by a strip of printed-circuit board. The key is surprisingly usable, even when gloves are being worn. A simple low-pass filter is included in the transceiver to facilitate operation near the local TV stations.

Concerning Construction

It might be worth making a few comments about the construction techniques which were used to realize a degree of miniaturization. To some extent, a limiting factor in determining the minimum practical size of the unit is the number and type of active devices used. Of equal significance is the size of the passive components, such as bypass capacitors, variable capacitors, coil forms, and resistors. The bypass capacitors used by the writer were either miniature monolithic types for rf circuits or dipped tantalum electrolytics for the audio system. The two variable capacitors are miniature 42-pF ceramic types. The coils are all wound on toroids from the writer's junk box. These units are not those specified in the parts list, since the cores used by the author may not be readily available. All resistors are 1/4-watt composition types.

It is worth simplifying circuitry where possible in the interest of miniaturization. For example, the input rf choke and capacitor used by DeMaw in his product detector are replaced by a link, with no detectable change in performance. The audio transformer, T1, could probably be replaced with resistors, with some loss in detector gain. This lost gain could be picked up by removing the emitter degeneration in Q4.

The total station is built on a 2 × 5-inch printed-circuit board with minimal component crowding. This, however, is realized only by using double-sided board. One side of the board is used exclusively as a ground plane with pads and connecting runs residing on the opposite side. Such a circuit is easily fabricated at home by laying out the pads and runs with thin strips of Scotch brand electrical tape. The ground-plane side is completely covered with tape. After the board is etched, it is washed in cold water, the tape is removed, the necessary holes are drilled and excess copper ground plane is removed by counter sinking with a large drill bit around the holes. The components are mounted on the ground plane side of the circuit board. In the author's unit, a socket was used for U1. It was force fit into an appropriate hole and fixed with epoxy. This writer has found this double-sided board method of construction to be both quick and easy to implement, and it leads to very clean performance, resulting mainly from the short, low-inductance ground returns. This is a necessity when any high-density packaging is being considered, although this unit is certainly not densely packed when compared with modern industrial practices.

The transceiver is packaged in a small Minibox measuring only 1-1/2 × 3 × 5-1/4 inches. The T-R switch is a dpdt toggle type unit and the VXO function is controlled with a spdt, center-off toggle switch. In each case, slide switches would be adequate. Usually, the unit is powered by a small pack of penlight batteries or a 12-volt, 450-mA-hour nickel-cadmium battery residing in a parka pocket. The total station, including batteries, crystals, a log, an antenna and a small 2000-ohm headphone will fit easily in one of the smaller pockets of the author's Kelty pack.

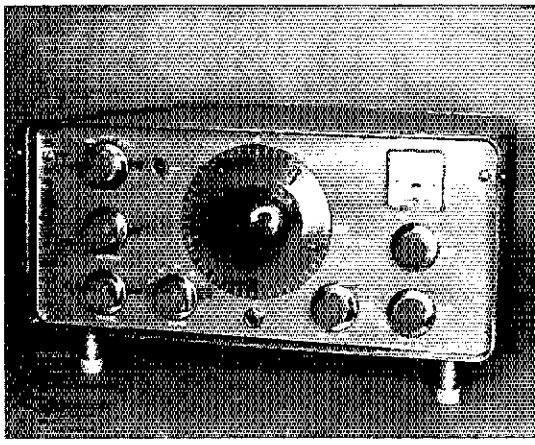
Some Closing Remarks

The unit shown is a bit awkward to demonstrate without the usual tunable receiver, and the operator who has never used such a transceiver is frustrated initially. However, once one becomes accustomed to the limitations of the machine, he finds it surprisingly usable. A similar rig with the same power output (0.5 watt) and a dozen switched crystals has been used with success in a number of Field Day contests. Plug-in crystals are used in the unit shown, only for reasons of miniaturization.

It should be emphasized that, unlike the earlier Mountaineer paper, this article is not intended to allow exact duplication. Parts procurement alone is problem enough for the amateur and it is further amplified if miniature parts are sought. The purpose of this note has been merely to present some of the ideas and techniques which have been used to realize some degree of miniaturization. There are a number of interesting variations that might be

(Continued on page 45)

Recycling Obsolete Gear



An Approach to Building at Home

BY ROBERT F. LEWIS,* K7YBF, Ex-W8MQU

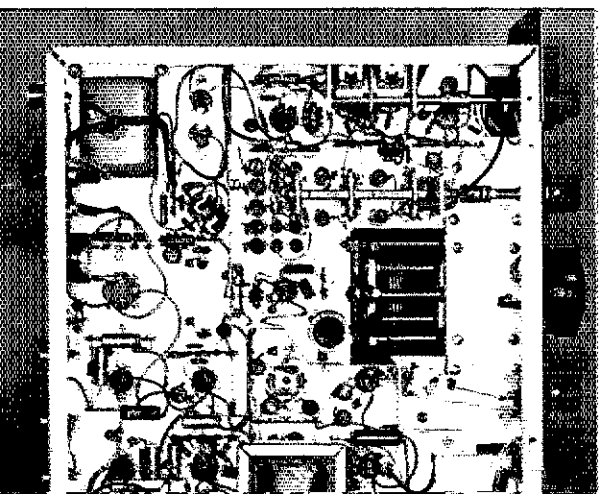
ONE APPROACH to building amateur gear at home is to modernize obsolete commercially made equipment. This can offer as great a challenge and as much satisfaction as starting from "scratch." Obsolete or inoperative commercial gear can sometimes be obtained for little or nothing, yet can be an excellent source of components which are hard to fabricate or hard to obtain, such as tuning mechanisms and metalware. With the complex components at hand, the rest of the work generally can be done with ordinary hand tools, and excellent results can be obtained with a little effort and patience.

The photographs here show the results of two successive modifications to a National NC-100X receiver. The author acquired the original version of this good old WW-2 vintage gem in the early 1960s, at no cost. Although it was completely dead and covered with dust, dirt, and wax from overheated tubular capacitors, it was basically sound and presented excellent possibilities for modernization.

* 1325 Avenida Regulo, Tucson, AZ 85710.

The first step was to strip the set down completely to the bare metal and to junk all the original resistors, capacitors, wiring, octal tubes, and sockets. Only the metalware, power transformer, filter choke, i-f transformers, crystal filter, tuning mechanism, and coil rack were retained. All components were carefully dismantled, cleaned, and reassembled. The chassis and cabinet were refinished and labeled. The mechanical and electrical design was modified to incorporate miniature tubes and dual conversion, and the tuning mechanism was changed from the original general-coverage configuration to the five standard hf amateur bands.

After giving satisfactory service for nearly a decade, the set was converted to the third version, shown here, primarily because of the shift to ssb operation, with its more rigid frequency-stability requirements. This time, the circuit was completely redesigned for ssb operation only, on the 80- through 10-meter bands. New features included crystal-controlled HFO and BFO (both lsb and usb), high-stability 500-kHz VFO, mechanical



An underside view of the receiver shows how a little care and planning in the construction can give the appearance of commercially built gear. Servicing of this receiver, if necessary, will be "a breeze."

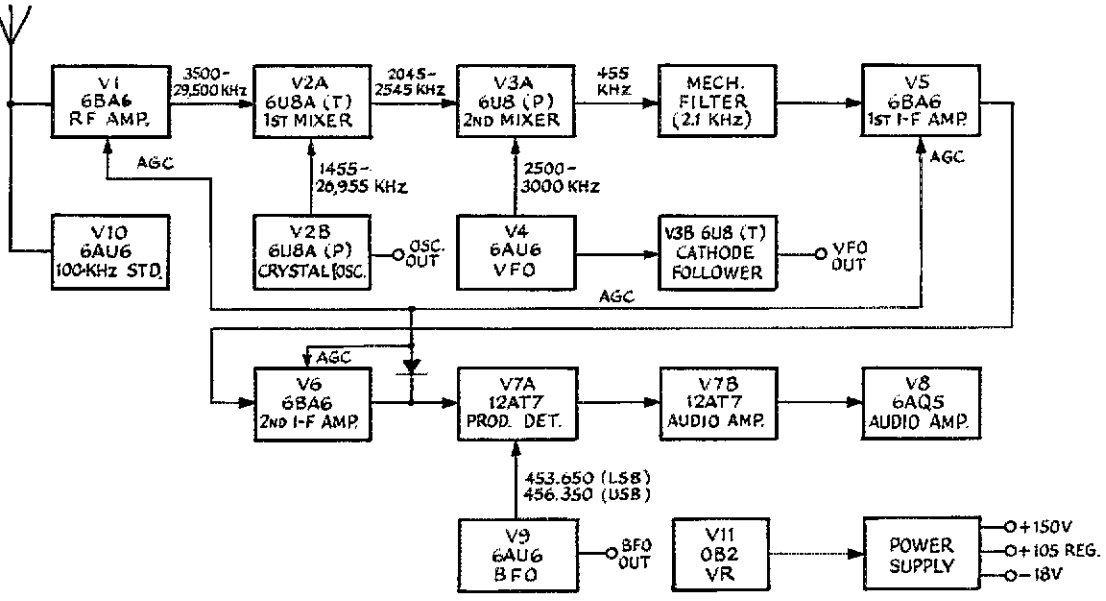
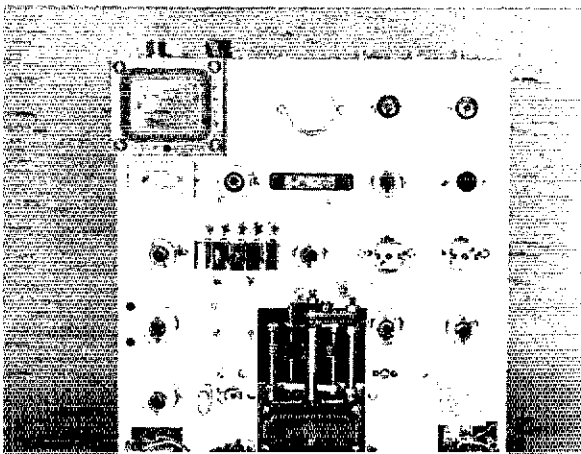


Fig. 1 — Block diagram of the author's receiver, a third-generation version of a surplus National NC-100X. For V2 and V3, the blocks with a T indicated in parentheses are the triode sections, and the blocks with a P are the pentode sections.

filter, and provisions for HFO, BFO, and VFO output for transmitter excitation in transceive mode. Solid-state techniques were not used, primarily because of the author's lack of design experience in this area. The current circuit configuration is shown in the block diagram of Fig. 1.

The latest model bears little resemblance to the original NC-100X from which it descended. None of the original components remain, except for the dial assembly and one section of the tuning capacitor. All of the original metalware was finally retired in favor of the lightweight modern-look style. All metalworking was accomplished with standard hand tools, and the cabinet was finished in hammertone enamel, *a la* spray can. Dry transfer labels were used for panel marking.

The greatest challenge in the design was to obtain a calibration accuracy of essentially 1 kHz per division over the 500-division range of the National PW dial. Although the original tuning capacitor was ostensibly of straight-line-frequency design, such did not seem to be the case in the author's VFO circuit. The first approach to the problem was to try to reshape the rotor plates by "drawing" the plate assembly over a sheet of abrasive paper. The original aluminum plates did not take kindly to this operation, however, and they were finally yanked out and replaced with new ones fabricated from do-it-yourself brass stock. The desired plate shape was first calculated mathematically, then the plates were cut to shape and soldered into the slits in the rotor shaft. Needless to say, the calculated shape was a bit off, especially at the band ends, and a good deal of midnight oil was burned in the final shaping process before acceptable VFO calibration accuracy was achieved. The final result was a receiver that would meet any commercial requirements for workmanship, appearance, and performance. QST



Top view of the author's "recycled" NC-100X receiver, after two successive modifications. In reality, only the dial assembly and one section of the tuning capacitor of the original receiver remain.

How to Solder

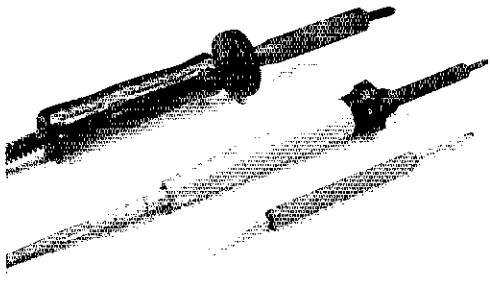
BY ROY HARTKOPF,* VK3AOH

EVERY TRADE and profession has some implement which is associated with it. The gardener has his spade and rake, the carpenter his hammer and nails, and the doctor his stethoscope. The basic tool for anyone who works in electronics is the soldering iron and until you can use it reasonably well, you will never get much satisfaction from your work. There is no magic about using a soldering iron. As in any craft there are some tricks and bits of knowledge which come only with practice. However, there are some fundamental requirements which will be discussed in this article.

Cleaning Surfaces

Solder is an alloy, a mixture of tin and lead, sometimes with small amounts of other elements. This alloy melts at a fairly low temperature. On the cleaned surfaces of some metals the molten solder will "wet" the surface and penetrate a tiny amount into the structure making a bond which is as effective as though there were no joint at all, but a continuous piece of metal. To get this result the first essential is that the surfaces should be completely free from contamination. Plumbers and sheet-metal workers achieve this by using acid (this is called a "flux") to etch the surface and remove all dirt and corrosion. But in electronics work it is not suitable to use this drastic method because the acid left on the joint eventually corrodes the components. So it is necessary to use a noncorrosive flux such as resin. Resin has the ability to dissolve some of the impurities which are on the surface, although the surface must be fairly clean before this can happen. When the metal to be soldered is tin the resin is very effective, as the tin alloys with the tin in the solder, and a perfect bond is formed. This is why most components and hookup wire are made with a tin coating over the copper conductor wire. An additional advantage of tin is that it does not corrode (that is, tarnish) in the atmosphere as much as other metals. Circuit boards, also, often have their copper foils coated with tin. Occasionally you will find circuit boards, copper braid, and so on, without any protective coating at all. If the copper is clean and bright you will have little difficulty in soldering. However, if the surface is dull and discolored, it may well be impossible to make a good solder joint unless you scrape the surface thoroughly to remove the impurities. Sometimes surplus components which have been stored for a long time have corrosion even on the tin-coated surfaces. Again, the only remedy is to scrape the surface thoroughly until it is bright and shiny.

* 34 Toolangi Road, Alphington, Victoria, 3078, Australia.



The iron at the top is the type used for heavy work. The smaller iron is a common kind used for etched circuit-board work and for soldering small devices, such as semiconductors and integrated circuits. The tool shown at the bottom is called a soldering aid and is handy for looping wires around terminals.

Choosing Suitable Solder

The solder itself doesn't present many problems. As mentioned above, it must be used with a noncorrosive flux and the best way to get this is to use solder which is in the form of a tube with the resin flux in the center. This is known as resin-core solder and is used almost universally in electronics work. Some manufacturers make solder which has not only one, but five separate cores so that the flux is distributed more evenly. Resin-core solders can be bought in different gauges and the use of the correct gauge for the job not only makes a better soldered joint but makes the work easier. For the wiring of tube-type equipment and general heavy work, No. 16 gauge is quite satisfactory, while for soldering integrated circuits onto circuit boards (and other fine work) a gauge as small as No. 22 can be used to advantage. Experimenting with different gauges will soon show you the best one for a particular job. It will pay in the long run

to have two or three different sizes of solder handy.

Choosing the Correct Soldering Iron

Probably the most important thing of all is to use the correct soldering iron. There are many brands and types of soldering irons on the market. They range from those which are excellent to some which are so unsuitable that one wonders if some manufacturers ever used a soldering iron! A fairly common mistake occurs when some manufacturers try to make a general-purpose tool. If you see an advertisement which tells you that a particular soldering iron is a universal tool and is suitable for the entire radio industry, don't buy it. Because it is intended to do everything, you can be certain it will do nothing really well.

There are several reasons why this should be so. The purpose of a soldering iron is to store heat and apply it to the joint. The question is *how much heat* is needed and *how hot* should it be? A little soldering iron is fine for small joints but it can only store a small amount of heat. If this iron is applied to a large joint which contains a large amount of metal, there just isn't the necessary *amount* of heat available to raise the temperature of the large volume of metal to a level where a satisfactory bond can be made. The manufacturers of these so-called universal soldering irons try to get over the problem by increasing the power which the soldering iron uses. What they seem to overlook is that a small bit (tip) stores only a small amount of heat and has a small surface area also. So when the iron is not in use and is resting on its stand, the air around it has only a slight cooling effect and the bit gets far too hot. This means that the solder on the bit and the bit itself oxidizes (that is, burns or corrodes) at a very rapid rate and the bit has to be constantly scraped and retinned. However, when the iron is used on light work, such as circuit boards, the heat is so great that small components and the adhesive material which bonds the copper foil to the board are burnt and ruined. Even if joints are made, the overheating causes them to be unreliable. On the other hand if the iron is used on heavy work it is still unsatisfactory because, although it may be too hot, it will still not have a sufficient amount of heat stored to heat the large volume of metal. Thus, the spot where the iron touched may be overheated for an instant and then the heat will spread out and the temperature drop so that the rest of the area is still too cold.

Even for a person who is an expert at soldering, the use of the wrong type of iron can make good-quality soldering almost impossible, and for a beginner the results can be disastrous. Quite a lot of people have lost interest in electronics because they can't solder without burning components and spoiling circuit boards. In almost every case the fault is not with the person but because he was using the wrong soldering iron and possibly the wrong solder.

Now that you can see how important it is to choose the most suitable iron, here are some hints which will help you.

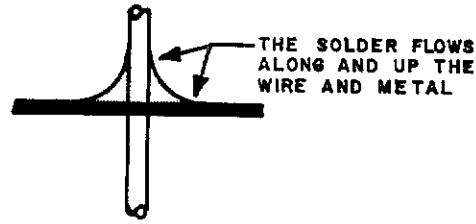


Fig. 1 — In a good solder connection the solder flows along the metal and presents a smooth, shiny appearance.

1) Look for an iron which you find is comfortable to hold. (You will be holding it a lot!) A lightweight cord is an advantage because it doesn't drag when you move the soldering iron around. Also make sure that the cord is not too short.

2) If you expect to do a lot of work with printed boards, transistors, and integrated circuits, then choose a small iron but don't expect to be able to use it on heavier work. The power rating of such an iron would be about 40 watts.

3) If you are building only tube-type equipment, then a bigger soldering iron would be more suitable. It should of course be much larger physically and have a bit at least a quarter of an inch in diameter.

4) Every modern soldering iron has replaceable bits. See that these are available when you buy the iron. With care and an iron which does not overheat the bit should last a long time, but it is a good idea to have a spare on hand for when you need it. There are some fancy-shaped bits available, but unless you are doing very specialized work they are not much use. A simple circular bar with the end filed at an angle of 30 to 45 degrees is all that is needed.

5) Finally there is a special type of soldering iron which should have a mention. This type has a switch on the handle so that the iron can be switched on and off during the actual soldering operation. Such an iron is usually called a soldering "gun." This is very useful if one is not soldering continuously, as the soldering iron heats up quickly and the temperature can be controlled. But a fair amount of experience is necessary because if one does not release the switch soon enough the iron can become too hot and everything burns. These irons are available in different sizes for heavy and light work. When you have selected your iron and brought it home you should make or buy a suitable stand and mount it firmly on the bench so that if the lead is accidentally pulled the iron does not fall and smash on the floor possibly giving you a nasty burn in the process.

There is one final accessory you will need. When you have been soldering for a while you will find you are either a "wiper" or a "flicker." Even though the soldering iron bit does not get too hot, or the solder burn off, it is still necessary when making a joint to have a bright and shiny film of solder on the point of the bit. If the iron has not

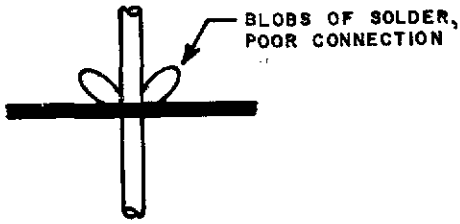


Fig. 2 — A common practice of beginners is to wind up with a ball of solder on the connection. This usually means the material was not hot enough to melt the solder and cause it to flow around the connection.

been used for a couple of minutes the surface of the solder on the bit oxidizes and becomes dull, and this impedes the transfer of the heat to the joint. So to get a bright and shiny film of solder it is necessary to melt a little fresh solder directly onto the bit just before using it. To remove the blob of solder thus formed one either wipes it off or flicks it off. The writer, a confirmed "flicker" from way back, has an open-top container about four inches square screwed to the workbench under the soldering-iron stand. Over a period of months this box gradually fills with solder and saves a mess on the floor. The "wipers" should organize a similar container with a piece of sponge slightly damped, or a suitable piece of rag.

Soldering Technique

And so we come to the soldering operation itself. Soldering is something like painting a house. If you have the correct materials and equipment and the surfaces are perfectly prepared, then the job is easy. If not, no amount of skill can make up for poor materials and lack of preparation. Careful preparation of the materials means seeing that they are bright and clean, as mentioned earlier, but contrary to what many people seem to imagine there is not the slightest need to wrap wires around terminals or twist them together before soldering. This idea has come about because some manufacturers assemble a lot of components and then solder the lot at once to save time. If you can't hold the wires and solder them at the same time, there is no reason why you shouldn't hook them together but it won't make the slightest difference

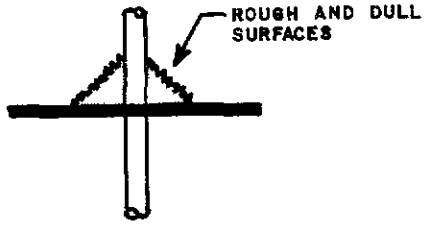


Fig. 3 — A cold solder joint presents a rough and dull appearance, and can be caused by insufficient heat or movement of the connection while it is cooling.

to the strength of the joint. In fact a wrapped wire can sometimes make a badly soldered joint harder to detect. And if you want to dismantle the project later and use the components again, a wrapped joint makes it very difficult to do so. What is a properly soldered joint? The important characteristics are shown in Fig. 1. The sketch represents a wire being joined to a flat surface, end on.

The solder should run or flow over the metal and the wire. The usual description for this is that the surfaces should be "wetted." The opposite situation is where the solder does not wet the surfaces but draws away from them like water on a greasy surface. This kind of poor or dry joint is shown in Fig. 2. If you see this effect anywhere on the joint you can be sure it is a bad one and it should be recleaned and resoldered. By the way, if you want to remove the solder from a joint then a piece of clean copper braid laid on the joint and heated with the soldering iron will soak up the solder as though it were blotting paper.

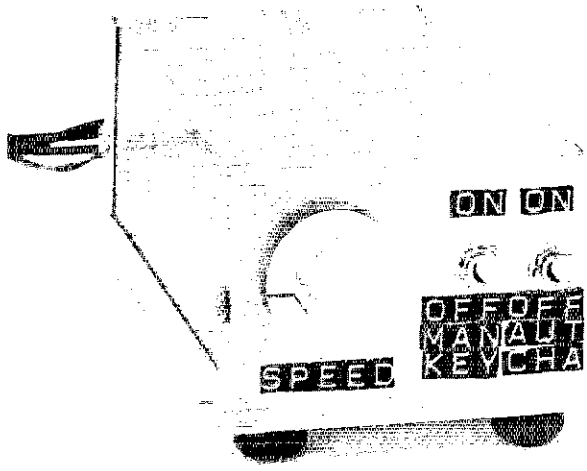
Finally, if the solder is not heated sufficiently or if the wire is moved before the joint has hardened properly, you can get the kind of result shown in Fig. 3. This is called a "cold" solder joint. A joint which looks like this should be reheated until it looks like the one in the first sketch.

There is one general tip which applies to all soldered joints from the finest wire in a meter movement to the soldering of gutter and downpiper for a house. If you have any trouble making a good soldered joint, take the joint apart and clean and tin each surface separately and try to put them together only after both have been completely wetted with solder. Incidentally, if you use this method it is quite easy to solder a wire to a sheet of aluminum or to solder two pieces of aluminum together, provided of course that the soldering iron has enough heat capacity to bring the aluminum up to the soldering temperature. This is how the joint is made. Clean the surface of the aluminum as thoroughly as you can and put a drop of ordinary engine oil on it. Then, with a sharp knife or scriber, scratch the already cleaned surface of the aluminum underneath the oil film and without wiping the oil away, tin the surface of the aluminum as you would do with any other metal. Once it has been tinned you can solder any other tinned metal onto it. But remember that if the aluminum is even moderately thick you will need a very heavy iron (a very *hot* small iron is no substitute, as has already been explained) in order to provide the large *amount* of heat needed to heat the aluminum.

That covers most of the basic information that you will need to make a success of the craft of soldering — essential for everyone who works in electronics. The formula for success can be summed up as: preparation, the right tools and materials, practice and patience.

There are many more practical tips that one picks up through experience, but if you master the *basic technique and start in the right way with a* suitable iron and the correct solder, you will have won the major battle. Good soldering! QST

The WB4VVF Accu-Keyer



BY JAMES M. GARRETT,* WB4VVF

IT IS QUITE POSSIBLE to send perfect code with a straight key. It has been pointed out to me, however, that my code left something to be desired. Also, because I have never quite grasped the fine art of holding a key firmly, I am Q5 at several hundred feet – audibly. Therefore, a keyer was deemed a necessity.

The price of commercial keyers is, however, quite high, if the keyer will do a reasonable amount of work – a requirement, since I am basically lazy. The Accu-Keyer is a result of trying to design the maximum keyer for the least cash outlay.

The Accu-Keyer has these features:

1) Self-completing dots and dashes
2) Dot and dash memories
3) Iambic operation
4) Dot and dash insertion
5) Automatic character space
6) 5-50 wpm speed range
7) Low cost

A synchronized clock provides uniform starting for constant-width characters. Also the dot-dash decision is made at the end of the space following the bit, allowing maximum leeway in paddle operation. The seven ICs used in the circuit can be purchased for three dollars or so total, while all the rest of the parts should come to less than twelve dollars including the printed circuit board, depending upon how good a scrounger you are. Total cost should be less than fifteen dollars, offering lots of performance for the money!

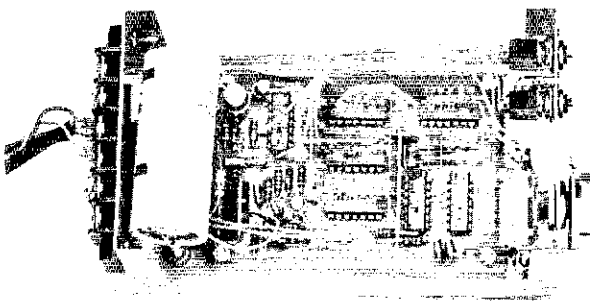
* 126 W. Buchanan, Orlando, FL 32809.

Logic Description

Three types of gates are used in the logic section of the keyer. There are three 7474 edge-triggered type *D* flip-flops, three 7400 quad two-input NAND gates, and one 7410 triple three-input NAND gate, for a total of seven dual-in-line packages. All the gates are TTL types.

The 7474 is a clocked edge-triggered type *D* flip-flop which has two modes of operation, synchronous and nonsynchronous. Nonsynchronous inputs are the SET (pin 1) and the RESET (pin 4) connections. These inputs can be used to force the Q and $\overline{Q}$ outputs into either a high or low condition. SET, when grounded, forces the Q output high and RESET, when grounded, forces the Q output low. The $\overline{Q}$ output is always in an opposite state from the Q output.

A synchronous input is provided (pin 2). If both the SET and RESET inputs are high and the clock pulse (pin 3) goes positive, the state of the *D* input (pin 2) will be transferred to the Q output, i.e., if *D* was high, Q will go high. This transition can occur only on the positive-going edge of the clock pulse.



The author's version of the Accu-Keyer is built into a Minibox. The keyer is powered from the 6.3-V ac line of the receiver filament supply. The rectifier and filter components are shown at the extreme left in this view.

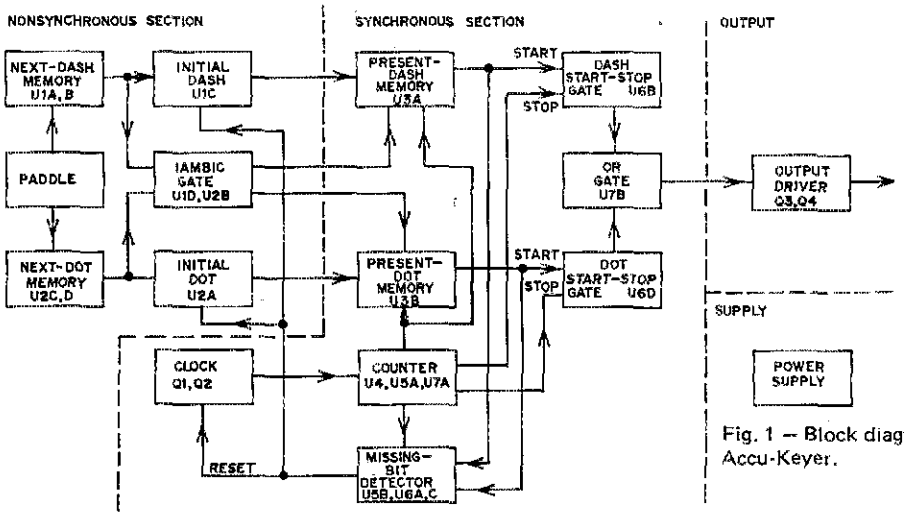


Fig. 1 — Block diagram of the Accu-Keyer.

The two- and three-input gates are NAND-type gates. Outputs of these gates are low only if all the inputs to the gates are high.

Block Diagram

Fig. 1 shows that the keyer is composed of four sections. In the nonsynchronous section the gates change logic state when the paddle is moved, while in the synchronous section the logic changes in step with the clock signal. The output driver changes the logic levels into voltages that will key the transmitter. The +5 volts is developed in the Zener-diode-regulated power supply.

The flip-flops and gates that perform the functions in the circuit are shown in the blocks. In the discussion that follows, a bit is defined as a single dot or dash and the space following.

The present-bit memories store the information as to which bit is being sent. These memories start the bit by enabling the start-stop gates. These outputs are fed through an OR gate to the output driver. A counter is also enabled at the start of a bit and disables the output at the beginning of the bit space.

Next-bit memories allow the keyer to remember one bit ahead. At the end of each bit four conditions are possible with the next-bit memories.

1) If the dot memory is on, the keyer will start a dot.

2) If the dash memory is on, the keyer will start a dash.

3) If both are on, the keyer will produce the opposite bit from the one it is sending.

4) If neither is on, the keyer will assume a missing bit and automatically give two additional spaces.

The iambic gate is used to produce the correct input to the present-bit memories for condition 3 above. At the end of condition 4, the missing-bit detector resets the clock and enables the initial dash-dot gates. These gates are used to start the keyer and synchronize the clock with the first bit sent.

Circuit Description

The following circuit description is included for those who like to "chase through the logic." In the discussion, the part designation is followed by a dash and the pin number of the logic package. Reference is made to the parts in the circuit diagram, Fig. 2. A timing chart for the synchronous portion of the keyer is plotted in Fig. 3. The sending of characters AB is shown.

Clock pulses for the keyer are generated by a relaxation oscillator consisting of Q1 and Q2 with associated parts. The base of Q1 is biased at about 1.4 volts by R1 and R2. R4 and R7, in series with the output resistor, R6, connect the emitter to ground. This combination is bypassed by the timing capacitor, C1. Q1 will therefore be biased on and some current will flow through the collector resistor, R3, producing a voltage drop which will start to turn on Q2, a pnp device. The Q2 collector will start going positive, forcing Q1 to turn on harder through the speed-up capacitor, C2. C1 will be forced to charge because of the current gain of Q1. At some positive voltage, Q1 will saturate and the charge across C2 will no longer be sufficient to supply base current to the transistor. Therefore, Q1 will turn off, causing Q2 to turn off and the output will return to zero. The emitter-base junction of Q1 will be reverse biased until C1 in the emitter circuit discharges through R4, R6, and the speed control, R7. A short positive-going pulse with a varying period, depending on the speed control setting, is produced across R6 as a result of this action.

A reset input is provided by CR1 to allow the clock to start in synchronism with the paddle. This input holds the emitter of Q1 at a high level and prevents the clock from oscillating when no code is being sent.

Synchronous Operation

Referring to the timing diagram, Fig. 3, *t1* is the time the keyer paddle is closed for a dot. Logic levels are shown for the points prior to this time.

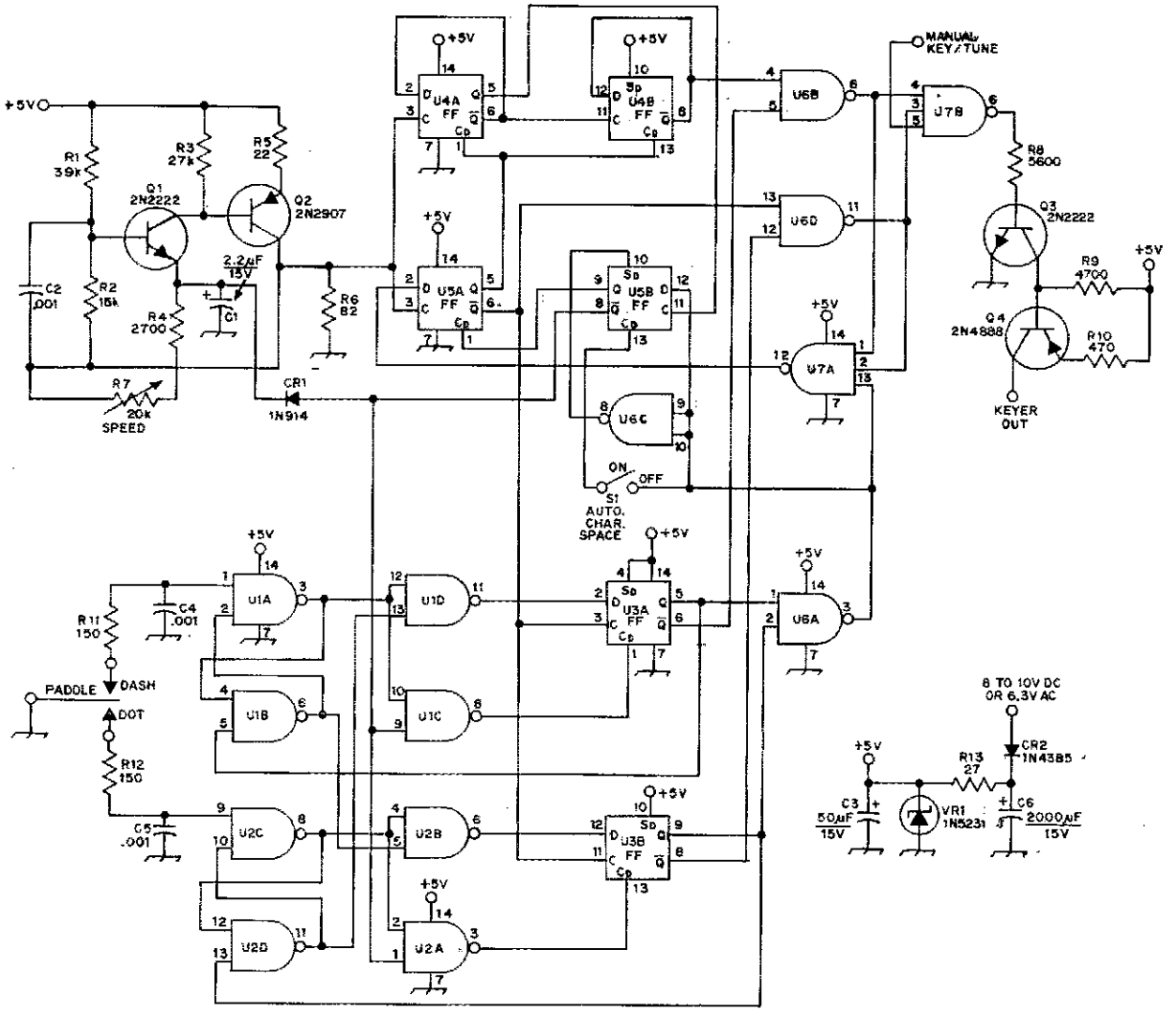


Fig. 2 — Schematic diagram of the Accu-Keyer. Resistances are in ohms; k = 1000. All capacitances are in microfarads. All resistors may be 1/4 watt except R13, which should have a 2-W rating. Capacitors with polarity indicated are electrolytic; all others are disk ceramic. Parts not listed below are for text reference and circuit-board identification.

CR1 — Small-signal silicon diode.

CR2 — Rectifier diode; 1/2 A or greater.

Q1, Q3 — Silicon npn, 250-mW, high-speed switching or rf-amplifier transistor.

Q2 — Silicon pnp, 250-mW, high-speed switching or rf-amplifier transistor.

Q4 — Silicon pnp, 250-mW, high-voltage af-amplifier transistor.

R7 — Reverse-log-taper control; Mallory U-28 suitable.

S1 — Spst toggle.

U1, U2, U6 — Quad 2-input NAND gate, type 7400.*

U3, U4, U5 — Dual type *D* flip-flop, type 7474.*

U7 — Triple 3-input NAND gate, type 7410.*

VR1 — 5.1-V, 0.5-W Zener diode.

* All ICs are dual-in-line package, 14 pin. Note: All ICs are available from various manufacturers or as surplus. Motorola part numbers are prefixed by *MC* and suffixed by *P*. Texas Instruments parts have an *SN* prefix and *N* suffix. Signetics ICs have an *N* prefix and an *A* suffix. For example, Motorola's MC7400P is equivalent to Texas Instruments' SN7400N or Signetics' N7400A.

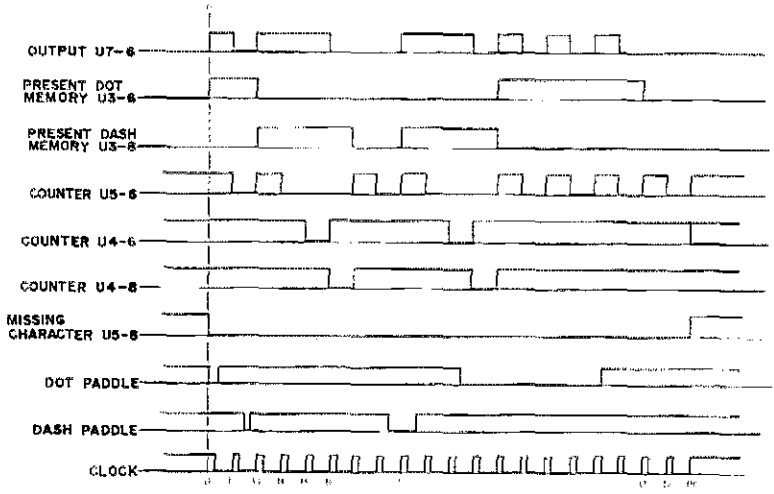


Fig. 3 — Timing diagram for the Accu-Keyer.

The upper plot is U7-6, which is the output of the keyer. At t1 the dot paddle is closed, producing a ground on U3-13, as will be explained later. This forces U3-8 high, U3-9 low, U6-3 high, and U6-8 low, causing U5-9 to go high and U5-8 to go low. The reset to the clock is removed, allowing the clock to produce a pulse at t2. Prior to the paddle closure, U5-9 was low, forcing U5-5 low. The U5-5 low caused U4-6 and U4-8 to be high. Therefore at t1, U6-12 will have a high from U3-8 and U6-13 will have a high from U5-6. U6-11 will be low causing U7-6 to go high, starting the dot and producing a high on U7-12.

At t2 the clock pulse occurs on U4-3 and U5-3. Because U4-6 is being held high by U5-5 low, it will not change state. The reset on U5-1 has been removed at t1. Because U5-2 is high, U5-5 will be clocked high and U5-6 low. The output at U7-6 will then go low because of the low on U6-13 stopping the dot. U7-12 will again go low.

At t3, either pin 2 or 12 of U3 will be low, as explained later, depending on which bit is required next. In this example pin 2 is low calling for a dash. At t3 the clock once again pulses and U5-6 will go positive because U5-2 is low. U3-3 will get a positive-going clock pulse and therefore U3-6 will go high and U3-5 low. U5-10 will always be held low by either a low on U6-1 or U6-2, as long as a character is being sent, because either U3-5 or U3-9 will be low. Therefore the clock will continue to run. A high on U3-6 will mean a high at U6-5, and because U6-4 is high the output at U7-6 will go high. Once again U5-2 will be high.

At t4, U5-6 will go low and U5-5 high, removing the resets from U4-1 and U4-13. At t5, U5-3 is clocked, but since the output on U5-5 is high and U5-2 is still high, nothing happens. U4-6 goes low, however, because of the high on U4-2. Because U4-6 is tied to U4-2, it will continue to change state at each clock pulse, as the input state is never the same as the output. Therefore at t6, U4-6 will go high, clocking U4-11 and causing U4-8 to go low cutting off the output and placing U5-2 low again.

Automatic Character Generation

If U5-6 goes high and neither of the U3 inputs are low, such as at t8, the reset is removed from U5-10. At t9, U5-6 goes low removing the reset from U4-1. Therefore at t10, U4-5 goes high clocking U5-11 and causing U5-9 to go low, resetting U5-5 low and U5-6 high. This provides another positive clock at U3 and if no bit has been called for the clock is held and the keyer waits for another low on U3-1 or U3-13. If either U3-2 or U3-12 were low, as at t7, the keyer continues and generates another bit. The AUTO CHARACTER SPACE switch, S1, shorts U5-13 and U5-12 causing the clock to be reset immediately on detecting a missing bit at U6-3.

Asynchronous Circuitry

The purpose of this circuit is to provide an input to U3 commanding a bit at the end of the space of the last bit. As seen previously, this occurs when the present-bit memories are clocked. The circuit consists of six NAND gates cross coupled to form set-reset flip-flops and two gates to allow the keyer to start after the clock has been reset. The dot and dash sections are both the same so only one will be explained.

When the clock is reset, U3-5 and U3-9 will be high. Grounding one of the paddles, the dash paddle in this example, will force U1-3 high, and since both U1-4 and U1-5 are high, U1-6 will go low causing U1-3 to remain high. The paddle just needs to be tapped, therefore. U1-9 is high because the clock-reset line is high, so U1-8 will go low starting the synchronous operation described earlier. Henceforth, both the U1C and U2A sections are disabled by the low reset signal.

The output of U3-5 will go low during the time of the bit as can be seen by the timing diagram. At the end of this interval U3-2 will be clocked. If the paddle is released before then, the flip-flop consisting of U1A and U1B will be reset because of the low fed to U1-5 from U3-5. Assuming the input from the dot circuit U1-13 to be high, U3-2 will go

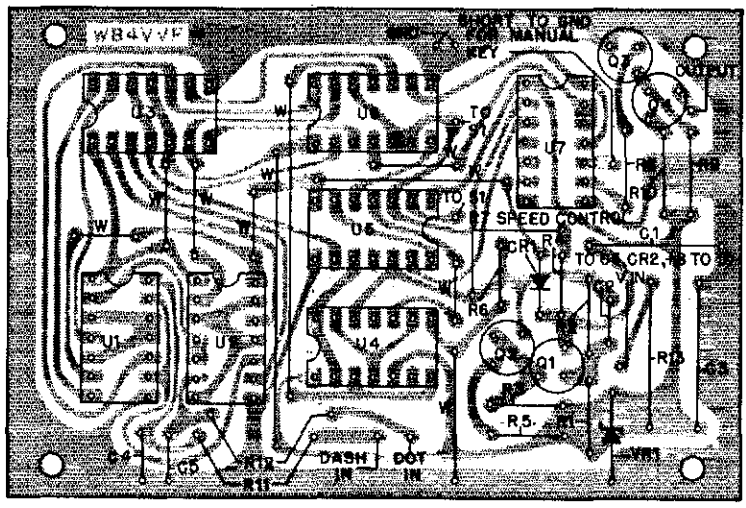


Fig. 4 — Etching pattern and parts-layout diagram for the Accu-Keyer. Pattern is actual size, shown from *foil side* of board. Ready-made circuit boards are available through the author.

high when the paddle is released. This prevents generating a double dot with a single tap of the paddle. The paddle contacts must therefore be held closed to generate consecutive dots or dashes.

If both paddles are held or if one of the paddles is tapped during a bit opposite to the one being sent, iambic operation calls for the next bit to be opposite. This provides for dot and dash insertion. When both paddles are held, both U1-3 and U2-8 are high. Therefore, both U3-2 and U3-12 would be low if it were not for the iambic gates U1D and U2A. Assuming that a dash is being sent, U1-6 will be low, causing a high on U2-5 and therefore a low on U3-12. However, U2-11 and U2-13 will be low, thus forcing U3-2 high. The inputs will continue to reverse as long as both paddles are held, thereby generating alternate dots and dashes.

Output Driver

The output from U7-6 is applied to Q3, which in turn drives Q4. Q3 is driven into saturation causing the base of Q4 to approach chassis-ground potential. The current through Q4 is determined by R10 and is set to about 10 mA. Q4 will withstand −100 volts when turned off. This should be adequate for most modern transmitters.[1] Obviously this keyer is designed only to drive transmitters using negative grid-block keying. If cathode keying is desired, an additional transistor may be used to key the cathodes directly or through a relay.

Power Supply

The 5 volts is regulated by R13, VR1, and C3. CR2 is used if operation from 6.3 volts ac is required. The current through R13 should be 100 mA for proper regulation.

[1] [EDITOR'S NOTE: Some grid-block-keyed transmitters may develop more than 100 volts across the keying terminals under key-up conditions. If this is the case, a fixed-value resistor may usually be shunted across the key line to lower the voltage somewhat. The resistance value should be high enough to prevent keying of the transmitter, usually a few hundred thousand ohms to a few megohms.]

Construction

A printed-circuit card has been laid out for the keyer containing all parts except the controls, filter capacitor, and rectifier in the power supply. The board will fit neatly in a 3 × 2 × 5-inch Minibox as shown in the photograph. A terminal strip is mounted along the rear to handle the inputs and outputs. There is ample room to mount a small 6.3-volt power transformer if operation from 117-V ac is desired. At my station the keyer is powered by the filament supply in the receiver.

Fig. 4 is an actual-size board layout and parts-placement guide for those desiring to build their own boards. A ready-made board is available from the author at a cost of $3.50. This is a glass-epoxy, mil-grade predrilled board, so no profit is being made at this price. A stamped return envelope would sure be appreciated!

It is essential that all leads to the keyer be shielded from rf. I use RG-174/U coax, which is small and does not take up as much space as the audio type of shielded cable. A .01-μF bypass capacitor is provided on the power input to remove rf. As shown on the diagram, the inputs from the paddle are filtered by 150-ohm resistors bypassed by .001-μF capacitors. In stubborn cases it may be necessary to bypass the paddle contacts at the paddle itself.

Substitution of transistors for Q1 and Q2 may require changing the value of R5 to make the first clock pulse the same length as the rest. Both should be transistors with a beta of at least 60. Q3 is noncritical, and any good silicon transistor should work. Q4 should be capable of withstanding the transmitter key-up voltage. Any pnp silicon device having a reasonable beta and meeting this requirement should work. The value of C1 may be juggled to change the range of the speed control. The value specified gives a range of approximately 5 to 50 wpm.

I would like to thank Duke Contini, W4YUU, and Dave Phillips, WB4UOC, for their suggestions and comments in the evaluation of the keyer. QST

Bearing and Distance Calculations by Sleight of Hand

BY JERRY HALL,* K1PLP

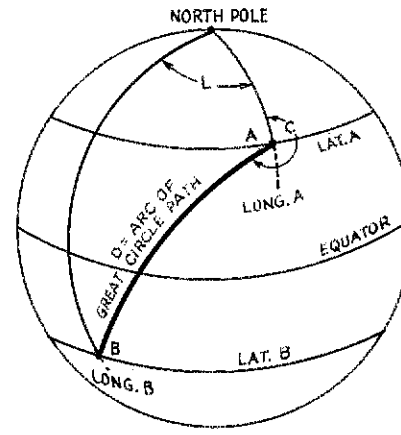


Fig. 1 — This sketch depicts the various terms which are used in the equations for determining bearing and distance. North latitudes and west longitudes are taken as positive, while south latitudes and east longitudes are taken as negative.

HOW MANY TIMES have you ever wanted to know the bearing and distance from your location on the earth's surface to that of another location some distance away with a fair degree of accuracy? If you're interested only in an approximation, you can, of course, get the desired information easily from a globe or an azimuthal-equidistant projection centered on your city or some large city near where you live. But for more exact information, such as you might desire for pin-point accuracy in aiming a rhombic or V-beam antenna, or for pointing an array or dish for long-haul vhf or uhf work, the only satisfactory way is to engage in some mathematical sleight of hand known as spherical trigonometry. "Ah," you say, "but I'd rather buy a computer listing from one of those fellows who offers them, and it'll be tailored to my exact location." True, but have you wondered how the *computer* determines what information to list? Besides, the exact destination or remote point that interests you at the particular moment may not be included in the computer listing.

Using spherical trigonometry isn't all that bad, anyway. All that's involved is looking up some values in standard tables, performing a few mathematical manipulations, and looking up a bit more information. And then, presto, there's your answer! This article explains how the calculations are made. A slide rule or an electronic calculator (pocket size or what have you) will be a great help in doing some of the manipulations, although neither is absolutely necessary. If you have access to a computer, you can use this information to come up with your own computer listing. The answer (if you've made no errors) will be the correct bearing as conventionally measured, clockwise from true north – 0 to 360 degrees – with no need to refer to a globe or map to determine sectors or quadrants. The calculations to be performed are based on a refined version of a pair of equations that have appeared in many editions of *The ARRL Antenna Book*,[1] and on an ingenious idea proposed in somewhat different form by Dennis Haarsager, WAØKKR, for completely eliminating ambiguous answers.[2]

Some amateurs, after trying their hand at using the equations in the *Antenna Book*, have become discouraged and given up. This is understandable, because the bearing equation is ambiguous in that the answer is an angle which is east or west of north or south. The correct quadrant must be determined by other means. Too, errors have existed in the example problem throughout different editions, and the consequent difficulty in following the use of the equations has perhaps been a source of confusion. The procedure presented here eliminates those problems.

The calculations to be performed are based on two trigonometric equations. One is unchanged from that of the *Antenna Book*. The other was derived analytically from a nomogram after D'Ocagne[3] some years ago by the writer, who failed to recognize its value at the time and put it aside. More recently the equation was derived mathematically by D. "Fish" Fischer, KØAKK,[4] and was also provided in a slightly different form (using haversines) by Haarsager.[5] It is possible that this second equation has appeared in other texts, for it is based on fundamental identities of spherical trig.

* Associate Technical Editor, *QST*.

[1] See the chapter on "Finding Directions," pp. 283-285, 12th edition (1970).

[2] Private correspondence.

[3] *Reference Data for Radio Engineers*, 3rd edition (1949), p. 424, Federal Telephone and Radio Corp.

[4] Private correspondence.

[5] Private correspondence, footnote reference 2. Haversine is a contraction for "half of the versed sine," the versed sine being 1 minus the cosine of the angle.

Some Definitions

Each of us has learned that the shortest distance between two points is a straight line. Thus, it is true that the shortest distance from, say, North America to Australia is a line running through the approximate center of the earth. This isn't a very convenient path to follow if one is traveling, however. Electromagnetic waves don't propagate well over that path, either. By following the shortest path *on the earth's surface* between those two continents, one will be taking the great-circle route. Except under unusual conditions, radio waves traveling between the two continents will also follow the great-circle path. Therefore, the equations are set up to give information for the great-circle bearing and distance, for the shortest path. For long-path work, the bearing will be 180° away from the answer obtained by these equations.

In order to determine the direction and distance from one point to another on the earth's surface, we must define where those two points are located. We do this by referring to the latitudes and longitudes of the locations – information which is available from maps and tables such as in an atlas or almanac. Fig. 1 will help you to visualize the nature of the situation. That sketch represents the path between points situated relatively such as Seattle, Washington, U.S.A. (at point A), and Sydney, New South Wales, Australia (at point B). In using these equations, northerly latitudes are taken as positive, and southerly latitudes are taken as negative. Also, westerly longitudes are taken as positive, and easterly longitudes are taken as negative. *In all calculations*, the appropriate signs are to be retained. *All additions and subtractions throughout the procedure are to be made algebraically*. Thus, if a negative-value number is subtracted from a positive-value number, the resultant will be positive, and it will be the *sum* of the two absolute values, and so on.

The Calculations

The two equations we'll be using for these calculations are:

$$\cos D = \sin A \sin B + \cos A \cos B \cos L \qquad \text{(Eq. 1)}$$

$$\cos C = \frac{\sin B - \sin A \cos D}{\cos A \sin D} \qquad \text{(Eq. 2)}$$

where A = *your* latitude in degrees
B = latitude of the other location in degrees
L = *your* longitude minus that of the other location (algebraic difference). If the resultant number is outside the range between ±180°, algebraically subtract or add 360, whichever gives a resultant value between +180 and −180 degrees.
D = distance along path in degrees of arc
C = true bearing from north if the final resultant value for L is positive. If L is negative, true bearing is $360 - C$.

The term, cos, is an abbreviation for cosine, and the term, sin, is an abbreviation for sine. A knowledge of the meanings of these terms isn't necessary for their use here. Tables of values of these functions for various angles are available in many reference books. Some tables express the angles in degrees and decimal fractions, and others use degrees, minutes, and perhaps seconds. Your latitude and longitude information must be in the form which is compatible with the tables you're using. It should be noted that the sine and cosine functions may be positive or negative in value, depending on the angle for which they are taken. The algebraic signs are not included in the body of the mathematical tables, but must be added when substituting numbers into the equations. Table I may be used for ready reference in assigning algebraic signs. For example, the sine of 35° is found to be 0.5736 from the trig tables, and from Table I is seen to be positive. The sine of −35° has the same numeric value, but from Table I is seen to be negative; thus, $\sin(-35°) = -0.5736$. Similarly, from Table I and the trig tables, it may be determined that $\sin(-110°) = -0.9397$, and $\cos(-110°) = -0.3420$.

The actual calculating procedure uses, first, Eq. 1 to determine the angular value for D, in degrees. From this value the path-length distance may be determined in miles or kilometers. Next, Eq. 2 is used to determine the bearing angle – and that's all there is to it! Using the Seattle to Sydney example mentioned earlier, let's refer to Fig. 1 and see just how the equations are used. From an almanac or map we may determine that the location of Seattle is 47°37' N. lat., 122°20' W. long., and Sydney is 33°54' S. lat., 151°12' E. long. Our location is in Seattle. Values for use in the equations are as follows:

A = lat. A = +47°37', and from tables,
sin A = 0.7387, and cos A = 0.6741
B = lat. B = −33°54', and from tables,
sin B = −0.5577, and cos B = 0.8300
L = long. A − long. B = +122°20'−(−151°12') = +273°32'. Subtracting 360 to bring this value into the proper range, we obtain a value of −86°28' for L. From tables,
cos L = 0.0616

Substituting into Eq. 1,

$$\cos D = 0.7387 \times (-0.5577) + 0.6741 \times 0.8300 \times 0.0616$$
$$= -0.4120 + 0.0345$$
$$= -0.3775$$
$$D = 112°11'^{6}$$

Each degree along the path equals 60 nautical miles, and each minute equals one nautical mile. Therefore, 112°11' of arc is equivalent to 60 × 112 + 11 = 6720 + 11 = 6731 nautical miles. To convert to statute miles, multiply by 1.15078. If the distance is desired in kilometers, rather than

[6] From Table I, it may be seen that D, the angle having a cosine of −0.3775, must lie either between 90 and 180 degrees, or between −90 and −180 degrees. D is always taken as positive.

Angle	*Sine*	*Cosine*
0° to 90°	+	+
90° to 180°	+	–
0° to –90°	–	+
–90° to –180°	–	–

Table I – Algebraic signs of functions of angles.

statute miles, multiply nautical miles by 1.852.7 Doing this, we learn that the distance between Seattle and Sydney is 7746 statute miles, or 12,466 km. Then substituting into Eq. 2 and taking the value for cos D as just determined,

$$\cos C = \frac{-0.5577 - 0.7387 \times (-0.3775)}{0.6741 \times \sin(112°11')}$$

$$= \frac{0.5577 + 0.7387 \times 0.3775}{0.6741 \times 0.9260}$$

$$= \frac{-0.5577 + 0.2789}{0.6242} = \frac{-0.2788}{0.6242} = -0.4467$$

C = 116°32′ (*always positive*). However, because the value of L was negative, the correct value for C is 360° – 116°32′ = 243°28′.

Thus, the true bearing from Seattle to Sydney is 243°28′ and the distance is 7746 statute miles. If the bearing from Sydney were desired, it would be necessary only to work through Eq. 2, interchanging latitude values for A and B. Because of the way in which L is defined, L will be positive in this case, and it will not be necessary to subtract from 360° to get the true bearing at Sydney, which is 46°36′.

These equations, applied as described above, may be used for any two points on the earth's surface – both locations in the northern hemisphere, both locations in the southern hemisphere, either or both on the equator, and so on. The equations themselves are exact, not being based on any approximations. However, there are some cases where practical limitations exist in the accuracy of the results obtained from Eq. 2, in relation to the number of decimal places used from the trig tables. These cases are where both locations are near or at exact opposite points on the earth (antipodes), where the locations are close together, or where *your* location is at or near one of the poles. (At the poles, all directions are either south or north, anyway.) More specifically, these situations exist when lat. A is near ±90°, or where D is near 0° or 180°. *In these cases, use of tables with several* decimal places will improve the accuracy. A better method would be to locate tables of secants and cosecants, and, instead of dividing by sine D in Eq. 2, multiply by cosecant D. In this way, much better resolution may be obtained for values of D near 0 and 180 degrees.

Perhaps the upshot of all this information will be a reversion to the true definition of the Q signal, "*QTH?*" – what is your position in latitude and longitude? Then, while in contact, those fellows who are fortunate enough to own electronic calculators which contain provisions for handling log and trig functions can quickly calculate the distance and bearings involved. Don't be surprised if, sometime on the air, you hear something like this. "Good evening, OM. Your signal is Q-5 and S-9 here, 6237 miles from your location. By the way, your correct beam heading for me is 53 degrees 22 minutes. How do you copy now?" QST

[7] Because the earth is not a perfect sphere, a degree of arc represents varying distances on the earth's surface, depending on the latitude. At the equator, one degree is equivalent to 69.41 statute miles, while one degree at the poles is equivalent to 68.70 miles (ref., *Handbook of Chemistry and Physics*, 51st edition, 1970-1971, The Chemical Rubber Co., Cleveland, Ohio). The conversion values given in the text represent an average.

"It Seems . . ."

(Continued from page 9)

the ham portion of 220 MHz" is the major cry. Are you really convinced by such bait? Be sure to look far beyond the sales pitch – *do we want to accept loss of a single kHz* of our spectrum, especially when the proverbial camel's nose in the tent is so perfectly apparent? The world above 50 MHz has become increasingly more important and will continue to develop as a prime communications area.

We said each amateur and club *concerned*. You may not currently be a user of 220 MHz – though if you are a 2-meter fmer you certainly will be sooner or later, as *crowding at 144 continues*. In any event, ***you are an interested party as an amateur***; who knows whether 144 or some other band, perhaps your favorite, may be next? Join us in speaking up. Your voice will be heard. QST

Strays

QST congratulates . . .

Raphael Soifer, K2QBW, special assistant to the Assistant Secretary of Commerce for Maritime Affairs, who has joined Bankers Trust Company, New York City, as a vice president.

Douglas C. Andrews, K6VGH, of the *Santa Monica Outlook*, honored by the Los Angeles Press Photographers Association for the best spot news shot for 1972.

Harry Fine, W3KFA, Assistant Chief Engineer in charge of the Research Division, Office of the Chief Engineer, Federal Communications Commission, Washington, D.C., honored by the Institute of Electrical and Electronics Engineers with the 1973 IEEE Patron Award.

J. Orrie Baumgardner, W8BF, selected as Citizen of the Year by the Fairview Park (Ohio) Community Council in recognition of his many years of public service as a radio amateur and for other *contributions to the community*.

The Rochester VHF Converters

A Club Project that Paid Off

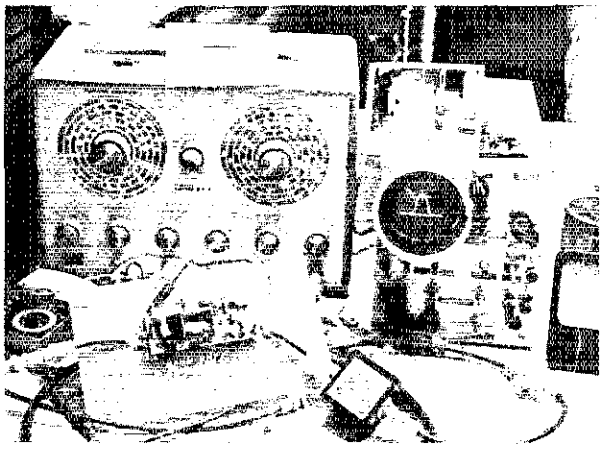


Fig. 1 – The testing facility used by W2DUC to assure that the completed converters met the design specifications. A sweep generator and oscilloscope check the bandwidth. Gain is determined by the substitution method using fixed attenuators. Use of a noise generator was also part of the final checkout procedure.

BY FRED B. CUPP,* W2DUC, AND

CHUCK ONESKE,** K2YCO

THE VHF CONVERTER PROJECT was started when W2DUC and W2CNS presented a program on modern solid-state converters at one of the club meetings of the Rochester VHF Group. Following the presentation K2YCO, then president of the group, channeled the program in the start of a project organized along industrial lines. This approach was, of course, planned prior to the program, after considerable design effort had been expended.

The project was well accepted and a large number of club members signed up. Some of the project members were "persuaded" to act as organizational leaders, heading up engineering, production engineering, purchasing, material control and expediting, photography, and administrative functions. A secretary and treasurer were also "chosen." As the project progressed, members were called upon, as time and talents permitted, to work in small teams performing the design, fabrication, inspection, and test of all converters (and power supplies).

* 27 Crescent Rd., Fairport, NY 11450.
** 27 Angora Dr., Rochester, NY 14617.

Design Objectives

The engineering team held several meetings to establish the design goals. Since a large number of units were to be constructed, it was immediately obvious that printed-circuit construction should be used. Because both six- and two-meter converters would be built, a universal design would be desirable to enable one circuit board to serve either model. Other specific design goals were:

1) Low noise figure, less than 3 dB.

2) State-of-the-art freedom from cross modulation.

3) Sufficient gain to override the front-end noise of most receivers.

4) Double-tuned bandpass interstage and output circuits to achieve a flat response over a two-MHz portion of either band.

5) Filtering of the local oscillator chain in the two-meter model to reduce spurious responses.

All too often a club project is a "make-work" undertaking that is supposed to stimulate interest and activity within the membership. Many of them fail because they were planned improperly and executed poorly. This project, by the Rochester (NY) VHF Group, is an outstanding example of a successful undertaking. It succeeded because the leaders recognized a need, presented an interesting program to meet that need, and enlisted the aid of many capable members to organize and conduct the experiment. The converters that were the outcome of their efforts can stand alongside the best of the lot. Whether you are interested in vhf converters or not, the lessons that can be learned here should make this article high on your reading list.

6) Small size and low power consumption.

7) Freedom from accidental mistuning during the life of the converter.

Other points considered were such things as freedom from the necessity of neutralization and the use of moderately priced transistors.

Several breadboard models were constructed and tested as the design evolved. Fig. 1 shows a completed converter and part of the final test set-up.

Circuit Design

A schematic diagram for the six-meter converter is shown in Fig. 2, and for the two-meter model in Fig. 3. The configuration of the rf and mixer portions of the circuit are virtually identical for six and two meters, with the values of the frequency-determining components being scaled appropriately. The major difference between the two converters is a change in the local oscillator chain. A minor change in the method of interstage coupling was necessary to prevent stray-capacitance effects from making the alignment critical on the six-meter converter.

All inductors in the six-meter model and the two-meter output circuit are wound on Amidon T-30-6 toroid cores. The tuned circuits are aligned by spreading or compressing the turns around the toroid core. After alignment the coils are glued in place with Silastic compound (sold as bathtub caulk).

The rf amplifier, Q1, is used in a grounded-gate configuration. The input circuit is tapped to provide a proper match between the antenna and source of the FET while maintaining a reasonable *Q*. The six-meter interstage coupling network consists of C3, C5, L2, and L3. Band-pass coupling is controlled by the capacitive T network of C3 and C5 in ratio with C6. A 40673 dual-gate MOSFET is used in the mixer circuit (Q2). Gate 1 receives the signal, while gate 2 has the local-oscillator injection voltage applied to it through C7. A slight amount of positive bias is applied to gate 2 through R2. A top-coupled configuration, using toroid inductors, serves as the 28-MHz output circuit of both converters.

The oscillator circuit in the six-meter model is straightforward, relying on the drain-to-gate capacitance of the FET for feedback. A tap at four turns from the hot end of the toroid winding provides the injection to the mixer through capacitor C7. In the two-meter converter, Fig. 3, the rf stage is identical to the six-meter version except for the tuning networks. L1, L2, and L3 are air wound, self-supporting, and are formed initially by winding wire around the threads of a 1/4-20 bolt. The turns of L1 are spread to permit adding taps prior to mounting on the board. The degree of interstage coupling in the two-meter model is controlled by the positions of L2 and L3. Since they are mounted at right angles, the coupling is very light. By changing the angle between these two coils, the passband may be optimized.

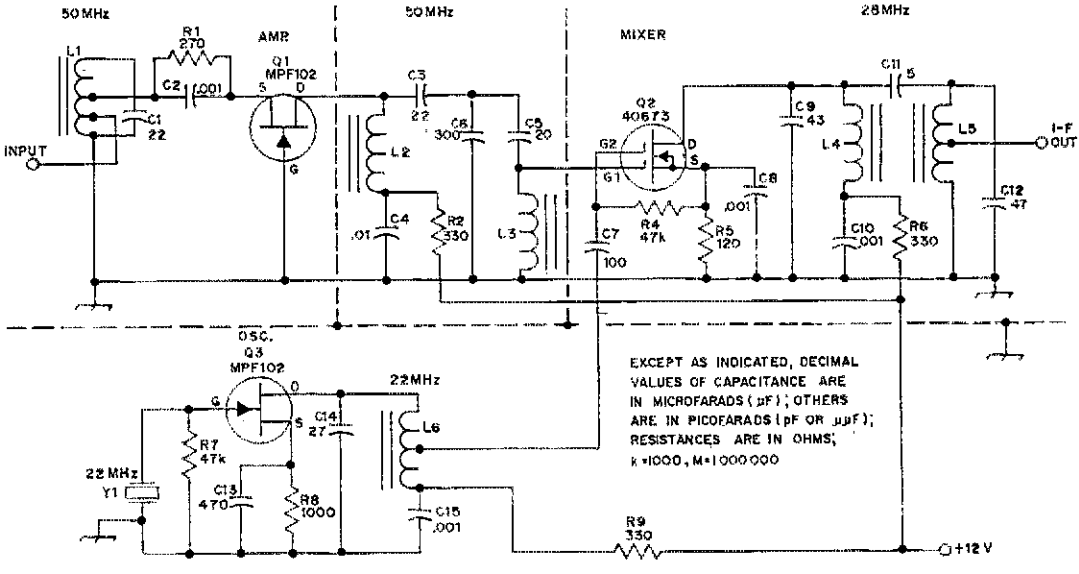


Fig 2 — Schematic diagram of the six-meter converter. All resistors are 1/4-watt composition. C2, C8, C10 and C15 are .001μF disk ceramic. C4 is .01-μF disk ceramic. All other capacitors are dipped mica.

L1-L6, incl. — All No. 28 enam. wire wound on Amidon T-30-6 cores as follows: L1, 14 turns tapped at 4 turns and 6 turns; L2, 13 turns; L3, 12 turns; L4, 18 turns; L5, 18 turns tapped at 4 turns from cold end; L6, 26 turns tapped at 6 turns from hot end.

Y1 — 22-MHz crystals. International Crystal Mfg. Co. type EX.

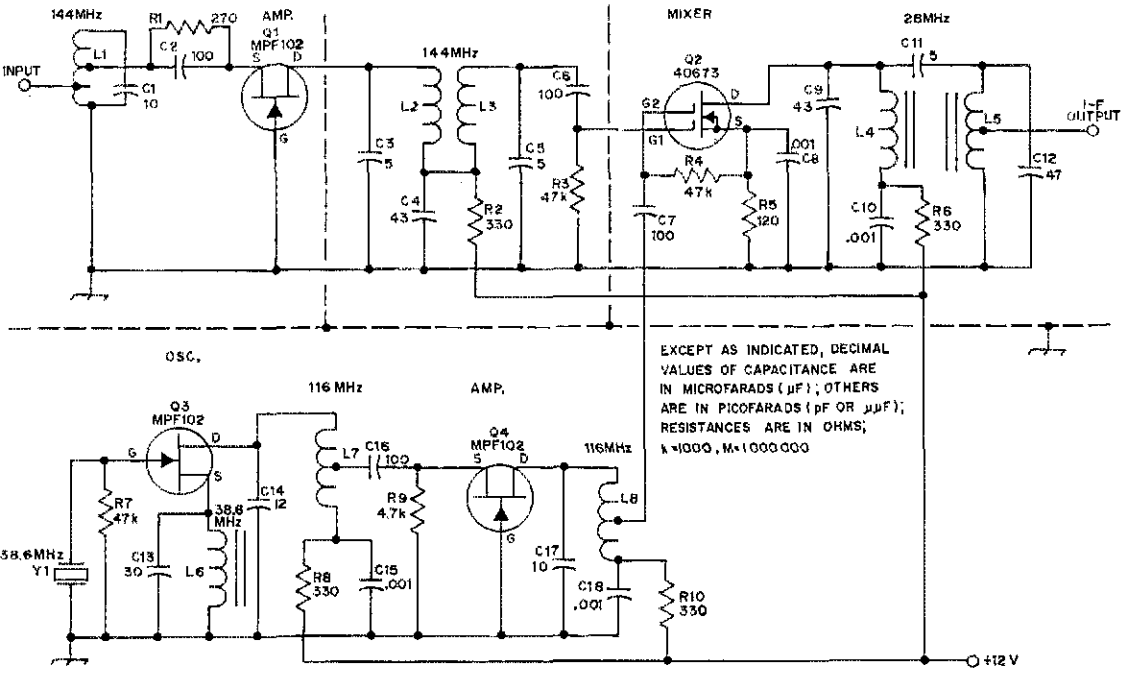


Fig. 3 — Schematic diagram of the two-meter converter. All resistors are 1/4-watt composition. C8, C10, C15 and C18 are .001-μF disk ceramic. All other capacitors are dipped mica units.

L1, L2, L3, L7, L8 — All No. 20 enam. wire formed by using the threads of a 1/4-20 bolt as a guide. L1, 5 turns tapped at 1-3/4 turns and 3/4 turn from cold end; L2, 5 turns; L3, 4 turns; L7, and L8, 5 turns tapped at 2 turns from hot end.

L4 — 18 turns No. 28 enam. wound on Amidon T-30-6 core.

L5 — 18 turns like L4, tapped at 4 turns from cold end.

L6 — 0.68 μH miniature inductor. Delevan 1025 series or J.W. Miller 9230-16.

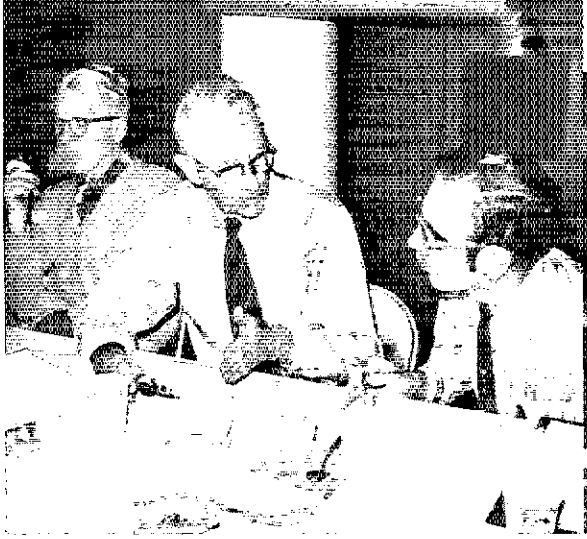
Y1 — 38.666-MHz crystal. International Crystal Mfg. Co. type EX.

In the two-meter oscillator stage Q3 is changed to an oscillator/tripler by replacing the source bias resistor with L6. Replace bypass capacitor, C13, with a 30-pF value to resonate L6 near the crystal frequency. Source-to-gate capacitance provides the feedback in this case. The drain tank is modified to provide output at the third harmonic, thus eliminating the need for a separate tripler stage. Q4 is used as an isolation amplifier running at very low current level (as controlled by R9) to provide attenuation of the adjacent harmonics. This stage is not needed for amplification of the oscillator signal but without the additional filtering, severe "birdies" may result from nearby fm or TV stations. In both the six- and two-meter versions, a number of printed-circuit pads will be left over when construction is completed. These are the result of providing both bands on a common pc layout. For example, the isolation amplifier following the oscillator is not used on six meters. Therefore this stage is bypassed by a jumper wire from L6 to C7. Five additional holes are located in the ground area along the centerline of the board and between rf and mixer stages. Component lead clippings are soldered into these holes to provide a mounting for the shield partitions, which are soldered to the wires where they extend through the board. Fig. 4 shows the parts layout for the six- and two-meter converters. Notice that one lead of C3 must reach past the ground hole and connect to the foil. R3 is not used on the six-meter converter.

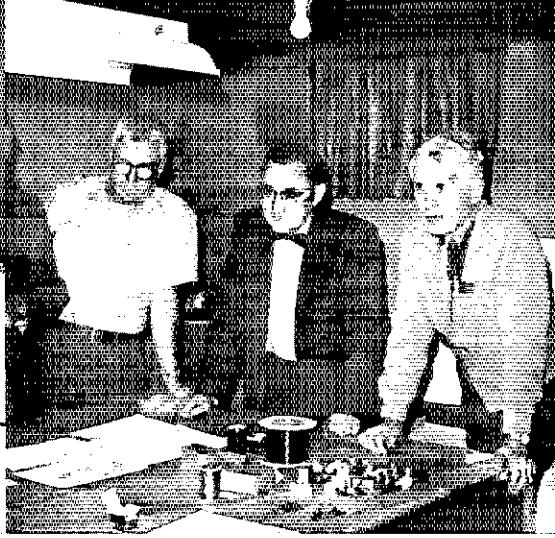
Construction Begins

After the design had been established firmly, other teams swung into action. The project administrator maintained a close watch on all phases of the effort. The secretary, WB2RJB, and his team prepared the detailed parts lists for use by the purchasing agent W2MPM. They also prepared the schematic diagrams and part-layout sheets and furnished a complete documentation package to be issued with each converter.

As parts were received, they were separated into kits to be used by the various assembly teams. One such team, under the guidance of W2UTH, met several times to concentrate on winding some 300 toroids by hand, only to have a change in the core material require them to be stripped and completely rewound. The rework effort was crowned with success. In addition, some 100 air-wound coils were produced by this group, with



. . . and it worked! W2QY, K2YMM, WB2RJB.



. . . need more time, WN2MVC, WA2KND, W2QY.

. . . now change R43. W2CNS, W2DUC.

. . . reschedule again!? K2YCO.

. . . you signed up too? WB2IUM, W2MPM.

. . . you want 100 copies!? WB2RJB.

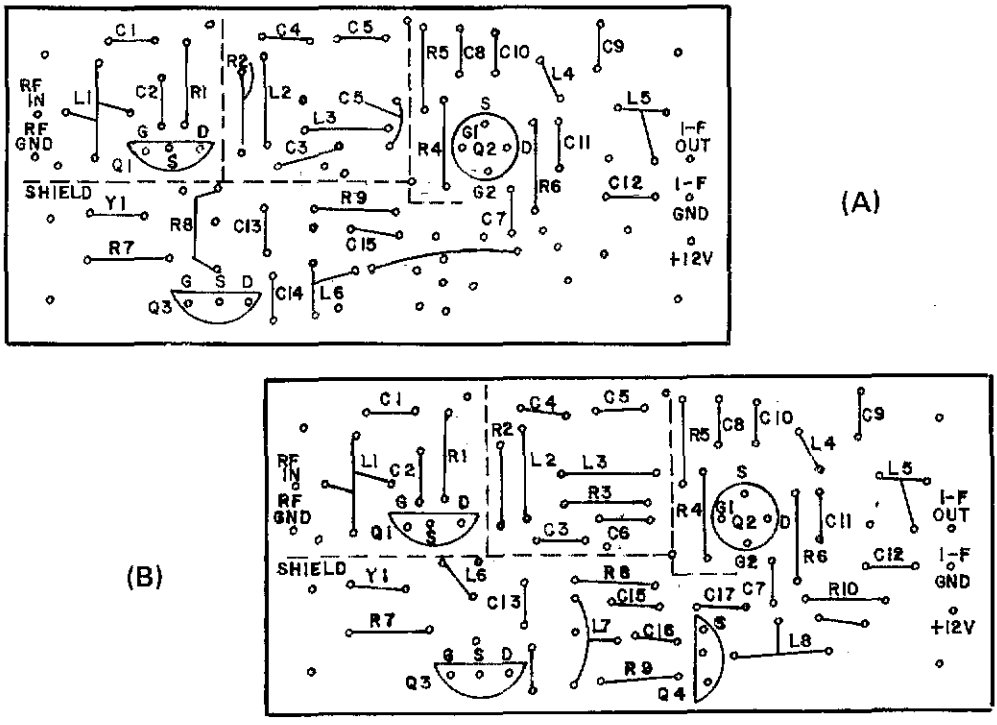


Fig. 4 — Parts-placement guide for the six-meter converter, A, and the two-meter converter, B. View is from the component side of the board. Dashed lines show the location of shields that are soldered to short pieces of wire which project through holes in the pc board. The shields may be fabricated from sheet brass or copper, or scraps of copper-clad board material.

WB2YHD helping. The fabrication of the production pc boards was administered (at low cost) by methods unknown to the authors. The main production teams met on numerous occasions to assemble components on the printed circuit boards under the supervision of K2YMM. An individual member would be given a small group of components to assemble, using a color-marked copy of the layout sheet. Another member would have the responsibility of soldering in certain groups of components. Another team member would have certain inspection responsibilities. WN2MVC made the shields and team members assembled this last item to the boards. Throughout it all, WA2FVG also took pictures, WA2KND and K2YAH chased parts, W2QY kept track of the bank account and WB2IUM administered (!). One newcomer to the project team, K2VCI, generously offered us the full use of his place of employment after hours, equipped with work benches, soldering irons and tools. When questioned gingerly about whether "they" would mind us using "their" facility and wouldn't he "get into trouble, he replied, "It's okay fellows, I'm the president." (You meet the nicest people in this avocation.)

Alignment and Test

Perhaps the most difficult task in the project was the test and tune-up of the finished converters – almost a one-man effort by W2DUC. A single test setup using a sweep generator, diode probe, and oscilloscope was a necessity to assure the flat response over the tuning range. Commercial attenuators were used to calibrate each converter by the substitution method.

Tuning of the air-wound rf circuit for two meters was accomplished by spreading or compressing the turns of the coils. After alignment, the windings were secured by a bead of Silastic compound along the coil to hold the turns in place. The noise figure of each converter was checked using the Monode noise-generator technique.[1] A final sensitivity check using a receiver (NC300) and a model 80 calibrated signal generator completed

[1] Guentzler, "The Monode Noise Generator," *QST*, April 1967.

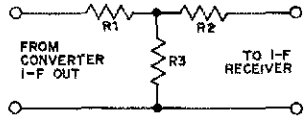


Fig. 5 — An i-f attenuator may be necessary if the receiver following the converter is exceptionally hot. Values for 6 dB: R1, R2 — 18 ohms; R3 — 68 ohms. For 10 dB: R1, R2 — 27 ohms; R3 — 39 ohms.

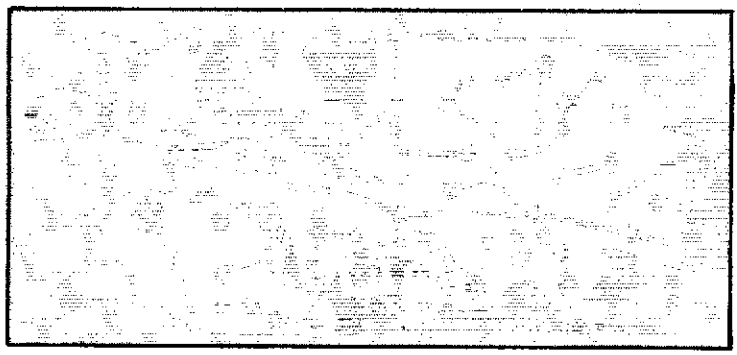


Fig. 6 — Scale-size layout for the pc board. The same pattern is used for either band. Foil side shown here.

the checkout. Each converter was marked with a serial number and could be identified as to its performance specifications.

Inevitably, a few quirks did show up at this point. The original source of crystals for the two-meter converters yielded about ten percent having insufficient activity to oscillate reliably. Some of these were cured by the addition of a gimmick capacitor from source to gate of Q3. However, some of the crystals were so sluggish that new crystals were obtained from a different manufacturer.

The transistors used in the rf stage were also subject to some variation in noise figure. When this occurred, an rf FET was carefully traded with an oscillator FET, since performance of the FET as an oscillator was always satisfactory.

The winding of the toroid coils was subject to a variation because of a change of manufacturer. Although the specifications seemed identical, the turns were low by some 25 percent. Rewinding a few coils by hand is easy for the individual constructor, but for a club project it can be a traumatic experience. It is suggested that one or two samples be built of each model using "production" cores, before winding any large number.

The performance specification range for the converters is seen in Table I on the next page.

An individual constructor may find it advantageous to use small ceramic trimmers in place of the fixed-value mica capacitors used in the tuned circuits of these converters. The midrange of the trimmer should be approximately the value of the mica capacitors replaced. This procedure may simplify the tuning process of the converters where a sweep generator setup is not available. A little careful tweaking should give a reasonably flat response.

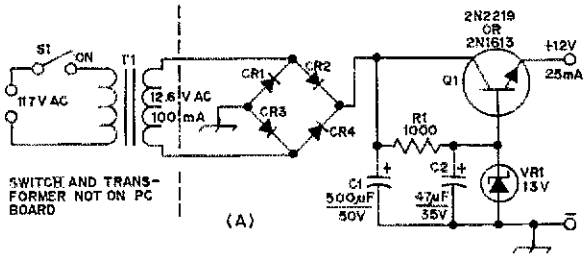


Fig. 7 — Schematic diagram and parts-placement guide for the power supply to the converters. The transformer is mounted external to the board. Pc board size is identical to the one used for the converters.

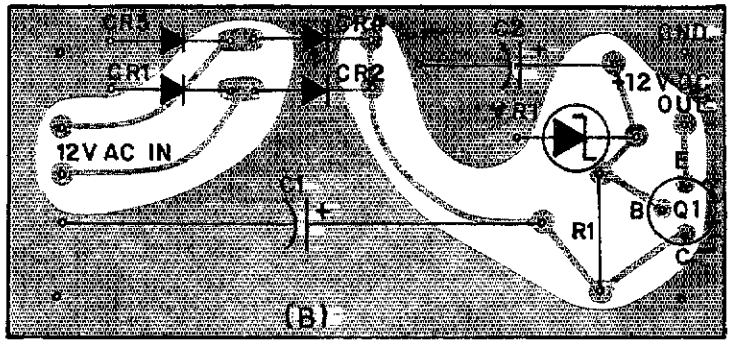


Table 1 – Performance Specifications

Parameter	*6 Meters*	*2 Meters*
Noise figure, dB	1.8 – 2.3	2.0 – 2.4
Conversion gain, dB	22 – 28	17 – 24
Spurious responses, dB	–80* * Has a response at 6 MHz	–60* * Responses at 107 & 181 MHz
Freq. response, ± 1 dB	49.8 – 51.5 MHz	143.9 – 146.4 MHz
Current at 12 V dc	12 – 18 mA	14 – 20 mA

If trimmers are used, the rf input circuit should be tuned to the center of the desired response, 50.5 MHz as an example. This circuit tunes broadly and is not too critical. The rf interstage circuits should be stagger tuned, one at 50.0 MHz and the other at 51.0 MHz, as an example. the output i-f circuits can be tuned in a manner similar to the interstage circuits.

Conclusions

The authors feel that the project was very worthwhile, both as a means of upgrading project-member stations and for the benefit of the club. The project created interest, participation, and fellowship. It increased the knowledge and experience of project members. In addition, the members received some 50 converters and about 25 power supplies.[2] Despite the low cost to the individual – less than $15 per converter – volume parts procurement resulted in a sizable amount of money left over after completion of the project. This money was turned over to the club treasury by choice of the project members. This should enable us to have free coffee and doughnuts at this year's club meetings! QST

[2] For availability and price of pc boards for these converters write to: Spectrum Research Lab. Inc., P.O. Box 5824, Tucson, AZ 85703 or D. L. McClaren, W8URX, 19721 Maplewood Ave., Cleveland, OH 44135.

NEW BOOKS

Handbook of Simplified Solid-State Circuit Design, by John D. Lenk. Hard-cover version, 6-1/4 × 9-1/4 inches. Publisher, Prentice-Hall, Inc. Price: $12. Pages: 310 including index.

Many new technical books are read by the ARRL hq. staff for the purpose of presenting book reviews on publications of value to radio amateurs. Regrettably, a fair percentage of the books being printed today are of little value to any technically inclined reader. The singular resemblance to being an electronics textbook or manual that many of these books exhibit is the presence of schematic diagrams. The text is all too often composed of hackneyed matter originated by other writers, or is at best simply a collection of condensed application notes from various manufacturers, spiced with circuits excerpted from the idea pages in American trade journals. Prices for these third-rate books range from a few dollars to as much as $30 depending upon the publishing-house name that appears on the cover.

It is indeed refreshing to read a book like *Handbook of Simplified Solid-State Circuits*. Here we find a collection of data that should be useful to radio amateurs, electronics technicians, and engineers. The author obviously took the old-time approach of being original in his treatment of the subject. Of even greater merit is Lenk's rendering of terms and explanations in language that can be understood by all but the most poorly informed technical reader. The battle of semantics, so frequently engaged in by modern technical writers, is totally absent. Furthermore, there is no need to have access to a computer terminal in order to decipher page upon page of equations: the author has confined his use of math to simple algebra, and has used it only where it is absolutely pertinent.

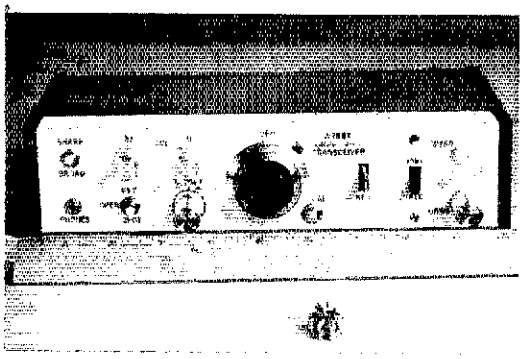
This volume features a simple, practical treatment of solid-state circuit design and application. Design theory and analytical procedures are kept to the barest minimum sufficient for a working, functional knowledge of the subject. Rule-of-thumb approximations are provided for the selection of component values used in transistor and IC circuits on a trial basis, assuming a particular design goal and a specific set of operating conditions.

Six major chapters are used to cover basic design rules, audio amplifiers, operational amplifiers, rf circuits (high- and low-level types), power supply circuits and wave-form and wave-shaping circuits. There is an important section which treats the interpretation of the data given on specification sheets for transistors and ICs – a subject which should be enlightening to many amateurs. Additional data are given on the use of heat sinks and how to troubleshoot equipment.

Anyone working with solid-state circuitry will find this book well worth the price. This writer would not hesitate to recommend the publication for inclusion in any modern-day radio amateur's library. – *WICER*

Strays

Two errors were noted in the club listings for the November SS. WB2JSJ is the phone winner for the Radio Society of Greater Brooklyn. K6JAN is the phone winner for the West Valley ARC.



Close-up view of the operating "console." A complete transmitter, receiver, and keyer is contained in one package that can fit into a brief case.

Quality Recipe for a Portable Package

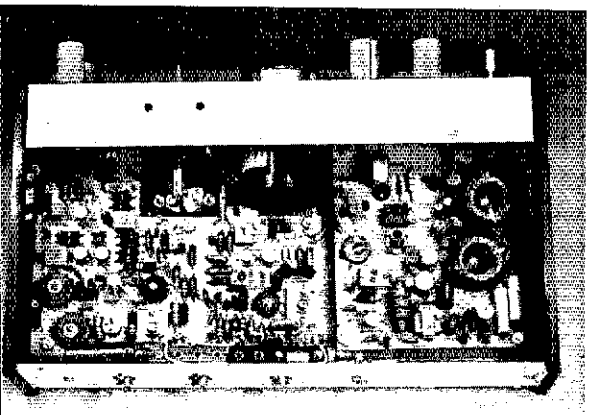
BY HOWARD F. BATIE,* W7BBX/4

AFTER READING the many articles on QRP appearing in *QST* over the last few years, I decided to jump in with both feet. My initial effort (Mark I) was the QRP rig for 3.5 and 7 MHz in the 1972 *Handbook*. Result: 45 states confirmed on 40 meters with a simple dipole up 18 feet and less than one-watt input. This was followed by the Mark I, Mod 1, a transceiver using the above as a crystal-controlled transmitter and W7ZOI's Mountaineer receiver from Aug. '72 *QST* with his keyer from Nov. '71 *QST*. But I think the Mark II described here really combines most of the features the serious cw QRPer appreciates, with the possible exception of QSK operation. I'll save that for the Mark III.

Since this project was expected (and proved) to be an exercise in high-density circuit component packaging, pc board construction was indicated. Selection of components for both physical size and mounting was carefully done during the breadboard phase for each subcircuit. Surplus computer boards proved an inexpensive source of miniature components such as rf chokes and electrolytic capacitors. Many mail-order firms (such as Poly Paks and Circuit Specialists) can supply most of the remaining components at bargain prices. Exotic transistors were avoided.

A Ten-Tec JW-10 cabinet was selected since it is within the desired size limits and provides a very handsome enclosure. After reducing the space available inside the cabinet for the circuit boards by the amount of space required for panel controls and rear apron connections, the pattern for each circuit board was laid out keeping in mind: the overall block diagram, which functions should go onto what board, and the exact size of each component which worked in the breadboard versions. Two separate pc boards were constructed: one for the transmitter, VFO, incremental tuning, keyer and sidetone oscillator, and one board for the direct-conversion detector, cw filter, audio amplifier and band-edge marker. However, a better approach would have been to construct a separate VFO-keyer board and driver-transmitter board, since the driver and final amplifier went through three pc-board variations before successful operation was attained. An attempt was made to design the boards to permit, where possible, short interconnecting leads to the required panel and rear apron controls.

* 2912 Johnson Road, Falls Church, VA 22042.



An inside view showing the pc-board construction. The receiver is of the direct-conversion type. Originally, a passive filter using toroids (right-hand side) was used, but was replaced by an active filter.

Circuit Notes

For my transceiver, I settled on a single-band design. However, multiband operation could have been achieved with some sacrifice in compactness and circuit simplicity. Since 40 meters is open nearly 24 hours a day, that band was chosen. One of the objectives of this project was to come up with a *complete* station, including power supply (or batteries) and antenna which could be packed into my briefcase (3 inches wide).

The Mark II version uses most of the circuits from articles mentioned previously, with the following important additions: a varactor-tuned VFO, a sidetone oscillator using an astable multivibrator, and some additional audio amplification. The passive filter originally used in the direct-conversion receiver was later replaced with an active filter. The active filter is an MFJ Enterprises CWF-1 and gives astounding performance with provisions for 180, 110 and 80 hertz selectivity with some audio gain. The unit used was prewired; the filter pc board was mounted on top of the receiver pc board. Some space savings could have been realized by designing the receiver pc board to take the individual parts from the filter kit (CWF-1K). However, sufficient space was available on the receiver board for the receiver, prewired filter, and marker oscillator.

Frequency control is provided by employing the reverse-biased collector-base junction of a bipolar transistor as a variable-capacitance diode (varactor). By changing the amount of reverse bias, the depletion region of the collector-base junction enlarges or contracts and hence, the capacitance across the junction is varied. This capacitance is isolated from the reverse-biasing source by an rf choke and a resistor and can then be coupled into the tank of an oscillator. The varactor VFO, or any voltage-controlled oscillator, is very dependent upon the regulation qualities of the power supply; even a few millivolts change in the power supply voltage under full load may cause some chirp or frequency shifting. Therefore, care should be taken in assuring that the power supply regulation is sufficient.

One of the limitations of varactor-tuned VFO's is that over a large frequency range, linear calibration of the VFO dial is extremely difficult to attain since the capacitance-change voltage ratio is not linear. To attain linear calibration, a very exhaustive analysis of the effects of each component affecting the tank frequency would be required. A more pragmatic approach was taken: sacrifice dial linearity for a reasonable tuning range and include a simple crystal calibrator to mark the lower band edge. The turns-counting dial used provides an excellent 1000-unit logging scale. The bandspread available at the lower frequency end of the dial was 9 units per kHz; at the upper end of the tuning range (75 kHz from the bottom), the bandspread increased to 30 dial units per kHz.

Performance and Conclusions

Performance of the transceiver on the air is very rewarding, and thoroughly justifies the care given to each subcircuit. The receiver is very sensitive, although the sensitivity was not measured quantitatively. Many South American and European stations have been heard. The cw filter reduces QRM significantly above and below the design center frequency. Rf power output was calculated at one watt with a 13-volt supply. Many contacts have been made up and down the East Coast and into the Mid-West. No chirp or clicks have been reported.

The transceiver frequency is very stable after a few minutes of warm-up. With the dial locked, the VFO *does not shift* even if the transceiver is dropped an inch or two onto the desk. This is because no variable capacitor is used to control the frequency. Current drain during receive is 40 mA and 165 mA during transmit.

Panel layout is functional and the transceiver is extremely simple to operate. Care had to be taken to provide only the minimum number of essential front panel and rear apron connections, yet the functions incorporated make it an extremely versatile and compact unit which is equally at home in the field or on the desk.

Illustrated here are some basic methods for incorporating various ideas into an integrated package that performs the way *you* want it to, and with the specific frills *you* desire. One thing can't be stressed too strongly: breadboard individual circuits first and select components that give you what you're looking for in terms of size, frequency response, gain, frequency coverage, power output, and power consumption. QST

W7BBX at the controls of his mini-station. Note the size of the QRP package compared to the conventional transceiver.

Another Look at Reflections

Part III — Going Around in Circles to Get to the Point

BY M. WALTER MAXWELL,* W2DU/W8KHK

Part I of this series of articles appeared in the April 1973 issue of *QST*, and Part II appeared in the June 1973 issue.

Basic Reflection Mechanics

It is generally well understood that the size or magnitude of a reflection arising from a mismatched line termination is determined by the degree of the mismatch, or how much of the incident-wave power is unabsorbed by the load, expressed as a voltage or current ratio relative to the size of the incident wave.[9] The reflection coefficient, $\overline{\rho}$ (rho),[10] is determined quantitatively from the line and load impedances by the expression

$$\overline{\rho} = \frac{Z_L - Z_c}{Z_L + Z_c} \qquad \text{(Eq. 1)}$$

where Z_L is the complex load impedance, $R + jX$, and Z_c is the characteristic impedance of the transmission line. This shows immediately that $\rho = 0$ (no reflection) when $Z_L = Z_c$. However, the load must be purely resistive ($R + j0$) for zero reflection, because we are considering only lossless and low-loss lines with a characteristic impedance that is purely resistive. Perhaps somewhat less appreciated than reflection magnitude is reflection *phase*, which is determined by the character of the mismatch, and expressed as an angle relative to the phase of the incident wave. The magnitude ratio, ρ and the relative phase, θ (theta), together comprise the complex reflection coefficient $\overline{\rho} = \rho\underline{\theta}$, which tells us all we need to know about the reflection in order to use it in understanding transmission-line propagation and matching techniques. How we use it will be explained in a later section.

An open-circuit (infinite impedance), a short-circuit (zero impedance), or a pure-reactance load on a transmission line is incapable of absorbing *any* power from an incident wave and will therefore cause total reflection of both voltage and current incident waves. The reflection coefficient magnitude, ρ, at such a load is therefore unity (1.0) for both voltage and current. The step-by-step process by which the reflections arise on low-loss lines, both coaxial and open wire, is as follows. The incident electromagnetic wave sees the characteristic impedance, Z_c, of the line as a resistive load as it leaves the generator in its forward travel down the line. Half of the energy is stored in the magnetic field, because of incident current, and the other half is stored in the electric field, because of incident voltage. The voltage and current travel in phase with each other because of the resistive Z_c. On reaching an open circuit the magnetic field collapses, because the current goes to zero. The changing magnetic field produces an electric field equal in energy to the original magnetic field. The new electric field adds *in phase* to the existing electric field, resulting in a corresponding increase of voltage at the open circuit to twice the incident-wave voltage. (At this instant a standing wave is developing, because now there is a current minimum and voltage maximum at the open-circuit terminals, where an instant before, current and voltage were constant all along the line.) The increased voltage now starts the reflected voltage wave traveling in the opposite direction, as if it had been launched by a separate generator at the open-circuit point.[11] Since no energy was absorbed by the open-circuit load, the returning wave will be of the same magnitude as the original incident wave. As the electric field starts its rearward journey it sets up a new magnetic field in opposite phase to the original, and once more the energy will divide equally between the two fields. The new magnetic field causes the current to build up again to the same magnitude as before, *but in the opposite polarity*, to be relaunched into the line as the reflected current wave *(refs. 17, p. 139; 19, p. 4; 35, p. 21; 43)*.† The total voltage (or

* Engineer, Chief of Space Center Antenna Laboratory and Test Range, Astro-Electronics Division, RCA Corporation, Princeton, N.J. Mail address: Box 215, Dayton, NJ 08810.

[9] [EDITOR'S NOTE: Here the author is not referring to the *standing wave* ratio which might be measured with an ordinary SWR indicator. Instead he is referring to *traveling* waves. The difference is discussed again in later text.]

[10] Reference ASA Y10.9, 1953 (American Standards Association). Prior to the adoption of this standard, either Γ or k was frequently used to indicate the reflection coefficient, while ρ was often used for standing-wave ratio. In studying the literature, the reader should exercise care to avoid confusing symbols used before and after adoption of the standard.

[11] Remember that motor-generator action results from mutual motion between a field and a conductor. Here the field is changing even though the conductor is not moving, as in a transformer.

† This and all subsequent references in italics refer to the bibliography which appeared at the end of Part I of this series. Also see supplemental listings at the end of this part.

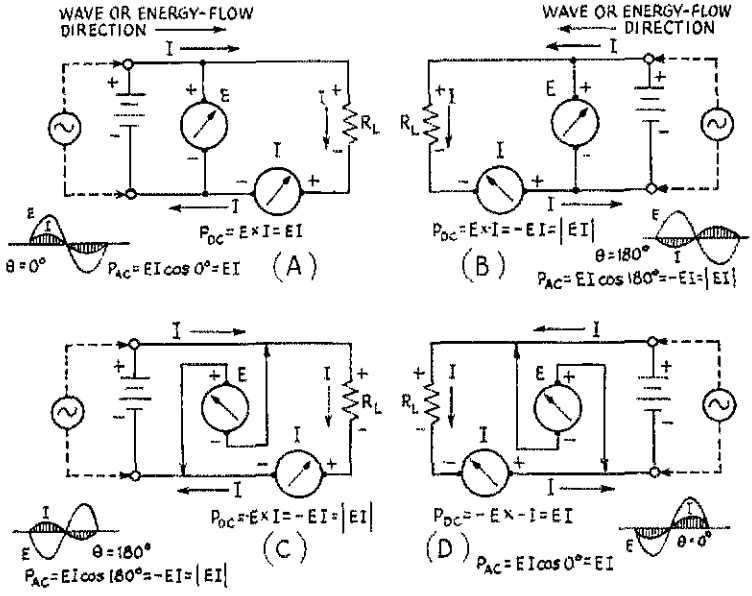


Fig. 3 — Illustrating relationships between current and various combinations of voltage reference and energy-flow direction.

current) at the load at any instant is the sum of the voltages (or currents) of the incident and reflected waves. Since the two current waves add to zero at the open-circuit load, the generation of the reversed-polarity reflected-current wave is verified. The in-phase reflected voltage wave is similarly verified because the sum of the two voltages at the load is double the incident voltage. The phase angles, θ, of the reflection coefficients at the open-circuit load are therefore 0 degrees for voltage and 180 degrees for current.

When the load impedance is a short circuit the reflection-generation process is similar to the open-circuit case, except that the electric- and magnetic-field actions and the polarities of the reflected-wave components are reversed. This is expected when we recall that while current goes to zero in an open circuit, voltage must be zero in a short circuit. For the voltage to be zero the incident and reflected voltage waves must cancel one another at the load, thus verifying the reversed polarity of the reflected wave. The corresponding currents add to double the incident value, as the voltages did when the load was an open circuit. The phase angles, θ, of the reflection coefficients at the short-circuit load are therefore 180 degrees for voltage and 0 degrees for current. When the load impedance is a pure capacitance it is equivalent to an additional length of open-circuit line, while a purely inductive load is equivalent to an additional length of short-circuited line.

When the load impedance contains resistance the reflection will be generated in the same manner as with an open- or short-circuit load, but it will be less than total, the amount depending on how much power is absorbed in the resistance. The reflected wave is again generated by the changing electric and magnetic fields at the mismatch point, caused by the change in voltage and current when the incident wave encounters a change in load conditions. Hence the reflection coefficient, ρ, is dependent on the difference between incident-wave voltage on the line and the voltage measured across the load.

No reflection arises when the load is a pure resistance equal to the line Zc, because all the incident energy is absorbed and there is no voltage or current variation when going from the line to the load. Thus there is no electric and magnetic field change, no new voltage or current generated, hence no reflected wave.

As the reflected wave propagates back up the line as a separate and distinct electromagnetic traveling wave, it encounters only the same low-loss line with resistive Zc[12] encountered by the incident wave in its forward travel to the load. Hence, the magnitudes of both the reflected voltage and current remain constant as the wave plows rearward, having the same values as when leaving the reflection generator. (There is a *gradual* diminishing effect because of attenuation; this will be discussed later.) They are completely unaffected by the standing waves being developed as the reflected and incident waves slide past one another. The incident voltage and current waves are similarly unaffected, continuing in their forward travel with constant magnitude until reaching the load.[13] Also, as in the incident wave, both the reflected voltage and current pass through zero simultaneously, and reach their maximum values one-quarter cycle later, because the line Zc is resistive. Are not the reflected voltage and current then also in phase with each other, like the incident voltage and current? Perhaps, but let's not

[12] The characteristic impedance, Zc of lossless line has *zero* reactance, and low-loss line has so little reactance that it is neglected.

[13] Incident voltage and current should not be confused with line voltage and current, because they are not the same except when the line is perfectly matched and no reflections exist.

overlook polarity -- the voltage maximum *could* be positive when the current maximum is negative, in which case they would be 180 degrees out of phase with each other. But does the phase really matter here? Indeed it does -- there is probably no other relationship more important to the principles of wave mechanics on a transmission line! Even though the incident and reflected waves travel separately in opposite directions, they are inescapably related to each other through the common line and load characteristics, and their respective voltages and currents add *vectorially* at every point along the line as the two waves slide past each other. Hence the polarity, or phase relationship between the voltage and current in both sets of waves determines the character of the resultant standing waves, line-input impedance, and any other effect resulting from the vector combination. Many aspects of transmission-line phenomena which seem difficult to follow can be resolved rather easily if we understand how the phase, or polarity relationships evolve. So how do we determine the polarity and how do we establish a reference?

Wave-Travel Analysis

Consider a single wave traveling on a two-conductor line. By following conventional current flow we can select the appropriate conductor as the voltage-polarity reference for a given direction of wave travel which will cause the voltage and current maxima to occur with the same polarity. This polarity relationship may be reversed simply, either by selecting the opposite conductor for the voltage reference or by reversing the direction of wave travel. Obtaining the opposite polarity or phase relationship by reversing the conductors is a simple enough concept, but obtaining it by reversing the wave-travel direction has been a point of confusion for many people.

To reduce the confusion factor, a set of simple current-flow diagrams showing both ac and dc treatment is presented in Fig. 3. Use of dc with center-zero meters as indicators makes the explanation of polarity easy. Conventional needle movement is to the left for negative polarity and to the right for positive. Once polarity is clear the battery may be replaced with the ac generator, and phase will also become clear using the wave forms as indicators. The setups in A and B of Fig. 3 are the same as in C and D, respectively, except that the voltmeter terminals have been reversed. Observe that the wave or energy-flow direction and voltage-polarity reference selected in A cause line voltage and current flow to be in the same polarity. Now notice that reversing either the wave direction (as in B) or the voltage reference (as in C) both result in *opposite* voltage and current polarities as stated previously. Observe also that reversing both direction and voltmeter reference polarity (as in D) again results in line voltage and current flow with the same relative polarity, though reversed from A. It may be helpful at this point to perceive that changing the wave or energy-flow direction is simply equivalent to reversing the terminal connections of the current meter, because the source changes sides. This is the key to understanding the polarity-reversal problem, because for a given voltage-polarity reference the current-flow direction has to reverse when the wave-flow direction reverses.

On the basis of the conditions stated above, if a generator is now placed at each end of a single two-conductor line, a reference selected to make the voltage and current in phase on the line for one generator will result in 180-degree out-of-phase voltage and current for the other generator. This is the situation which exists with the mismatched rf transmission line -- a source generator at one end and the reflection generator at the other. By selecting the conventional reference to make incident voltage and current in phase with each other (or $\theta = 0°$) it follows that reflected voltage and current must be 180 degrees out of phase with each other (ref. 35, p. 23).

It is of interest at this point to be concerned with the nature of the power in the incident and reflected waves. Some writers contend erroneously that the voltage-current phase relationship in the reflected wave is 90 degrees. If this was true, then the wave would contain only reactive volt-amperes, but no real power. The evidence above disproves this contention since we have seen that the voltage-current relationship in the reflected wave is 180 degrees and not 90. And certainly we will agree that if real power is conveyed in A of Fig. 3, it is also real power in B, or C, even with reversed current-meter or voltmeter terminals. We will agree also that real power, P, equals $EI \cos \theta$, in which cosine θ is the power factor. It matters not whether the phase angle is 0 or 180 degrees, for $\cos 0° = 1$ and $\cos 180° = -1$. This simply connotes the polarity difference discussed above. When conductor spacing is restricted to the near field, the fundamental principles governing transmission-line propagation are the same as those which govern all general ac-circuit relations, including electric power transmission. From these principles we know that real power flows for every value of θ in all four quadrants, except at 90 and 270 degrees where the cosine is zero, yielding zero power factor. Wherever the phase is other than 0, 90, 180, or 270 degrees, both real power and reactive volt-amperes are present. But at 0 or 180 degrees, *only* real power exists because the absolute value of power factor is 1.0 in either case. This clearly proves that reflected power and incident power are both *real* power, and that no fictitious power, or reactive volt-amperes, exists in either one, because the current and voltage in the reflected wave are always mutually 180 degrees out of phase and the voltage and current in the incident wave are always mutually in phase.

The conflict concerning real vs. reactive power in reflected waves arises in part from confusion between traveling and standing waves, because of insufficient familiarity with both types. To broaden the familiarity, we have logically concentrated first on the *traveling* incident and reflected waves, because, from the physical viewpoint, standing waves are derived from the re-

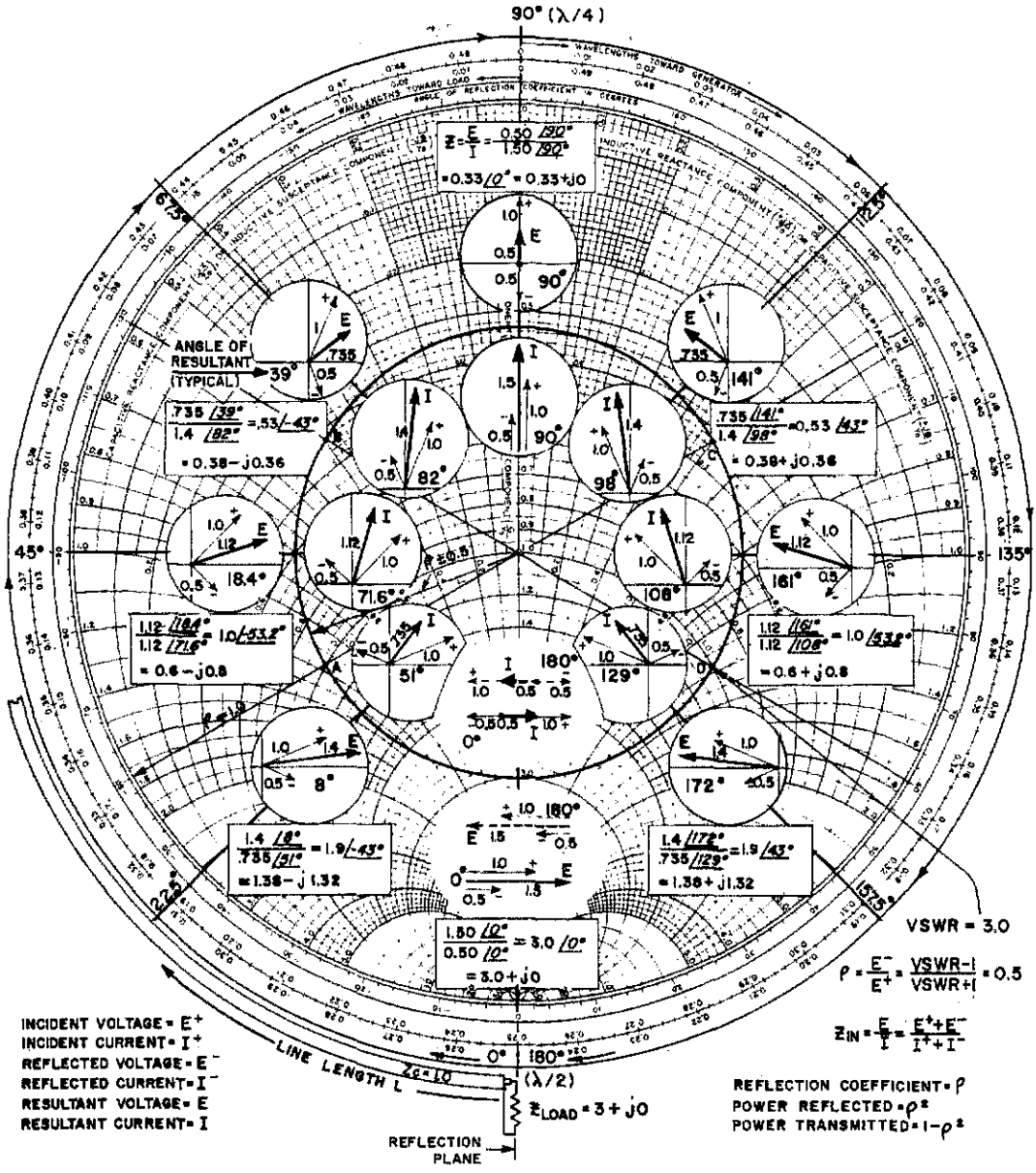


Fig. 4 — The W2DU Reflection Mechanics Vector Graph.

sultant interaction between the two traveling waves. And thus, sufficient pertinent knowledge concerning traveling waves is essential before one can correctly understand the formation of standing waves and other correlated phenomena occurring on the transmission line which will become apparent as we proceed.

Now that we have a reasonably enlightened background concerning the ingredients of standing waves, let us explore the details of their development, after which it will be appropriate to return to the power conflict for a few brief comments to clear away any remaining confusion.

Vector Graph Explanation and Standing-Wave Development

The newly launched reflected voltage and current waves, in their rearward travel toward the generator, combine with their respective incident waves at every point on the line. The continuously changing relative phase differences along the line cause alternate cancellation and reinforcement of the voltage and current distribution on the line. This results in the formation of the well-known standing wave and a change in the input terminal impedance from the initial line Zc value.

A physical picture of this complex relationship greatly enhances the understanding of the phenomenon. Accordingly, Fig. 4 graphically illustrates the progressive phase relations with accurately scaled vector plots of the incident and reflected waves for visual comparison at every 22.5-degree (sixteenth-wavelength) point on the line. The reference is from the termination point back toward the generator. These vector plots, being superimposed circularly around the Smith chart, present certain symmetrical phase-angle relationships with respect to line length which are not obvious with previous displays.[14] *(Refs. 2, p. 72; 17, p 146; 18, p. 110.)* This visual aid, in addition to providing a new dimension in presenting the formation of the standing wave, vividly emphasizes the development of capacitive and inductive components of complex impedance, the understanding of quarter-wave impedance inverting action, the impedance-repeating phase-inverting action of the half-wave line, and the reciprocal relationship between impedance and admittance.

For this illustration we have terminated the line with a pure resistance equal to three times the line impedance Zc. Hence, a circle representing an SWR of 3.0 is shown. Line length, L, measured from 0° at the termination point (or reflection plane) toward the generator, is represented by clockwise rotation around the chart.

Current vectors are displayed inside the SWR circle, marked "+" for incident current (magnitude 1.0), "−" for reflected current (magnitude 0.5), and I for the resultant current. Directly opposite and outside the circle are the corresponding voltage E vectors. The number in degrees shown with each vector set indicates the angle of the resultant. The vector lengths are proportional to the amplitudes of their respective voltage and current waves. By setting the incident-vector length equal to 1.0 the reflected vector length, by definition, equals the magnitude of the reflection coefficient, ρ. The reflected-vector lengths are thus 0.5 because ρ = 0.5 for an SWR of 3.0, from the relationship

$$\rho = \frac{\text{SWR} - 1}{\text{SWR} + 1} \qquad \text{(Eq. 2)}$$

While the vector lengths are proportional to each other, the lengths are not scaled to any chart dimension. These vector plots at each angular position on the graph contain the necessary amplitude and phase information to define both the standing wave and the impedance at the point on the transmission line represented by the point where the SWR circle intersects the radial line at each L = 22.5° interval.

The SWR = 3.0 (or ρ = 0.5) circle is based on the chart scales, and may be observed to have a radius of one half the chart radius. The perimeter of the chart has a radius of 1.0, representing total reflection, i.e., an infinite SWR. The ρ-circle radius is thus directly proportional to the reflection coefficient ρ, so an SWR or ρ circle may be constructed for any value of reflection by making the radius equal to the reflection value, ρ.

In order to make valid phase comparisons between points on the line, wave motion has been frozen at an arbitrary point in time, so that all vectors are shown in their true positions, *relative to each other.* It makes no difference when the motion is stopped, but the symmetry of the presentation is enhanced if we stop the motion when the incident vectors at the reflection plane are pointing in the zero direction in the standard polar coordinate system.

Observe that at any point on the line the incident voltage and current are always in phase, while in contrast, the reflected voltage and current are always 180 degrees out of phase, thus illustrating the conclusion of the discussion on this point in the previous section on basic reflection mechanics. At the reflection plane (L = 0°) it may be seen that all components are in phase except the reflected current, which is 180 degrees from the others. This is as it should be when the terminal impedance lies between Zc and an open circuit.

As we travel clockwise from the reflection plane toward the generator, each incident and each reflected vector rotates the same number of degrees as the change in position along the line. But observe carefully, for this is very important: The incident-wave (+) vectors rotate counterclockwise (phase leading), while the reflected-wave (−) vectors rotate clockwise (phase lagging). For example, at 45 degrees from the termination the incident voltage vector is at +45 degrees, while the reflected voltage vector is at −45 degrees, for a total phase difference of 90 degrees. Thus, for every degree of motion along the line the relative phase angle between the incident and reflected voltage changes two degrees.[15] This can be readily understood when we consider that in the distance from the reflection plane to our observation point the reflected wave has traveled twice as far as the incident. From the observation point the incident wave travels only to the reflection plane, while the portion of the incident that is reflected travels an equal additional distance in returning to the observation point.

Now let's see what happens at L = 90°, or $\lambda/4$ of travel from the load. At the load, where L = 0°, the incident and reflected voltages are exactly in phase with each other, giving the reinforcement

[14] Smith charts may be obtained at most university book stores. They may be ordered (50 for $2.50, postpaid when remittance is enclosed) from Phillip H. Smith, Analog Instruments Co., P. O. Box 808, New Providence, NJ 07974. For 8-1/2 × 11-inch paper charts with normalized coordinates, request Form 82-BSPR. A brochure of Smith charts and accessories will be sent upon request. Smith charts with 50-ohm coordinates (Form 5301-7569) are available at the same price from General Radio Co., West Concord, MA 01781. Readers who are unfamiliar with the Smith chart are encouraged to consult the bibliography of Part I for references; they will find the chart a valuable tool. *(See refs. 19, 25, 26, 27, 28, 29.)*

[15] The relative phase angle between the incident and reflected voltage waves is the *angle* of the reflection coefficient, referenced on the incident. See the "Angle of Reflection Coefficient" scale around the perimeter of the impedance-plotting portion of the Smith chart.

mentioned earlier (resultant = 1.5). But at 90 degrees toward the generator the two voltage vectors have each rotated 90 degrees in opposite directions and are now 180 degrees out of phase and opposing (resultant = 0.5). Going on to L = 180°, or $\lambda/2$ from the load, we see that each voltage vector has now rotated 180 degrees, but in opposite directions of rotation. Hence the vectors have rotated 360 degrees relatively, and once again are exactly in phase with each other and reinforcing.[16]

At the points between L = 0° and L = 90°, the resultant voltage vector, E, is seen to diminish gradually from the maximum of 1.5 to a minimum of 0.5 and then increase back to the 1.5 maximum at L = 180°. In Fig. 5 these resultant magnitude values at each point have been plotted on the more familiar rectangular coordinate graph. The smooth curves connecting the plotted values indeed yield the familiar standing-wave pattern. The curves verify the relationship

$$SWR = \frac{1+\rho}{1-\rho} = 3.0 \qquad \text{(Eq. 3)}$$

by first adding to and then subtracting ρ = 0.5 from the incident voltage 1.0.

Line lengths greater than a half wave are accommodated merely by continuing on around the circle again (Fig. 4), repeating the same values encountered 180 degrees earlier, thus establishing the periodicity of the standing wave. Only lossless line is being considered here; correction factors for attenuation, which change the circle into a spiral, will be presented later. The basis for the phase- or polarity-reversing characteristic of the 180-degree or $\lambda/2$, line may be observed on the vector graph by noting that the specific phase of the voltage vectors at the 180-degree point on the line is 180 degrees from their phase orientation at the reflection plane (L = 0°).

The significance of the *constant* 180-degree phase difference between the reflected voltage and current will emerge if we now compare the phase and magnitude of the current vectors with the voltage vectors previously studied. We see that at the reflection plane (L = 0°), where the incident and reflected voltage waves are in phase and adding to create a voltage maximum, the corresponding currents are out of phase and opposing to create a current minimum. And at L = 90°, where the voltage waves are out of phase and opposing for a minimum, the currents are in phase for a maximum. This graphically illustrates why the maxima and minima of the *voltage standing wave are* ALWAYS *separated by 90 degrees from the corresponding maxima and minima of the current standing wave.* This phenomenon is caused directly by the 180-degree phase difference between the reflected voltage and current, as strikingly shown by the vector display.

A visual comparison of the angular positions and magnitudes of both the voltage- and current-vector resultants on the vector graph (Fig. 4) may

[16] On the chart the dashed lines show the vectors after 180 degrees of travel on the line.

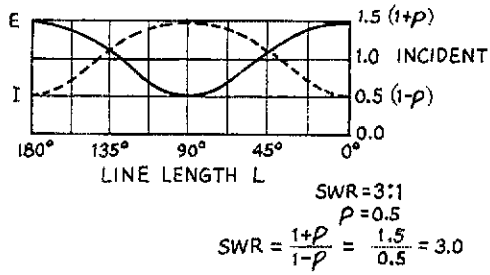


Fig. 5 — Illustrating how the voltage and current standing waves relate to the magnitude of the reflection coefficient, ρ.

be made with the corresponding positions along the plot of Fig. 5. This comparison will enhance the understanding of this important concept. It is important because as we proceed it will be seen to be the basis for the impedance-transforming properties of the transmission line, including the quarter- and half-wave sections, which are only two specific conditions of the general case.

As we discuss the concept of impedance in the next section and solve matching problems later on, conjuring up a mental image of the action occurring on the line will at times be more helpful in understanding the difficult points than through logical reasoning alone. It is especially important to have a clear image of the formation of the reflected wave, because the reflected wave must be considered as a separate traveling wave identical to the incident wave, except for the direction and, usually, the magnitude. This point is important, because it helps us keep in mind that the *reflected* voltage and current waves travel the line 180 degrees out of phase with each other, and thus transfer actual, real power during their travel. It is essential to the process of reinforcement and cancellation of voltage and current along the line in the formation of the standing wave that real power be conveyed in the reflected wave, as if it had been developed by many tiny little generators at every point all along the line. It will also become clear in the section to follow why the impedance along a line changes in the presence of reflections only because real power is flowing in *both* directions *(refs. 2, p. 70; 35, p. 24; 42).*

We are stressing this point because, as mentioned previously, some writers have presented the erroneous viewpoint that the reflected wave conveys no real power, with the argument that the reflected voltage and current are 90 degrees out of phase with each other and are therefore wattless. The reflected wave would indeed convey zero power if its voltage and current *were* 90 degrees out of phase, but the argument is incorrect because they actually travel 180 degrees out of phase, as we have previously shown. At least two writers, W9IK[17] and W5GO,[18] would have us believe

[17] Woods, "Power in Reflected Waves," *Ham Radio*, October, 1971, and Woods' correspondence on same, *Ham Radio*, December, 1972, p. 76.

[18] DeLaMatyr, "Reflections on 'Reflected Power,'" Technical Correspondence, *QST* for November, 1972, p. 46.

otherwise. It is easy to reach the wrong conclusion, however, because of the lack of a clear image of the reflection process and the somewhat complicated wave mechanics on the line. It may be that W9IK has confused the *reflected* wave with the standing wave, while both writers may have confused *reflected* voltage E^{-} and current I^{-} with *line* voltage E and current I.[19] The true nature of the reflected wave as a separate electromagnetic *traveling* wave must be appreciated. It is interesting to note that W9IK states, ". . . re-reflection of power at the input end (of the line) is impossible to accept since the necessary conditions of impedance mismatch are not present," and yet his Fig. 2 shows a means for obtaining a (conjugate) match. This is also true in his Fig. 1, since he implies that his final amplifier is loaded and tuned properly. Now the very essence of the conjugate match is its totally reflecting mismatch for waves traveling toward the generator, while presenting a perfect match for waves traveling toward the load. Yet misunderstanding of this important basic concept is widespread among the amateurs. This concept is basic to the operation of passive frequency-selective filters, and the mechanism for developing the conjugate match simply constitutes a filter of this type. The mechanism behind its operation involves wave interference and reflections, which will be described in detail shortly, again using the vector graph as a visual aid.

It is understandable that the 90-degree difference of position on the line which exists between the voltage and current maxima (or minima) of the *standing* waves (described a few paragraphs earlier and shown in Fig. 5) could have been mistaken as the phase difference between the *reflected* voltage and current. And the similarity between *line* voltage and current behavior with the voltage-current relationship in ordinary ac circuitry also makes it easy to understand why *line* voltage E and current I are being confused with the *reflected* voltage E^{-} and current I^{-}. This is because, in addition to the in-phase line voltage and current components, which convey only the *net* power flow, *line* voltage and current do contain reactive components which are 90 degrees out of phase with each other when reflections are present. Obviously, these reactive components convey no real power. Unfortunately, some people who are well versed in ac circuitry using lumped constants, but who are less familiar with transmission-line operation, sometimes make the error of assuming that the two circuit types are identical in electrical performance, and so we should be wary of making unwarranted comparisons which can bring about disastrous consequences of the type we are attempting to straighten out here.

Another specious argument set forth is that reflected power cannot be real power because it cannot perform work. We will prove this argument erroneous by showing how power in the reflected wave can do work. Now a simple rf voltmeter and ammeter in the line will indicate only the *resultant* voltage and current of the *combined* incident and reflected waves (E and I on the vector graph), the product of which, when weighted by the cosine of the phase angle between them, yields only the resultant, or *net power* flowing toward the load. But there are many devices in common every-day use which selectively extract either the reflected or the incident wave (or both) from the line separately (independently of the standing wave), and thus permits separate measurement and analysis of the power associated with the waves traveling in either direction. One such device is the directional coupler. Another is the circulator. This is a three-port directional device in which the reflected wave from a mismatched load on the second port is completely diverted away from the input feed line and emerges from the third port. The reflected wave cannot get back onto the feed line to interact with the incident wave to develop a standing wave, and thus does not change the line-input impedance at the source feeding port one. However, current flow through a resistor placed on the reflected-power-output port (port three) develops heat (I^2R) equal to the amount of the power reflected from the mismatch at port two. A four-port hybrid coupler can be connected to perform in the same manner as the circulator. Directional rf devices most familiar to amateurs are the simple reflectometer SWR indicator and the directional wattmeter *(refs. 18, p. 180; 38; 40; 42)*. The meter in either one is actuated by rf *power* – absorbed from one of the traveling waves on the line – either the forward or reflected, as selected. If the reflected wave were wattless reactive power, no power would be available to actuate the meter movement in the SWR indicator, or to produce heat from the current flow in the resistor on the third port of the circulator. Furthermore, for power to become wattless on being reflected would violate the most general and fundamental of all physical laws, namely the law of conservation of energy *(ref. 35, p. 25)*. On the basis of this law, if all of the energy flowing in the line toward the load cannot be absorbed in or dissipated by the load, that portion which is not absorbed must appear somewhere. It cannot just disappear or cease to exist as if by magic. The reflected power recovered as heat in the circulator is a typical proof of this fact.

Here is another way of expressing net power flow through the line, which enables us to break power down into its incident and reflected *power* components. The expression is obtained from the power formulas, e.g.,

$$P = EI \qquad \text{(Eq. 4)}$$

or

$$P = \frac{E^2}{Z} \qquad \text{(Eq. 5)}.$$

[19] **Line voltage, E, and line current, I, are the resultants of the forward and reflected E (+ and −) and I (+ and −) components (Fig. 4). Line E and I, respectively, are measurable with a simple rf voltmeter across the line and an ammeter in series with the line. Both quantities may be seen to vary along the line with the reflections (Fig. 5), and are generally reactive except for the two specific cases where they are in phase.**

On rf lines, *power* = $P = E_{max} \times I_{min}$ (Eq. 6)

or

$$P = \frac{E_{max} \times E_{min}}{Z_c} \quad \text{(Eq. 7)}$$

Now E_{max} (produced by $E^+ + E^-$)occurs as shown in Fig. 4, where the incident and reflected voltages are in phase at $L = 0$ and 180°, and E_{min} (produced by $E^+ - E^-$) occurs where they are 180 degrees out of phase at $L = 90°$. Later we shall see that both the *resultant* voltage E and current I are *nonreactive* at these points on the line, while being reactive everywhere else along the line between these points. Because these points are nonreactive, the products of their voltages divided by the line impedance, Z_c,yields the net power flow, exactly. But recalling that E^+ and E^- are always *nonreactive*, we can replace the term E_{max} by $E^+ + E^-$ and E_{min} by $E^+ - E^-$, and thus:

$$P = \frac{E_{max} \times E_{min}}{Z_c}$$

$$= \frac{(|E^+| + |E^-|) \times (|E^+| - |E^-|)}{Z_c} \quad \text{(Eq. 8)}$$

Multiplying out the numerator terms gives the desired incident and reflected components:

$$P = \frac{|E^+|^2}{Z_c} - \frac{|E^-|^2}{Z_c} = \text{net power flow} \quad \text{(Eq. 9)}$$

The first term on the right of the P expresses the power associated with the incident wave and the second term the reflected power. This simple separation of power into two separate components, each associated with one of the traveling waves, can be done on a lossless or low-loss line, where the Zc is resistive. If the line has appreciable loss the interaction of the two waves gives rise to a third component of power which we can disregard, as lines normally used by amateurs are usually in the low-loss category. *(See refs. 18, p. 150, and 37, p. 129.)*

This separability of the forward and reflected powers forms the physical basis for the operation of reflectometers and directional wattmeters, *(ref. 38)* in which either the forward or reflected component is sensed by taking advantage of the 180-degree out-of-phase relationship of the reflected components of voltage and current, while the forward voltage and current components are in phase with each other. In these operations a sample of the *voltage across the line* is added to a sample of a voltage derived from the *current in the line*. When the amplitudes of the samples are adjusted to the correct relationship (determined by line impedance Z_c), the two reflected components cancel, so that the sum represents the forward component alone. By reversing the phase of the current sample 180 degrees, the forward components cancel and the resulting sum represents the reflected components alone. A meter connected to indicate these voltage sums can now be calibrated in *power*, because the square of the voltage is proportional to power. Thus, the beautiful aspect of the directional wattmeter is that, when properly calibrated, it indicates the *true* power in the transmission line with the line terminated in *any* load impedance; the load can be either a match or a mismatch, and it can be reactive or nonreactive. The meter does this because the forward power value is always equal to the sum of the line-input power plus the reflected power; thus it indicates the true power which is actually incident on the load. In the reflected-power position the meter indicates the amount of the incident power which was not absorbed by the load, but which adds to the line-input power from the transmitter at the line input, or at whatever point in the line the conjugate match is performed. *(Ref. 18, p. 191.)* The difference between the forward and reflected readings, is, thus, the *net* power flow in the line at whatever point the wattmeter is inserted. In a lossless line the net power flow indicates the line-input power, which is the absorbed power exactly; the two are identical *anywhere on the line*. In a line with attenuation the meter indicates the line-input power if it is placed at the line input, or it reads the absorbed power if it is placed immediately ahead of the load. The difference between these readings is related to the line attenuation. Of course there may be, for practical reasons, errors in the actual results from SWR measurements – diode nonlinearity at various power levels, for one example *(ref. 40)*.

Except for a somewhat different viewpoint concerning the nature of reflected power, the work of W6EL, formerly K6CYG, closely parallels the basic theme of this series of articles and reaches the same conclusions *(ref. 44)*. Reference to Shallon's work was omitted from Part I of this series because of author error, but his work deserves thorough review at this point.

A detailed explanation of why the points mentioned above take place and of the wave mechanics of conjugate matching will appear in Part IV of this series, in a subsequent issue of *QST*.

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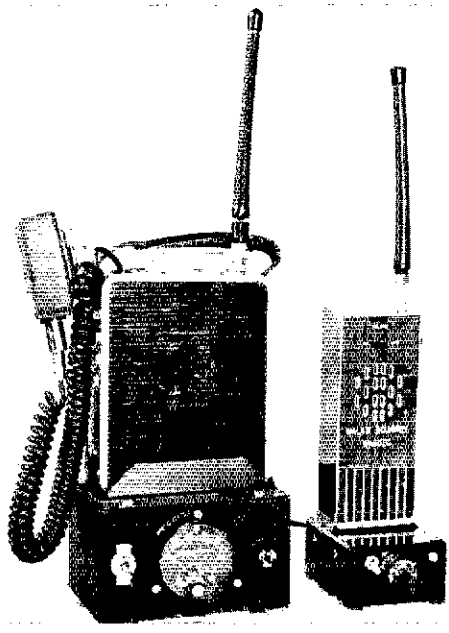
44) Shallon, "The Monimatch and S.W.R.," *QST* for August, 1964, p. 54. QST

ARE YOU LICENSED?

- When joining the League or renewing your membership, it is important that you show whether you have an amateur operator license. Please state your call and/or the class of operator license held, that we may verify your classification.

Charging Nickel-Cadmium Walkie-Talkie Batteries



Two homemade walkie-talkies on top of their respective chargers. The batteries are left on charge continuously.

BY ROBERT D. SHRINER,* WAØUZO

ANY ADVANTAGE that a Nicad (nickel-cadmium) battery may have over other types can be lost through improper charging. Nicads can even be ruined on the *first* recharging cycle. If connected to a constant-voltage source, initial current may be quite high. Normally, no damage would result unless the battery voltage is low (fully discharged). Using a constant current for battery charging is permissible at the start of the charging cycle, however, as the battery reaches full charge, the voltage may rise to an excessive value.

The correct solution is a combination of the two methods. Any circuit used for charging Nicads should limit both the current and voltage, such as the one described here.

Some other precautions which should be observed while charging Nicads are:

1) Battery temperature should be between 40° and 80° F. It should never exceed 100° F.

2) Two or more batteries with the same voltage rating may be charged in parallel, but be sure that the charger has sufficient current capability.

3) Check the manufacturer's data sheet for the maximum allowable charging rate. A typical figure would be ten percent of the ampere-hour rating (a 10-ampere-hour battery would require a current of 1 A).

4) Do not attempt to charge two batteries in series with a constant current unless the batteries are of the same type and capacity, and are in the

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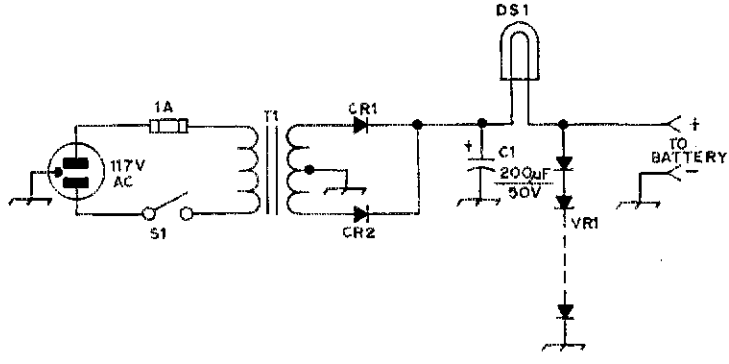


Fig. 1 – Schematic diagram of the 117-V ac charger.
C1 – Electrolytic.
CR1, CR2 – Silicon diodes, 100 PRV, 3 A.
DS1 – See text.
T1 – Primary 117 V ac, secondary 25.6 V at 500 mA. Calectro D1-752 (or equiv.).
VR1 – See text.

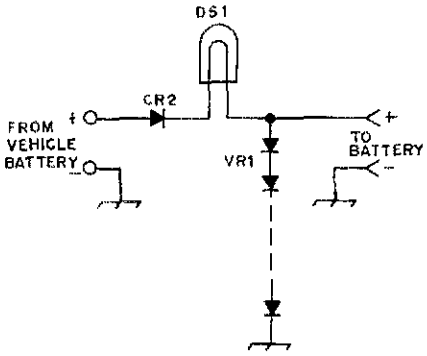
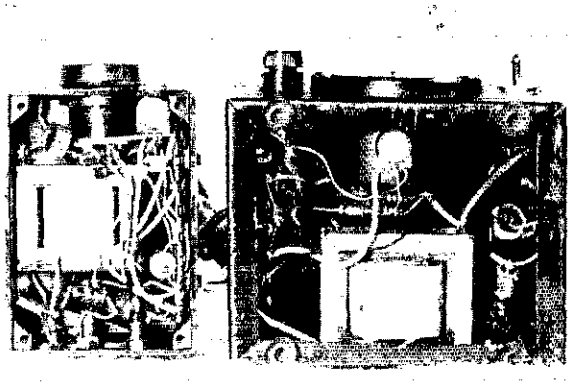


Fig. 2 — Schematic diagram of Nicad battery charger suitable for mobile use. See text for explanation of DS1 and VR1. CR2 protects the components in the event of accidental reversal of input leads. See Fig. 1 for CR2.



Bottom view of Nicad battery chargers.

same state of charge (voltage on one may be excessive).

5) To determine the approximate charging time, divide the ampere-hour rating by the charging current used, and multiply the resulting time by 1.25.

Suitable Charging Circuits

Figs. 1 and 2 show two versions of the same basic charging circuit. The circuit shown in Fig. 1 is used with 117 V ac, and the one in Fig. 2 can be used with the car battery. The latter circuit could be connected to the cigarette lighter, and is suitable for battery packs of up to 14 volts.

The dial lamp (DS1) is used to limit the current. One with a rating of 100 to 150 mA should work fine with most batteries. The voltage rating should be approximately that of the charging source (for example, two 12-V bulbs in series may be necessary if a 26-V supply is used).

The voltage-regulator shown in Fig. 3 is based on the fact that a forward-biased diode will not conduct until approximately 0.75 V dc is applied. By adding a suitable number of diodes in series as shown, a voltage regulator for the maximum battery voltage can be built easily. The circuit shown in Fig. 3 can be used in either Fig. 1 or 2, for VR1. It will draw little current until the battery voltage reaches a permissible value during charge. Once the voltage reaches a preset level, the

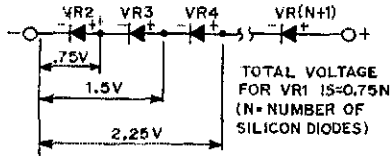


Fig. 3 — Schematic diagram of the voltage regulator (VR1, Figs. 1 and 2).

diodes start to conduct and limit any further increases.

Initial Testing

After the circuit is wired and checked, apply power (without a battery connected for charging). The bulb should light to less than full brilliance. Measure the voltage across the regulator. It should be 3 to 8 percent above the rated voltage of the batteries to be charged. Adding and removing some diodes in VR1 may be necessary. Connect the discharged batteries and measure the charging current (either a built-in meter could be used as shown in the photograph, or a temporary one could be connected in series with the battery). The current should be typically 100 mA with partially discharged batteries. The current will decrease as the charging time increases, and a value of 5 mA indicates a fully charged condition. No damage will result if the batteries are left on charge continuously. QST

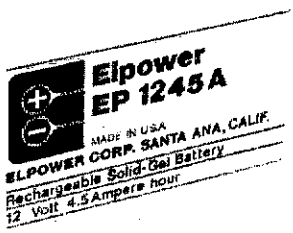
Micromountaineer

(Continued from page 13)

considered by the QRP/portable buff. These would include an outboard VFO for home-station work or a dsb phone version utilizing crystals originally intended for the former 40-meter Novice band. Other bands are obviously of interest. The East Coast wilderness traveler (?) might find 80 meters a much better frequency for his use.[4] The author and W7HCV have even considered a similar design concept for 144- and 432-MHz cw rigs for vhf DXing from the lofty heights. QST

[4] [EDITOR'S NOTE: The writer had his tongue in cheek when referring to the "East Coast wilderness." W7ZOI and the editor, W1CER, have long belabored what is and what isn't "wilderness" . . . East Coast versus West Coast.]

• New Apparatus



ELPOWER CORP
EP 1245-A BATTERY

Something new has come to the market by way of compact rechargeable batteries. Most of us are familiar with the expensive NiCad battery, but the amateur can now buy a style of battery that does the same job at much lower cost. Elpower Corp. has a product line that should be of special interest to QRP enthusiasts who must rely from time to time on "canned" dc power for portable or emergency work.

Highlighted here is but one battery from their large line of products, the EP 1245-A solid-gel electrolyte battery. This unit delivers 13 volts at 4.5 ampere-hours and measures 2-1/2 × 6 × 4 inches. There is no opportunity for leakage because the battery is completely encapsulated in durable plastic. As the manufacturer states in the literature, "Our batteries are drier than dry-cell batteries." The polystyrene case is guaranteed not to chip, crack or deteriorate. The battery can be operated in any position.

Elpower's battery is designed to operate in temperature environments from 76°F to +150°F. Nominal ratings apply at a temperature of +68°F. Unlike NiCad batteries, the solid-gel type does not suffer permanent cell reversal if completely discharged. Furthermore, this lead-dioxide battery does not develop a "memory" when charged repeatedly to a specific voltage level, hence does not "forget" its capacity, as can happen with NiCads.

The manufacturer claims that this battery can withstand 100 or more full-charge/full-discharge cycles and up to 1000 cycles if the battery is only partially discharged each time. The battery is protected against internal pressure buildup by means of self-sealing vents which pass only dry gas.

This reviewer put the EP 1245-A through its paces at the home station. The battery was charged to 12.5 volts, then connected to a QRP transceiver. After approximately 10 hours of cw operation, 50 percent of which was spent listening to the other fellow, the battery voltage dropped to 11.5. The transceiver draws 450 mA during transmit, and takes roughly 100 mA from the supply during receive. It is important to mention that despite the drop in voltage the transceiver was still working fine, and the battery could have provided many additional hours of use. In fact, the battery came in mighty handy one evening when Newington had one of its frequent line-power outages: the QRP station was operated for two hours on 40 meters. Illumination was provided by a candle during that period! Two of these batteries will become part of the QRP travel package from this time on. While this writer was operating as 8P6EU from Barbados, W.I., last December, power service was out for an entire afternoon at St. James. It certainly would have been convenient to have had an EP 1245-A to keep the 2-watt, 20-meter station operational!

The price class for the EP 1245-A battery is $16 and it is available from Elpower Corporation, 2117 South Anne Street, Santa Ana, CA 92704. – *WICER*

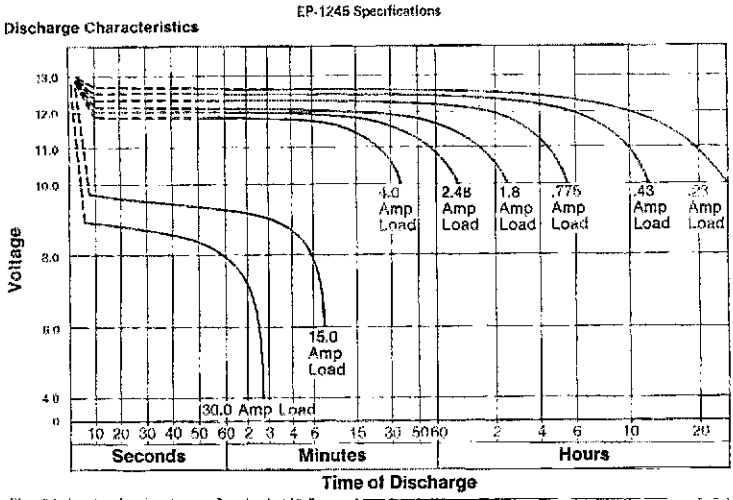


Fig. 1 – Discharge characteristics of the EP 1245-A solid-gel battery.

Technical Correspondence

REFLECTIONS AND TRANSMISSION LINES

Technical Editor, *QST*:

Three cheers for W2DU.[1] The apparent obsession in the past few years on the horrible consequences of high VSWR (why not ISWR?) has probably been brought about by the ready availability of inexpensive SWR indicators. Mine has a scale reading PERCENT REFLECTED POWER. This can scare you to death; the implication is that this "reflected" power has in some mysterious manner disappeared or been stuffed back into the poor old transmitter. This whole subject hasn't been helped by the publication of charts and nomographs showing appalling amounts of "reflected power loss" at moderate SWRs.

These things can be carried to extremes; I have a dummy load which has an SWR of nearly 1:1, but it doesn't radiate worth a hoot! On the other hand I have a set of tuned feeders with an SWR of probably 10:1 or more feeding a dipole, and that dipole radiates like "Gang Busters" – apparently it isn't aware of the horrible SWR.

Harking back a few years, before we were gifted with SWR indicators and tuned up with a pencil or a light bulb and a loop of wire, many of us ran full legal power into a pair of venerable old 852s, thanks to the pioneering work of Charlie Perrine, W6CUH. These things had to operate at 80 percent efficiency at a kilowatt input or there went your school-lunch money for three or four months. If the tuned feed lines we used with those outfits, which must have had an SWR of 10:1 or more, had allowed anything to back up into the amplifier we would have been perpetually hungry. Actually, something like 95 percent of the power that started up the feeders got to the antenna, SWR be hanged. And the guy on the other end never knew the difference!

Admittedly, matters are different at vhf and uhf, when solid-dielectric coax cable is used. Some of that stuff can make an excellent dummy load at those frequencies. One alternative is the heavy-duty 300-ohm open-wire "ladder line." Moral – use common sense in dealing with SWR and its effects. – *Leigh Norton, W6CEM, 570 El Bosque Rd., Santa Barbara, CA 93108.*

[1] Maxwell, "Another Look at Reflections," Parts I and II, *QST* for April and June, 1973.

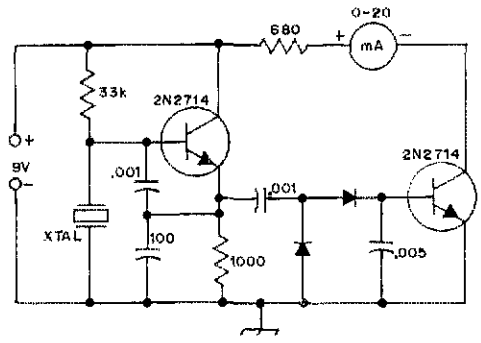
CRYSTAL CHECKER WITH METER AMPLIFIER

Technical Editor, *QST*:

Thanks a million for the FET and MOSFET tester in the May issue – just what I have been needing.[2] I built a crystal checker some time back, similar to yours (same article), but 50-μA meters are a luxury and delicate, so I added another transistor and now can use any meter up to 50 mA. Mine is more of a go/no-go tester. Nice for a portable tester at flea markets. Collecting crystals is a hobby with me.

The circuit is shown in Fig. 1. The second transistor acts merely as an amplifier. My unit will work fine from 4 MHz up. Couldn't get it to work lower, but your idea of the variable feedback capacitors gives me hope to try that sometime in the future to check lower frequency crystals. The complete unit is mounted in a small Bakelite box, using only two crystal sockets. I took a small piece of pc board and cut out a narrow strip through the middle, so by just touching the crystal to the strip, any type of holder configuration can be tested.

In place of the meter, one of the small 50-mA lamps can be used as an indicator, or an LED could even be used. The series resistor can be varied for the type of indicator used. Using the LED or lamp, the entire unit can be mounted in a container smaller than the battery. – *C. E. Harington, W5EQA, 149 Ridge Rd., Little Rock, AR 72207.*



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=1000 000.

Fig. 1 – Crystal checker circuit with meter amplifier. The transistors are npn silicon, 250 mW. Nearly any high-beta general-purpose type will do. The diodes are germanium, such as 1N34A or equivalent.

SSTV CALLING FREQUENCIES

Technical Editor, *QST*:

At the Dayton Hamfest TV session we had a good discussion about SSTV operating frequencies, and something approaching a consensus emerged:

1) The widely publicized slow-scan frequencies should be used primarily as calling, not working frequencies.

2) Slow-scan operations should expand up and down from the calling frequency except on 20 meters, where expansion should be *up* the band only. On 75 meters expansion should be up the band when possible.

3) A new 40-meter calling frequency, 7171 kHz (easy to remember) was chosen to replace 7220 which has an impossibly high QRM level in the evenings from European broadcasters and jammers.

Twenty meters is the biggest problem. The DXers would like the slow-scanners out of the 14200-14250 segment of the band. But 20 is the *most popular SSTV band as well as being the most* popular DX band, and 14230 has received much publicity as an SSTV gathering place. Complete evacuation of 14230 will be a very slow process. There is talk of moving the Saturday SSTV Net up

[2] DeMaw and Greene, "A Pair of Handy Testers," *QST* for May, 1973, p. 24.

the band, and new net operations will be on higher frequencies which should help. SSTVers should check the entire high end of the Advanced band segment for activity, and select operating frequencies above 14240 whenever possible. *Cop Macdonald, WØORX, 516 NW First Ave., Rochester, MN 55901.*

FREQUENCY-DIVIDER ICS

Technical Editor, *QST:*

The method of making a divide-by-*N* circuit used by David Madison in his letter in May 1973 Tech. Correspondence[3] can be simplified by making use of the internal gates of the 7490. In his Fig. 2 he uses 1/4 SN7408 where he could just as easily have connected pin 11 and 12 to pins 2 and 3 respectively. One disadvantage in doing this is that the decoded output is lost. For many applications this is acceptable, because the IC is used as a frequency divider or drives edge-sensitive circuitry. In these cases the output should be taken from the most significant bit that changes state, pin 11 in his example.

This scheme and Madison's will not allow a division by 7 because the internal gate and his SN7408 have only 2 inputs, while a binary 7 (0111) requires 3 input lines. This problem can easily be solved by adding two diodes connected in an AND configuration, shown in Fig. 2. Noise immunity is enhanced by a pull-up resistor connected as shown. Any value between 1000 and about 5000 ohms will do. While the cost of the diodes and resistor is probably about the same as the IC package they replace, the board complexity and power consumption can be considerably reduced.

This technique can be expanded to counters requiring more than one package, as shown in Fig. 3. Simply connect all of the outputs that will be high (1 state) when the desired count is reached, either to the reset pin directly or through a diode AND gate. Reset lines on all the packages should be tied together as shown. Any reset line not used should be tied low (0 state or ground for TTL). At least one reset line must be low for the IC to count, as shown in Fig. 3.

Diodes should be germanium for best noise immunity, although silicon diodes will often work. The low-state input voltage (V_{IL}) is specified as less than 0.8 V. Given a worst case, low state output (V_{OL}) of 0.4 V for a TTL gate and a forward voltage drop (V_f) of 0.6 V for a silicon diode, the total (0.4 + 0.6 = 1.0) is above the specified V_{IL}, but V_{OL} is seldom as high as the worst case. More generally it is around 0.2 V.

I have found that silicon diodes work most of the time, but a germanium diode with its $V_f = 0.3$ V is a better choice. Switching diodes with their fast turn-on and turn-off characteristics are best for this application, but most any type will work as fast or faster than the 7490 can toggle. If there is any question, the output that changes to a 1 (high) last (the least significant 1) can be tied directly to the input of the IC while all others go thru the diode AND gate to the other reset pin. This will give them all time to change state and settle before the final count is reached.

It is worth noting that it is possible to get counts to 16 by using an MC7493 instead of two MC7490s. By using two 7493s, counts to 256 can be generated with two packages instead of three.

[3] Madison, "Versatility with Decade Dividers," Technical Correspondence, *QST* for May, 1973, p. 38.

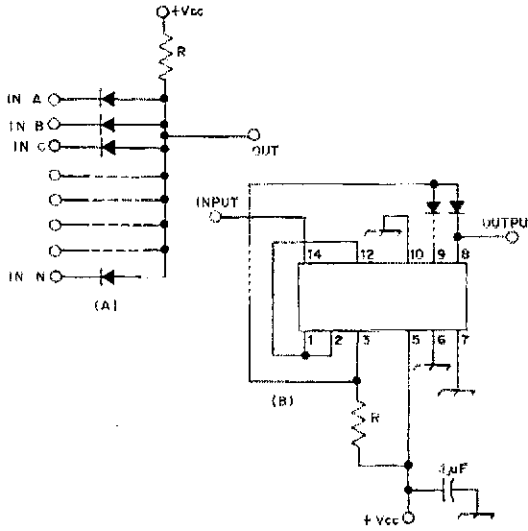


Fig. 2 — At A, the basic circuit of a diode AND gate (positive logic). The output is high when all inputs are high, and low for all other conditions. At B, a divide-by-7 counter using the *reset* method and a diode AND gate. The IC is a decade divider, type 7490. Pin numbers not shown are not connected. See Fig. 2, p. 38 of *QST* for May, 1973, for information on the internal wiring of the IC and identification of the pin connections. R and diodes — See text.

The only change is that the count will be in binary instead of BCD.

Another method that is not as straightforward as the above may be used for simplification in some instances. That is to preset the 7490 to 9 on the count before you want it to reset, and let it reset itself on the next pulse. This can be used effectively on counts like 7, 11, 13, and so on. The procedure is as follows. Since numbers that are represented by three 1s are preceded by numbers represented by two 1s, simply connect those two lines to the R_9 lines and preset the part to 9 on the $N - 1$ count. When the Nth pulse arrives it will

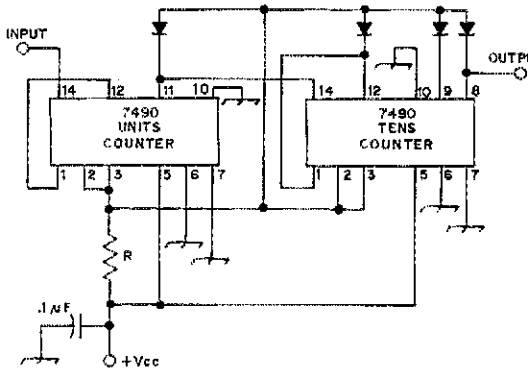


Fig. 3 — A divide-by-78 counter using a diode AND gate and the *reset* method. The ICs are decade dividers, type 7490. R and diodes — See text.

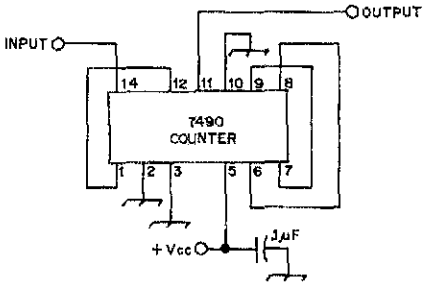


Fig. 4 — Example of the *preset* method of constructing a divide by-*N* counter, where *N* in this case is 7. At the count of 6 (2 + 4) the 2 output (pin 9) and the 4 output (pin 8) preset the IC to 9 (pins 6 and 7). At the count of 7, the IC resets itself to 0, providing one output pulse for each 7 input pulses.

reset the part, thus making it divide by *N*. Fig. 4 shows a divide-by-7 circuit using this method. All of the techniques described above for resetting the IC will work with this method. — *Paul Scott, Option Development Engr., Semiconductor Products Div., Motorola, Inc., Box 20906, Phoenix, AZ 85036.*

ON PROCURING VARIABLE CAPACITORS[4]

Technical Editor, *QST*:

Concerning your recent letter, we are very well aware of the radio amateur's dilemma in reference to procurement of components, and variable capacitors in particular. You can rest assured the amateur will always stay close to our heart.

I think you are aware that we never manufactured variable capacitors but only distributed other American manufacturer's products. About this time last year the variable-capacitor squeeze started. Several manufacturers planned to get out of the business, and the ones who were left began to increase their prices to a level which we could no longer afford.

We immediately proceeded to investigate sources abroad and ran head-on into serious problems, one of which was that their capacitor standard ranges were different than the American capacitors. This is because of the fact that American manufacturers were still working with pre-World War II tooling. The Japanese tooling, for example, is all post-World War II. The expense of new tooling to produce in Japan to the old American standard would be too costly. The other problem was that the Japanese require purchases in large quantities and at the rate we were selling variable capacitors, we would have to buy a minimum 5-year supply.

We decided at that time to keep looking, but in the meantime to remove variable capacitor part numbers from our catalog as stock became exhausted. This is still our present program, as you might have noticed by the variable capacitor line left in the new catalog. Nevertheless, we are still looking and are actually talking to some manufacturers in England. — *Curt Henius, General Manager, J. W. Miller Div., Bell Industries, 19070 Reyes Ave., P.O. Box 5825, Compton, CA 90224.*

[4] [EDITOR'S NOTE: This letter came in response to our continuing efforts to resolve the critical parts-procurement problem which confronts amateur-radio experimenters. Hammarlund Mfg. Co. has ceased to manufacture variable capacitors. At last report Cardwell Corp. took over the Hammarlund line, but indicated no interest in selling in small-lot quantities to amateurs. We know of no single-lot suppliers who will sell transmitting variable capacitors of other popular brands. At least one leading manufacturer of transmitting and receiving variables has depleted his inventory of some fast-moving amateur-market variable capacitors, indicating that the company can make no promises concerning future stocking of those components. The situation is presently at the critical stage. The ARRL is doing all that is possible to encourage any willing manufacturer to produce and sell those components that are no longer available to amateurs. The genuine concern of such organizations as J. W. Miller is indeed an encouraging sign.]

• New Apparatus

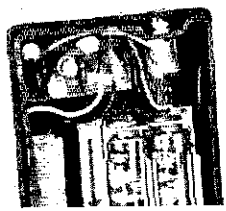
LOWCOM WIRELESS INDUCTION RECEIVER

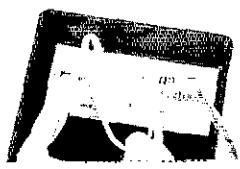
How many times have you missed a schedule, failed to monitor a net or the local fm repeater because you've had to be in another part of the house at the time? Probably at one time or another we all have, and then felt a bit perturbed because we missed something we wanted to hear. Lowcom Systems Inc. has manufactured a wireless induction pocket receiver that will help to prevent events such as that.

As shown in the photograph, a receiver about the size of a hearing aid and its earphone is used to receive the output of your station receiver. First, a simple wiring installation is necessary in the home or yard. A wire loop is placed around the desired listening area and connected to the station receiver in place of the speaker (across the 4-ohm output). When signals are received, and if the operator is within this wired area, the user will be able to hear what is being said much as if he had a small portable receiver in his pocket tuned to the frequency of interest.

After the unit was received at Headquarters we found an additional use for it. With this hand-held receiver it was possible to hear the noise generated by electrical motors and fluorescent lights, suggesting that the unit would be useful in tracking down some forms of interference. Additionally, when held in the proximity of electrical wiring, the path of the wire could easily be traced. It doesn't seem to matter if the wiring is encased in electrical conduit, because it's presence can still be detected by this sensitive device.

The induction receiver's cost is $25. For an extra $1.50, an engraved brass plate with your call sign will be made and attached to the unit. Lowcom Systems, Inc., 10727 Indian Head Industrail Blvd., St. Louis, MO 63132, makes them available within three weeks after receipt of order. — *W1NTH*



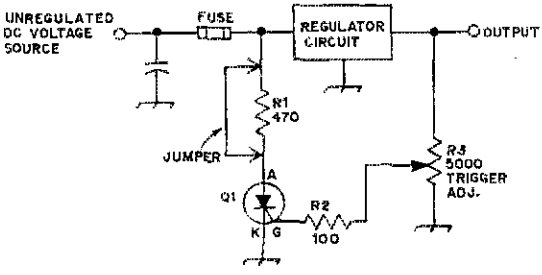


Hints and Kinks For the Experimenter

A CROWBAR CIRCUIT FOR POWER SUPPLIES

Much of the equipment being constructed today that uses solid-state devices requires a regulated supply voltage. Many of the more simple regulators are quite adequate, and the "on-card" regulators are becoming increasingly popular.

However, these simple regulators have one major problem area – if the series element shorts, the entire output from the rectifier will appear on the supply line feeding the equipment. Few of the ICs and transistors which are popular today will withstand such abuse.



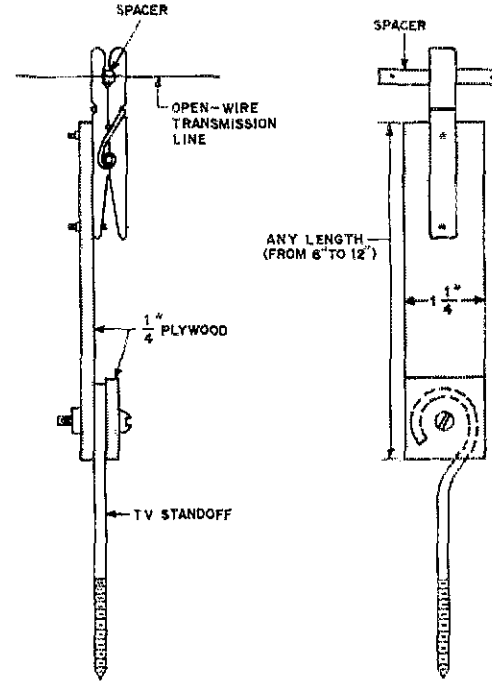
SCR "crowbar circuit" for regulated power supplies. The device used at Q1 will depend upon voltage and current requirements. SCRs such as the HEP300, 302, or 304 are recommended.

The circuit shown will detect such an overvoltage condition and shut down the supply by blowing the fuse between the rectifiers and the regulator. Operation is quite simple; when the voltage at the output of the regulator reaches a value that will trigger the SCR, the SCR conducts heavily and the fuse opens. This configuration has the advantage of not overloading the regulator circuit if the SCR should fire because of some temporary condition. Such would not be the case if the SCR obtained anode voltage from the output side of the regulator.

To adjust the trip point of the crowbar, the jumper should be removed from across R1 and a voltmeter connected in its place. The regulator circuit should be adjusted until the output voltage is at the maximum value that is desired. If the regulator is of the nonadjustable type, substitute a voltage from another source, such as several flashlight batteries connected across a 25,000-ohm potentiometer. If the substitute method is used, R3 should be disconnected from the regulator output. When the voltage is of the desired maximum value, R3 should be adjusted until the SCR fires, as indicated by a sudden large increase in the voltage across R1. Check the setting several times. Note that you must remove power from the circuit to restore the SCR to the nonconducting state. When the adjustment of R3 is correct, place the jumper across R1, and connect R3 to the output of the regulator. The fuse should be of a value that is 50 to 75 percent higher than the maximum that will be furnished by the regulator. Note that the filter capacitor must be ahead of the fuse; otherwise the charging surge of current will blow the fuse when the supply is turned on. – *WISL*

SUPPORTING OPEN-WIRE TRANSMISSION LINE

Here is a simple yet effective insulator for supporting open-wire transmission line. It is made from 1/4-inch plywood, a clothespin, and a TV-standoff insulator. The circular plastic insulator is removed from the standoff and the parts assembled as shown in the drawing. Plastic clothespins are best since they are weatherproof. Mounting the clothespin is accomplished by separating the two halves, fastening one section to the plywood with small machine screws, then replacing the remaining part. It is wise to bend the spring to increase its tension before reassembling the clothespin. The completed insulator should be protected with



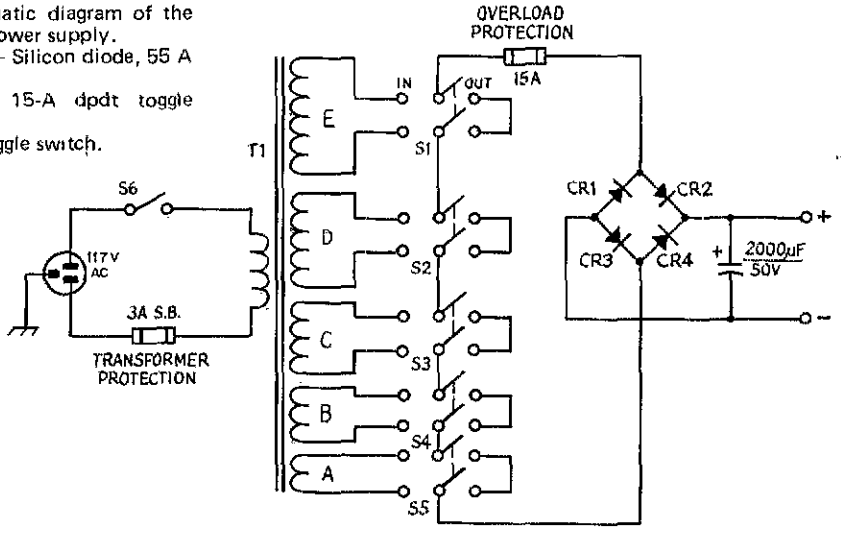


Fig. 1 — Schematic diagram of the experimenter's power supply.
CR1-CR4, incl. — Silicon diode, 55 A at 100 PRV.
S1-S5, incl. — 15-A dpdt toggle switch.
S6 — 5-A spst toggle switch.
T1 — See text.

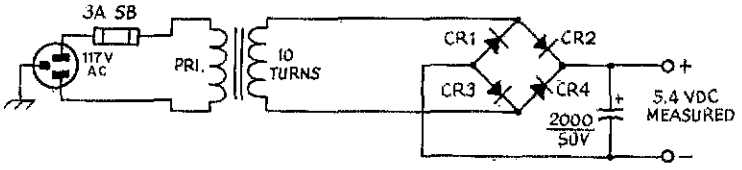


Fig. 2 — Schematic diagram of test circuit for determining turn-to-voltage ratio. CR1-CR4, incl., same as Fig. 1.

several coats of paint. After the insulators are installed in place, the open wire is supported by inserting the spacers into the jaws of the clothespin. — *Bruce W. Campell, WA8OJR*

EXPERIMENTER's POWER SUPPLY

I've built an experimenter's power supply which someone may be interested in. It provides between 1 V dc and 31 V dc in one-volt increments at 10 amperes with good regulation. The schematic diagram is shown in Fig. 1. T1 was made from an old TV transformer with approximately 350 watts capability. The secondary windings are wound with No. 14 enameled copper wire. The number of turns per dc volt output was determined experimentally, using the circuit of Fig. 2. The open-circuit voltage with ten turns was 5.4 volts dc yielding:

$$\frac{10.0 \text{ turns}}{5.4 \text{ V dc}} = 1.85 \text{ turns/volt dc}$$

Now the turns for each winding can be determined (see Table I). The necessary winding of fractional turns presented a minor problem that was easily overcome with a little planning.

The circuit provides no electronic regulation. Two facts ensure good load regulation. First, the transformer impedance is low and secondly, 55-A diodes were used. Of course, the output is proportional to the line voltage, but most power lines today have good line regulation so this is not considered a significant problem. When tinkering with an oscillator circuit or other circuit requiring voltage stability, I use a small Zener-diode circuit that would be part of the finished circuit in any event. — *Steven W. Siter, WN1RFW*

Table I

Winding	*Output dc*	*Secondary Turns*
A	1.0	1.85
B	2.0	3.7
C	4.0	7.4
D	8.0	14.8
E	16.0	29.6

TENSIONING DEVICE FOR VHF TUNING MECHANISMS

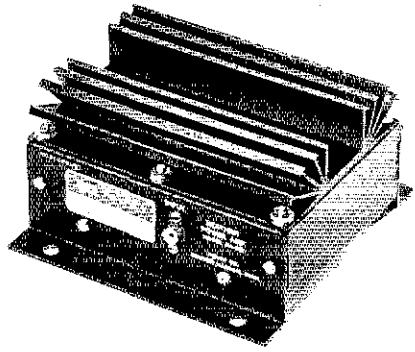
Homemade tuning capacitors and moveable vanes for vhf often exhibit erratic behavior because of lack of tension and consequent poor grounding and wobble. A simple tensioning device can be found in an old flashlight. Remove the large spring from the base of the flashlight and slip it over the tuning shaft. When the tuning knob is replaced, the spring is compressed between the front panel and the knob and keeps everything nice and tight. — *Michael Schmidendorff, WB8JXF*

HEAT SINKS FOR NUVISTOR TUBES

Transistor-type heat sinks make excellent heat dissipating radiators for Nuvistor tubes. Choose a high-emissivity black anodized finish if possible and use heat-sink compound (silicone grease) between the metal tube and the heat sink to reduce thermal resistance. — *Richard Mollentine, WAØKKC*

Recent Equipment

To acquaint you with the technical features of current amateur gear.



The Heath HA-202 Two-Meter FM Amplifier

HEATH'S ENTRY into the burgeoning field of two-meter fm has been eagerly awaited for some time. Considering the relative complexity of amplifiers and transceivers, it is not surprising that the HA-202 preceded the companion HW-202 transceiver into the marketplace. The amplifier can be used with any two-meter fm transmitter in the ten-watt class, which is the most popular power level for equipment not intended for hand-held operation.

The amplifier provides a boost of about 6 dB in transmitted signal strength. Whether this kind of power increase is really needed depends largely upon the requirements of the individual operator. If your mobile operation is limited to in-town repeaters, adding an amplifier does little more than add to the pollution of the spectrum. If, on the other hand, your travels take you to the fringes of a repeater's coverage, or if you enjoy simplex operation, the extra power can be a significant asset; it will transform a signal which is audible, but difficult to copy, into one that is pertectly readable.

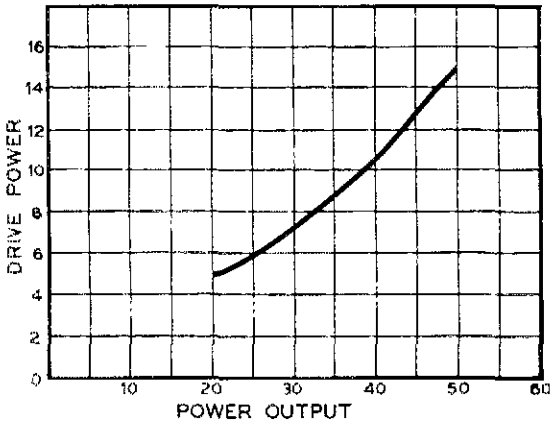


Fig. 1 – Rf-output power vs. drive for the Heath HA-202.

Circuit Description

The amplifier uses two 2N5591 or CTC B25-12 transistors in a push-pull configuration. Strip-line inductors are not used in the tuned circuits, and the "coils" are not coils at all, but single loops of wire.

Because the HA-202 is designed to be used with a transceiver, the amplifier is switched into the antenna circuit automatically when sufficient drive is present, and is switched out when the drive drops below about 1.5 watts. The switching circuit is illustrated in Fig. 2. A sample of the drive signal is taken from the input by C18 and is rectified and filtered. The resulting dc voltage drives Q3 into conduction, energizing K1. One benefit this switching method provides is "barefoot" operation for any transceiver which has a low-power transmitting switch position for one watt or less. If it is desired to have the capability of running without the amplifier at a higher transceiver power level, it is a simple matter to install an outboard switch in the +13.6-volt lead connecting the amplifier to the battery.

Construction

In current Heath vernacular, the HA-202 is a "one evening" kit. Construction took about three hours, including performing the simple ohmmeter checks suggested in the assembly manual. All parts (except the connectors) mount on one circuit board, so assembly is straightforward. The only step where exceptional care is required is the one

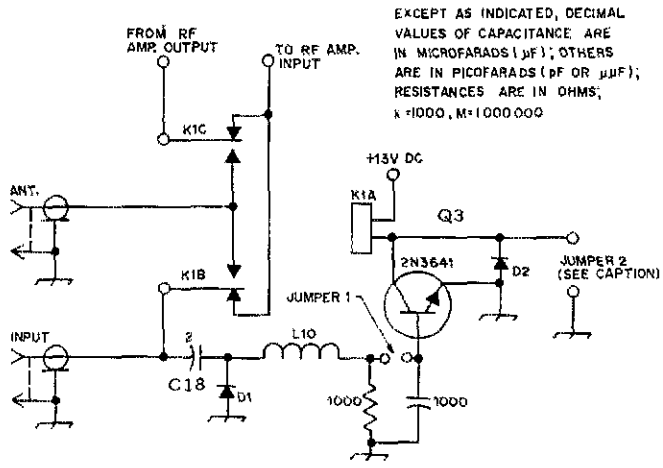


Fig. 2 — Circuit diagram for the antenna relay. The theory of operation is explained in the text. For alignment using a voltmeter, jumper 1 is disconnected and jumper 2 is installed, thereby keying the antenna relay. Relative rf power output can be measured by connecting a dc voltmeter across the 1000-ohm resistor.

for tightening the nuts holding the power transistors to the heat sink. The replacement cost of each transistor is nearly $20, so they deserve to be treated with respect! In the usual Heath style, writers of the assembly manual took special pains to help the builder avoid trouble at this stage.

Installation required about two hours, mostly for running the power cable between the trunk and the battery, through the passenger compartment. Sufficient heavy, insulated cable is provided to run the length of all but the largest automobiles. Also provided is about 15 feet of RG-58A/U coaxial cable which will be unnecessary for most installations. In the typical situation, installing the amplifier in the antenna lead will be simply a matter of cutting an existing cable and installing the proper connectors.

Phono plugs and sockets are used for the rf connections to the HA-202. Vhf purists may wish to install better connectors, such as BNC; for the rest of us, making sure the plugs fit tightly into the sockets will provide sufficient peace of mind.

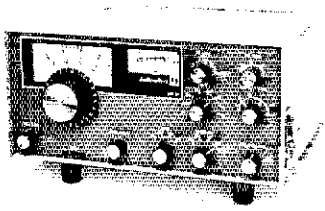
Two alternative methods for alignment are offered in the instructions, one using a wattmeter or SWR meter and the second using a voltmeter. The manual lists the operating range as about 750 kHz either side of the alignment frequency. The only problem encountered at this point was that the exciter used for testing the HA-202 contained a protective circuit which disabled the transmitter when the SWR exceeded a certain level. As a result, it was necessary to try several adjustment settings of the amplifier-input circuit to obtain sufficiently low reflected power to allow the exciter to operate. After that, it was a simple matter to tune the four trimmer capacitors in the amplifier for maximum rf output.

In judging the merits of most amateur equipment, subjectivity can be an important factor. In other words, one person may like green panels on his equipment, another gray. There is no such problem in evaluating the HA-202; its businesslike black finish graces the trunk, not the dashboard or the operating table. The amplifier is designed to meet the needs of a segment of vhf fm operators. It is easy to build, and it performs as advertised; what more can be said? — *K1ZND*

Heathkit HA-202
Two-Meter FM Amplifier

Frequency range: Any 1.5-MHz segment, 143 - 149 MHz.
Power output: 40 watts, nominal (see Fig. 1).*
Drive power required: 5 to 15 watts (see Fig. 1).*
Dimensions (HWD) and Weight: 3 × 4-1/4 × 5-1/2 inches excluding mounting flanges, which add 1-5/8 inches to width; 2 pounds.*
Power requirements: 12 to 16 V dc, 7 A maximum, negative ground.*
Standby current: less than 1 mA.*
Input and output impedance: 50-ohms nominal.
Input VSWR: 1.5:1 maximum.*
Output VSWR: 3:1 maximum.
Operating temperature range: −30°F to +140°F.
Price class: $70.
Manufacturer: Heath Company, Benton Harbor, MI 49022.

* Measurements made in the ARRL lab.



The Hallicrafters FPM-300 SSB Transceiver

IT WOULD SEEM that Hallicrafters had the more nomadic members of the amateur fraternity in mind when they designed the FPM-300 transceiver. Just plug in either a mic or key, connect the appropriate power cord and an antenna, tune up the rig and start making contacts. For those desiring a compact transceiver with moderate power output and versatile supply-voltage options, the FPM-300 may be the answer. Because of its solid-state design, current drain while receiving is low. Also, the filaments of the PA and PA driver-amplifier tubes can be turned off during extended periods when the transmitting function is not being used. Of course, homebody type operation is also possible. Here the small size of the transceiver would appeal to those of us who have limited space for amateur equipment.

Slightly smaller than an old Hallicrafters S-38 receiver, the FPM-300 is the equivalent of equipment that once took up most of the space on the operating desk and part of the floor. While vacuum tubes are still used in the driver and final-amplifier stages of the transmitter, the rest of the FPM-300 utilizes solid-state components. Mobile and portable fans will like the built-in ac and dc power supplies. One transformer is used for both modes of operation and switching between the two is accomplished by using differently strapped power plugs.

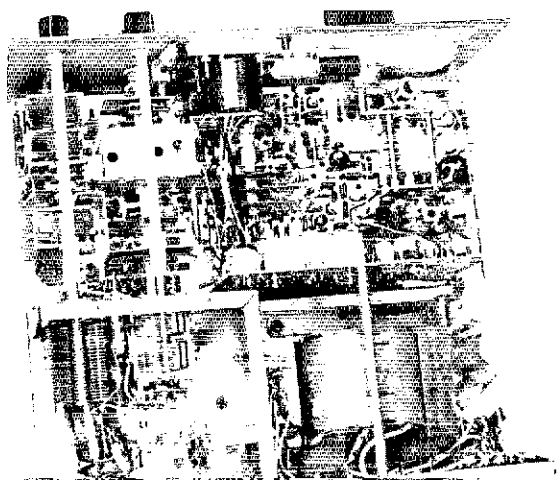
The basic transceiver comes with a plug wired for ac operation and a power cord, crystals for all of the amateur bands from 3.5 through 21 MHz, and one crystal for 28.45 to 29.05 MHz. In the author's opinion, the instruction manual is in the best of the Hallicrafters tradition. Many of the manuals that one sees of late are sketchy in their content, but the one for the FPM-300 is quite comprehensive. It includes schematic diagrams, servicing data, and parts list. Accessory items available are the MR-300 Mobile Mounting Kit, the HA-60 Blower Kit, and crystals for the remaining portions of the 28-MHz band not covered by the basic unit. While FPM-300 operation is possible without the accessory blower, its use is recommended by Hallicrafters. The blower mounts on the back of the transceiver and will operate with either the ac or dc supply voltages.

Technical Features

Solid-state transceivers lend themselves nicely to the use of bilateral mixer and amplifier stages. The circuit shown in Fig. 1 illustrates a way in which dual-gate MOSFETs can be used to good advantage. Q501 is used in the receiver rf-amplifier stage and Q502 is part of the driver chain in the

Table 1 — FPM-300 VFO Stability

Time Minutes	*VFO Frequency Kilohertz*
1	5401.047
2	5401.036
3	5401.010
4	5400.993
5	5400.934
10	5400.905
15	5400.885
20	5400.879
25	5400.812
30	5400.793
45	5400.736
60	5400.682



Top view of the FPM-300. The shield enclosure of the PA stage has been removed, showing the 6KD6 and output circuits.

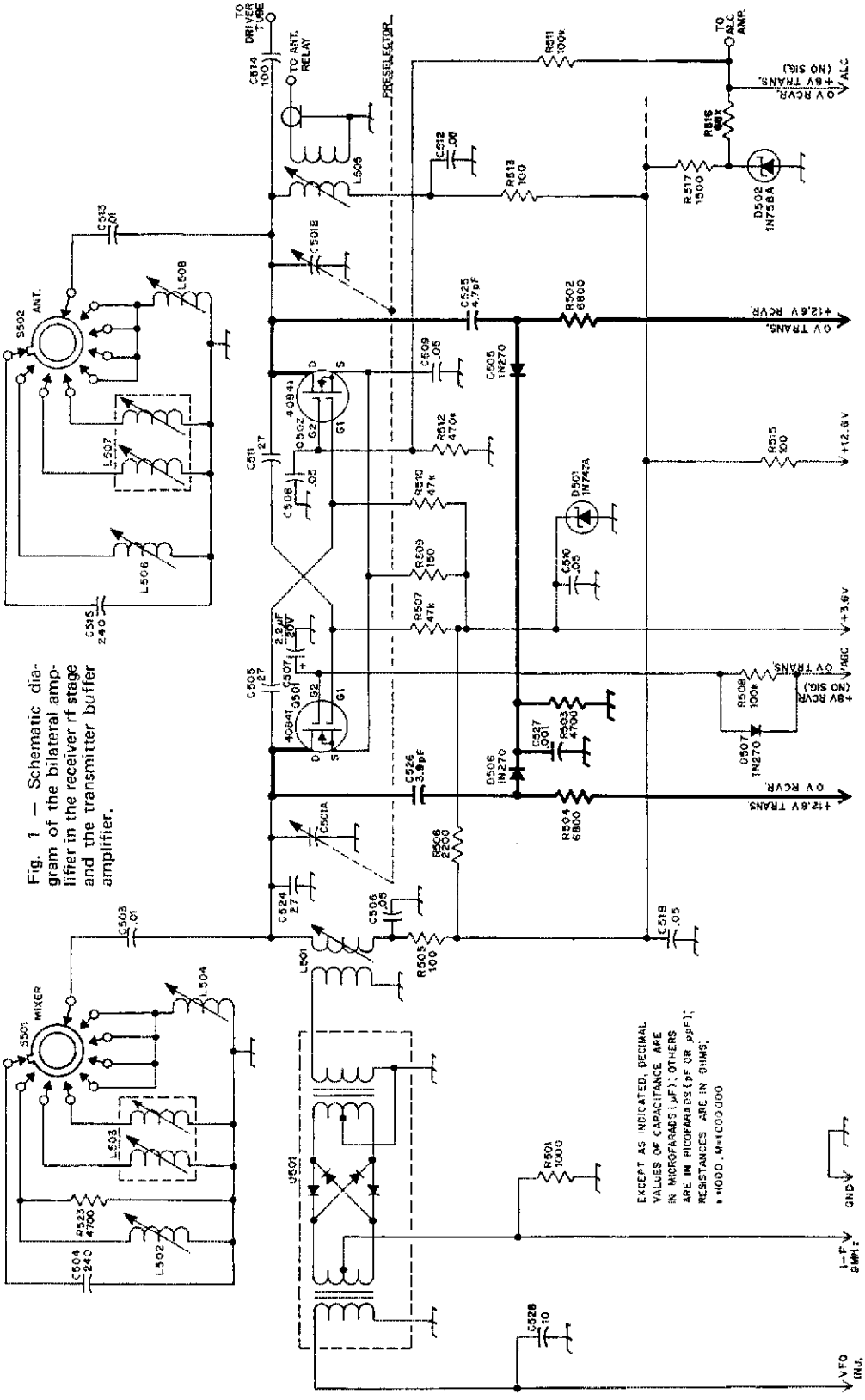


Fig. 1 — Schematic diagram of the bilateral amplifier in the receiver rf stage and the transmitter buffer amplifier.

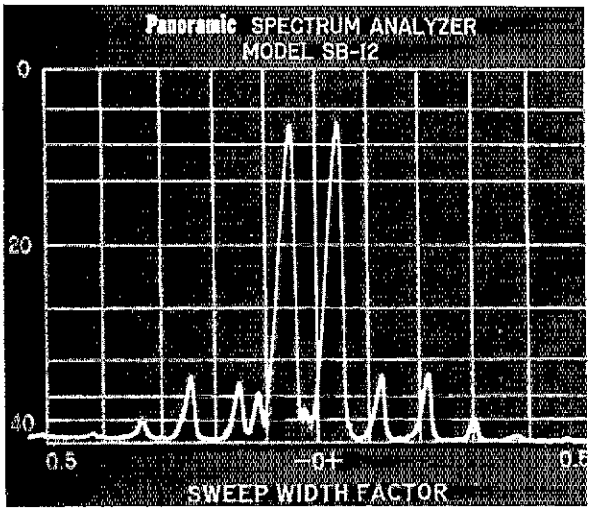


Fig. 2 — Spectrum-analyzer display of the output of the Hallicrafters FPM-300 Transceiver with a two-tone 250-W PEP input. The horizontal axis of the display represents frequency, and the vertical axis amplitude. Each "pip" represents a single-frequency component of the rf output. The display is adjusted so the amplitude of each component may be read from the scale at left, directly in decibels below the peak-envelope power (PEP) output, as rated by the manufacturer. Each reticle division represents 5 dB. Responses other than the two individual tones near the center are distortion products; third-order products 31 dB down may be seen here. Individual tones of the two-tone signal are down by 6 dB from the PEP output. This is because the tones are displayed as two discrete frequencies. At the instant when voltages of the individual tones are in phase, they add to produce a peak in the envelope wave-form 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.

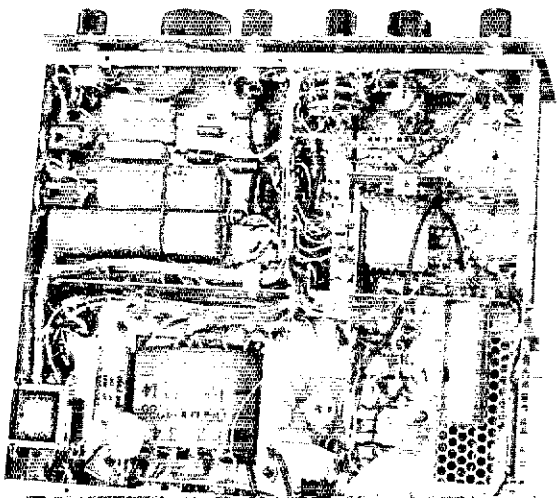
transmitting portion of the transceiver. Gate 2 of each MOSFET is used for the age and alc functions respectively, and to cut off the stage when going to the other mode (transmit or receive). Applying zero voltage to gate 2 will make the stage inoperative; however, the drain-to-source capacitance will change. C525 and C526, which are switched in and out by D505 and D506 compensate for this change and thus prevent possible stage detuning on the higher bands. Similar type bilateral amplifiers are also used in the i-f stages, but the 9-MHz i-f is low in frequency, eliminating the need for compensating capacitors.

Performance

Sunday morning on forty meters is no time to be found with a receiver which has fragile overload characteristics. This is true for most of the east coast and especially from the world's worst location for noise — the author's. No cross modulation was evident in the FPM-300 from strong stations outside of the filter passband. Recovery from some very high-level noise pulses was fast. Generally, this solid-state transceiver compared favorably with a vacuum-tube type tuned over the same frequency range. Audio quality of the FPM-300 is good; the old Donald Duck jokes about ssb reception are definitely out of order here.

Received reports on the quality of the transmitting signal have been favorable. Fig. 2 shows that the manufacturer's specification of 26 dB down from single-tone PEP for intermodulation distortion products is actually exceeded by the unit under test. Generally speaking, the FPM-300 is oriented toward ssb operation. While cw operation should be sufficient for the casual operator, like many transceivers in the same class, the FPM-300 lacks some of the refinements deemed necessary by the more avid adherents to this mode. There is no provision for offset tuning, nor for more selective filters than the 2.1-kHz filter supplied with the unit. Since the inception of the transceiver concept, it has been more responsible than any other factor in making the ssb dream a reality and one can't be too critical if transceiver designers favor this mode.

The unit reviewed here was an early model and had to be returned to the manufacturer because of some defects. Spurious signals, audio hum, and tuning-dial backlash were noted. Hallicrafters later provided us with an updated model which did not display these characteristics. — *WIYNC*.



Bottom view of the transceiver.

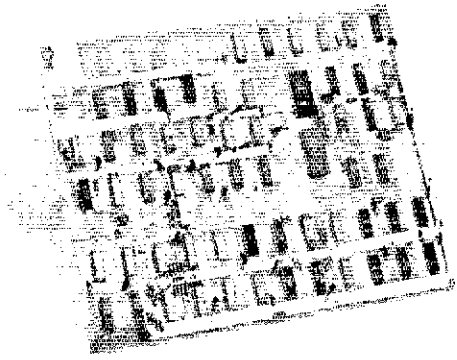
Hallicrafters FPM-300 Transceiver

Sensitivity (for 10 dB signal-plus-noise to noise): 3.8 MHz – 0.12 μV; 7.1 MHz – 0.16 μV; 14.2 MHz – 0.15 μV; 21.3 MHz – 0.15 μV; 28.5 MHz – 0.16 μV.*
Stability: See Table I.*
Dial calibration: 10-kHz increments, 600-kHz tuning range.
Dial backlash: Minimal.
Power output: 3.8 MHz – 100 watts; 7.1 MHz – 110 watts; 14.3 MHz – 100 watts; 21.3 MHz – 85 watts; 28.5 MHz – 85 watts. (Cw conditions.)*
Plate voltage: Key up – 760 volts; key down – approx. 670 volts.*
Intermodulation distortion products: Approx. – 31 dB for third-order products. (See photograph of analyzer display.)*
Keying: Tone keyed.
Dc power input to PA: 250 watts PEP for ssb, 200 watts for cw.
Amplifier output circuit: Pi network.
Power amplifier tube: 6KD6.
Power requirements: 117/235 V ac 300 watts. Also, 13.4 V dc at 20 A for mobile operation.*
Dimensions (HWD) and Weight: 5-1/2 × 12-3/4 × 10-3/4 inches, 25 pounds.*
Price Class: $595.
Manufacturer: The Hallicrafters Co., Rolling Meadows, IL 60008.

*Test measurements made in the ARRL Lab.

QST —— QST —— QST

Petit Logic Systems MT-5 Morse to Teletype Code Translator



BACK IN THE January 1971 issue of *QST*, W7GHM described his Morse-A-Verter, a gadget which, without adjustment or attention, would translate received Morse code at speeds between 5 and 60 wpm into teleprinter pulses for operating a 60-wpm printer.[1] That device, developed by Petit as an experimental venture primarily for its edificatory value, used something like 180 ICs, 60 transistors, and 500 diodes. Complicated and costly as the circuitry was, many readers of *QST* were interested enough to want to own one of those instruments. The response was so encouraging that the author of the article formed his own company, developed a highly sophisticated version of his Morseaverter, and now markets the device commercially. This is the model MT-5 code translator offered by Petit Logic Systems. The output code may be either Baudot or 6-level ASCII, with either a serial or parallel format.

The MT-5 uses 62 ICs, plus a few resistors and capacitors. The circuit is constructed on a single etched board measuring 8 × 10 inches. Not included on the board but required for operation is a 'TTY interface' circuit (loop keyer). Detailed suggestions for interface circuitry are included in the MT-5 instruction manual, however. The MT-5 which we tested also required an external 100-kHz frequency reference. As wired at the factory, the translator operates at Morse code speeds from 5 to 40 wpm without adjustment, but the unit may be rewired easily to cover the ranges of 2.5 to 20 or 10 to 80 wpm. (If the input code speed averages 55 wpm or higher, a faster readout device than a 60-wpm teleprinter must be used.)

[1] Petit, "The Morse-A-Verter, — Copying Morse Code by Machine," *QST* for January, 1971, p. 30.

About the Circuitry

One can imagine that it is not an easy task to design circuitry for receiving Morse code, even at a fixed speed, and for converting the received information into teleprinter pulses. Allowing for automatic "tracking" of code-speed changes complicates the requirements even more. And yet Petit

had solved all the associated problems when his first Morseaverter appeared in print.

The block diagram of the commercially made version does not differ greatly from that which originally appeared in *QST*,[2] and the reader is referred to that discussion if he desires more detail on the basic circuit operation. An input interface and correlating filter accepts audio from the station receiver and converts the signal into TTL logic levels corresponding to Morse code marks and spaces. These alternating logic levels are passed along to an element recognizer, which classifies each mark signal as a dot or a dash, and each space signal as an element space, a letter space, a word space, or as a pause in sending. These classifications are made according to the duration of the element in question. A letter assembler accumulates the dots, dashes, and element spaces, and groups them into patterns corresponding to the particular character which has been received.

If necessary, a controller generates either a letter-shift or figure-shift function and routes it to a 16-character buffer memory. Then the code group held in the letter assembler is transferred into the memory. (The controller also generates carriage-return and line-feed functions and substitutes them for the first word space or pause following 47 characters and spaces on a given line of print.) The memory stores the characters in sequence and delivers them as they are called for by a code converter.

The converter accepts the characters delivered by the buffer memory and converts them into a 6-bit code – either the 5 selector-pulse bits of the Baudot code plus a case or shift bit, or a 6-level ASCII code, depending on the programming of the converter. Read-only memories are custom-programmed to yield the desired output, which is presented in parallel format. For operation of a teleprinter, the code is processed through a parallel-to-serial converter and is then delivered to the output.

Operation

The input interface and correlating filter are designed to distinguish a single cw signal from the hissing of background noise. As stated in the instruction manual, "Its performance resembles that of an extremely narrow cw bandpass filter as far as separating the signal from the noise is concerned. Its outstanding feature is that this high performance is obtained without the need for critical tuning." The filter will not function properly if more than one cw signal is present, unless the desired one is considerably stronger than the others and the level from the receiver has been appropriately set. Setting the receiver controls for optimum copy requires some experience. Too low or too high an audio level will result in no copy at all, and of course the receiver selectivity and tuning to reduce the level of adjacent-frequency signals affects the quality of the received copy. An audio pitch of at least 500 Hz is desirable, and 1 kHz seems to be much better. Using receiver age is helpful, if it is slow enough to keep noise from popping up between spaces in the code but fast enough to compensate for fading.

The MT-5 is available either factory wired and tested, or as a kit, including the etched circuit board, all ICs and instructions. A comprehensive 54-page instruction manual is included, which contains complete information on setup procedures, theory of operation, and circuit diagrams. The MT-5 Morseaverter is an ideal station accessory for the amateur who uses cw regularly and who desires to have unattended cw reception. It is also handy for RTTY types who wish to know what the cw gang is saying, and is a boon to those who shuttle message traffic between cw and RTTY nets. – *KIPLP*

Petit Logic Systems
MT-5 Morse to Teletype Code Translator

Dimensions (HWD) and Weight: 3/8 × 10 × 8 inches, 9 ounces.
Power Requirements: 5 volts dc at 3 amperes.
Price class: Wired and tested, $560; kit form, $485. A special kit is also available consisting of the etched circuit board, instruction manual, and the four custom-programmed ROMs, $185.
Manufacturer: Petit Logic Systems, P. O. Box 51, Oak Harbor, WA 98277.

[2] See footnote 1.

QST —— QST —— QST

Heath Model GR-110 Scanning Monitor

THE HEATH GR-110 Scanning Monitor is a vhf receiver capable of receiving signals in any 9-MHz segment between 146 and 174 MHz. It has eight crystal-controlled channels. The crystal that is used for each channel will determine the frequency received.

Tuning is accomplished by use of eight push-button switches and can be either manual or automatic. In the automatic mode, the monitor will scan all of the channels and lock on the first one where a signal appears. The receiver remains "locked" on that channel as long as the signal is present. When the signal disappears, the monitor waits four seconds, and if there is no further transmission, it resumes scanning. With manual tuning, the MANUAL/AUTOMATIC switch is switched to MANUAL. The SELECT switch is depressed until the desired channel is tuned in.

The Monitor has a priority channel feature. If a signal appears on the priority channel, the receiver will automatically lock to that channel even though there are signals on other frequencies. As soon as the station on the priority channel stops transmitting, the receiver will resume scanning.

An incandescent readout tube is used to display the channel numbers. When the Scanner locks on a particular signal, the number of that channel is displayed. If there are no signals present the readout tube will display each number consecutively while scanning the channels.

Circuit Description

It isn't often that we can say one of the unusual features of a receiver is its front end. The first and second rf stages use 40673 MOSFETs and double-tuned circuits to provide maximum front-end selectivity. See Fig. 1. The first mixer is also a 40673.

Output from the mixer is coupled through two monolithic crystal filters tuned to 10.7 MHz. The signal is then amplified and coupled through another ceramic filter to provide additional selectivity. It should be pointed out that good selectivity is required for a scanning receiver to eliminate the possibility of lockup on undesired signals *near* the passband. The signal is then amplified by an integrated circuit that also serves as a quadrature detector. The output from this IC is routed to the squelch circuits and several amplifiers, the output of which serves as a switch for the scanning circuits.

Scanning Circuit

The signal is routed to a transistor which acts as a control switch, starting and stopping the operation of the scan-oscillator transistors. Another transistor is used for a delay circuit. When a received signal disappears a delay of about four seconds duration begins. After this time is completed, the scan-oscillator transistors start to search for another signal.

A 7490 IC is used in the counting circuit. When it stops counting and is locked on a channel, the priority oscillator, consisting of two transistors, pulses an input to each gate of the 7410s. This causes the outputs of three input NAND gates to go "low." Another 7404 then inverts these signals to a "high" (logic 1) and couples these signals to the decoder drivers, a 7441 and 7447. When all their inputs are high, an indication of "0" will be

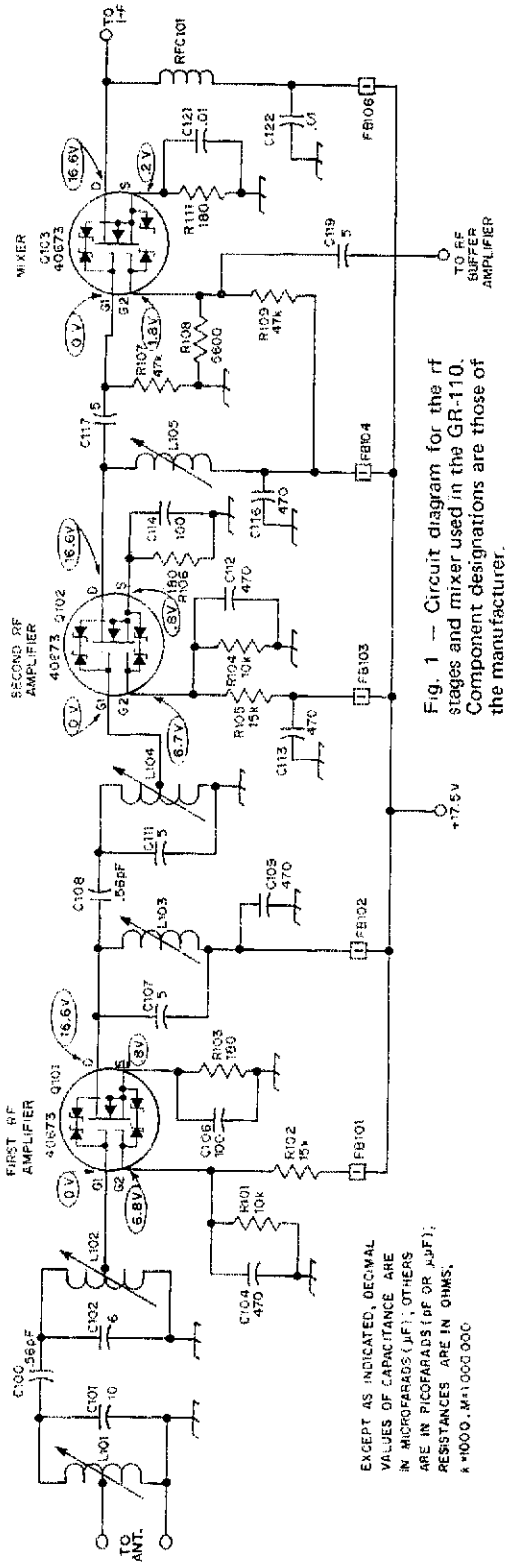
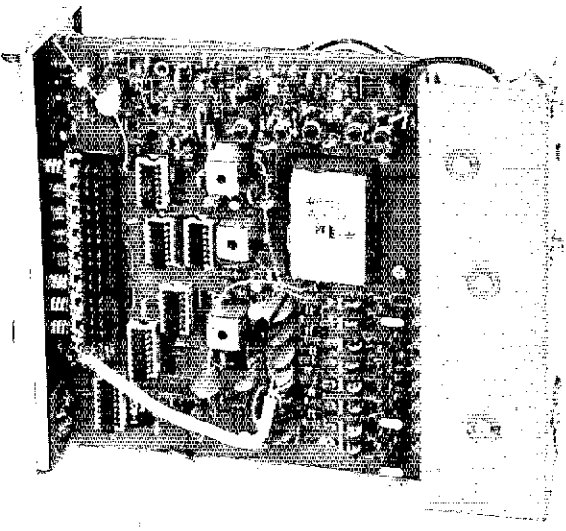


Fig. 1 — Circuit diagram for the rf stages and mixer used in the GR-110. Component designations are those of the manufacturer.



This side of the receiver shows the scanning board plus the rf and mixer stages. The crystal sockets are visible at the lower right rear.

presented on the readout indicator. This occurs about every four seconds and has a duration of 20 milliseconds. During this time, the crystal used in the priority channel (0) oscillates. If a signal is present, the scan circuit will "lock on" by using a squelch voltage to trigger pin 4 of one of the 7410s. A voltage is coupled from the priority channel output through an inverter to produce a "high" on pin 4 of the 7410, keeping the receiver locked on.

The crystal oscillators use diode switching. The diodes are normally biased off. When each circuit is grounded via the 7441, the associated diode conducts and places that particular crystal (and channel) in operation. For 2-meter operation, crystals in the 45-MHz region are used.

Constructional Information

As usual, the Heath instruction manual is excellent. The previous Heathkit this reviewer wired came with all the hardware in one bag. Considerable time was spent just sorting parts! The GR-110 project, however, was the writer's first experience with the current generation of Heathkits. It was a real pleasure to have Heath do the presorting.

Wiring time for the completed receiver was 17 hours, not including trouble-shooting. However, as to be expected, all of the faults encountered were "built-in" by this kitbuilder! Once a couple of poor solder connections and a foil bridge were corrected, the receiver worked as Heath said it would.

Performance

The GR-110 met or exceeded all the manufacturer's specifications. The selectivity is excellent. The manufacturer rates the unit as −40 dB for 30-kHz channel spacing. In central Connecticut there are several adjacent-channel assignments of repeaters, so it is easy to check on-the-air performance. One machine on 146.82 MHz is only a mile from the reviewer's home. It was impossible to detect any crud on either the 79 or 85 channels while "82" was in service.

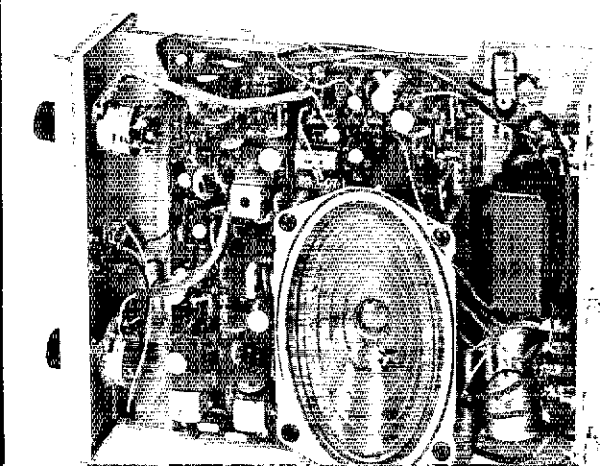
Audio output from the receiver is rated at two watts, with provisions for an external speaker, if desired. We found the existing speaker produced plenty of audio even when the receiver was used for mobile operation.

The receiver has its own 117-V ac supply or can be powered by an external 13.8-V dc supply. Switching from one type of power to the other is accomplished by using the appropriate power plug connector on the rear of the receiver.

During operation, a popping noise occurs in the speaker every time the priority channel is scanned when the receiver has a signal locked on a channel *other* than the priority one. The noise isn't loud, but it takes some getting used to. – *W1ICP*

Heath GR-110
VHF Scanning Monitor

Dimensions (HWD) and Weight: 3 × 8-1/4 × 9-3/4 inches, 5-1/2 pounds.*
Power requirements: 13.8 V dc, or 117 V ac.
Sensitivity: 0.5 μV for 20 dB of quieting.*
Frequency range: 146 to 174 MHz.
Scanning range: Any 9-MHz segment of the frequency range.
Modulation acceptance: ± 7.5 kHz maximum.
Price class: $120.
Manufacturer: Heath Co., Benton Harbor, MI 49022.
* Measurements made in ARRL lab.



The audio board is at the upper right, above the speaker. Along the left is the i-f board.

OSCAR NEWS

As we go to press with this issue, there has been time to receive only a handful of reports of activity via Oscar 6 during the ARRL Field Day, June 23-24. Even with this small and unrepresentative sample, though, it's obvious that dozens of clubs, groups, and individuals took advantage of Oscar availability to add to their Field Day scores and to gain local publicity for their efforts. Many new calls were heard through the satellite over the weekend; a list containing a few is elsewhere in this column. Portable stations who made multiple contacts via Oscar during Field Day included W1TX/1 and W1ARR/1 with 15 QSOs apiece, W3VD/3 with 13, W7YE/7 with 11, K2AE/2 and W9KM/9 with 10, and W8FO/8 with 7. In addition, several fixed stations made a point of working FD portables; K1HTV exchanged reports with 19, WA4JID (operating with emergency power and a temporary setup in his backyard, but not portable) garnered 14, and VP5DD lent an international flavor to the event by working 7.

Many amateurs received their first exposure to Oscar over the Field Day weekend, and no doubt many of them will be working on setting up their own satellite ground stations over the summer! If their FD experiences were typical, they know it doesn't take elaborate equipment to join the space age — K2AE/2 used W2GN's widely-traveled mobile rig for its contacts, and W1TX/1 used an Ameco TX-62 and 6-element circularly polarized yagi eight feet high for its uplink.

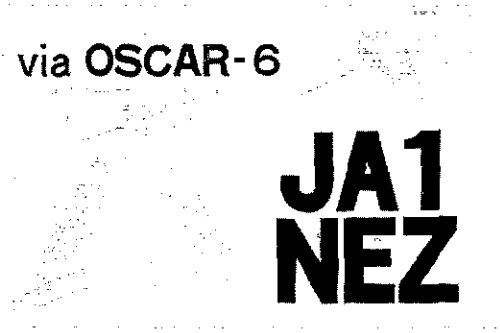
Field Day stations reported working through Oscar: W1ARR/1, W1KVI/1, W1TX/1, WB6CEP/1, K2AE/2, W2FR/2, W2LX/2, K3SSC/3, W3VD/3, W4ABK/4, W4CVY/4, W4DW/4, K4GFG/4, WA4JJD, W4PLB/4, W4VTA/4, K5RWK/5, W5TSV/5, K6YA/6, W7DK/7, W7YE/7, WB8BGY/8, W8FO/8, W8HH, K9BPL/9, WB9FDZ/9, W9FU/9, W9KM/9, DJ6RD/W9, WØCY/Ø, WØHNV/Ø, WØIW/Ø, WØZWW/Ø.

Recent Satellite DX Achievement Award Winners

WA2ACW SM2CFG JA4ABY DJ1QT JA1EGM JA1KCA SM5LE ZE7JX W3BHG K2MQY G3PEJ WØJKF F2FD F6CER F5PL W4CK WA2RDE.

Certificates have been issued to 106 stations in 18 countries and 5 continents.

JA1NEZ, an early winner of the Satellite DX Achievement Award, uses this special QSL to confirm Oscar 6 QSOs. Having the cards printed was no problem for Tom; he is an editor of *CQ Ham Radio*, a monthly magazine in Japanese which contains nearly 600 pages in each issue!



WAS Minus One

Listed in the Oscar 6 Two-Ways box this month you'll find not one, but *two* stations with 49 states worked — W3TMZ and VE2BYG. The holdout for both is Hawaii, which is within range from Maryland and Quebec rather seldom and only for short periods of time. Jack, W3TMZ has been heard in Hawaii several times and has heard KH6IJ once. The other 49 QSLs are already in hand. A special Amsat trophy awaits the first person to confirm all 50 states by satellite.

Oscar 6 QSL Data Needed

WB4DRB has developed a computerized Amsat Oscar 6 Communications Information Retrieval System which lists participating stations, states, and countries that use Oscar 6. Updating is done periodically, and all users of Oscar 6 are invited to send an alphabetical list of QSL cards they have received for contacts through Oscar so the user file can be brought up to date. Lists may be sent to Amsat, Information Retrieval Section, P.O. Box 27, Washington, DC 20044. — *K1ZND.*

OSCAR 6 TWO-WAYS

	Stations worked	*States*	*Countries*
F9FT	450	24	41
G8CEX	51	1	14
ZE7JX	21	—	13
VE2BYG	510	49	39
W1FTX	160	41	15
K1HTV	465	47	37
W1JSM	268	38	21
WA1NUH	329*	33	6
W2GN	191	41	21
K2KNV	267	42	26
WB2VKZ	252	44	22
K2ZRO	123	35	11
K2QBW/3	117	33	8
W3BWU	82	30	10
K3JTE	47	19	4
W3TMZ	367	49	28
WA4JID	300	46	20
K4MSG	16	12	1
W6BGJ	172	46	6
W6DMN	176	45	7
DJ6RD/W9	145	39	11
W9OII	136	37	11
KØDDA	166	35	12
WØPHD	262	42	15
WAØTAQ	210*	29	7

* Total contacts

VE/W Contest Announcement

September 22-23, 1973

THE MONTREAL Amateur Radio Club Inc., invites all W and VE amateurs to participate in the 1973 VE/W Contest. The contest period this year is the weekend of September 22-23.

Rules are similar to those of last year's event. Log sheets and check sheets for both Canadian and American entrants are available from the VE/W Committee at the address shown below (do not write ARRL for these) upon receipt of SAE with IRCs or sufficient Canadian postage.

Stations should look for each other in the "General" part of the phone and cw bands, and are reminded to check all bands for openings.

Be sure to send in your log regardless of score. It will be of definite interest in preparing the contest summary. Soapbox comments (unusual occurrences, exceptional QSOs, etc.) and station photos will be of great interest.

1) *ELIGIBILITY*: The contest is open to all amateurs located in the ARRL sections listed on page 6 of any *QST*.

2) *CONTEST PERIOD*: All contacts must be made during the period shown above. Only 20 hours total operating time may be used in this period. Times on and off the air must be shown in the log. Minimum time off period allowed is 15 minutes. Listening time must count as operating time.

3) *BANDS*: All bands and modes for which the participant is licensed may be used. A station may be worked once on cw and once on ssb on each band.

4) *CLASSES OF ENTRY*: The contest is divided into two parts, phone and cw. These scores must be tabulated separately and not combined. There are two classes of entry, single operator and multioperator.

A single operator station is one manned by an individual amateur who receives no assistance from other persons during the contest period. He may not have assistance in any manner in keeping the station log and records, or in spotting stations during the contest period. Such entries must be placed in the multioperator category.

5) *EXCHANGE*: W/Ks will work VE/VO stations and vice-versa, W-to-W and VE-to-VE QSOs do not count. Valid points can be scored by contacting stations not working the contest if complete exchanges are made. The exchange consists of RS or RST report, QSO number (5 digit phone, 6 digit cw) and ARRL section for W/Ks, geographical areas listed below for VE/VOs.

Contest Period

Starts 2300 GMT Sat., Sept. 22
Ends 0200 GMT Mon., Sept. 24

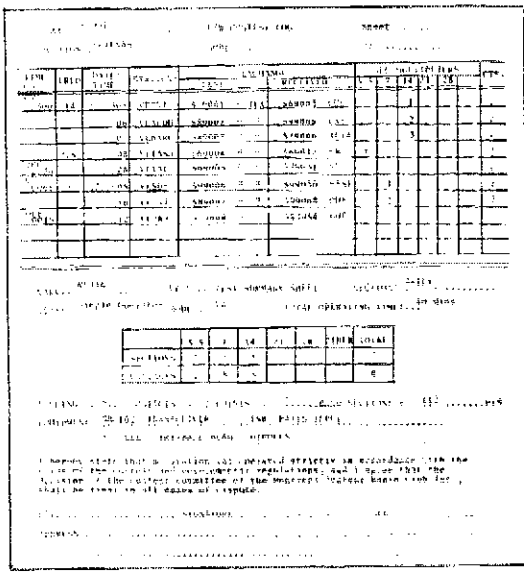
GEOGRAPHICAL AREAS:

Area	*Prefix*	*Abbr.*
Newfoundland	VO1	NFLD or NF
Labrador	VO2	LAB or L
Prince Edward Island	VE1	PEI or P
Nova Scotia	VE1	NS
New Brunswick	VE1	NB
Quebec	VE2	QUE or Q
Ontario	VE3	ONT or O
Manitoba	VE4	MAN or M
Saskatchewan	VE5	SASK or S
Alberta	VE6	ALTA or A
British Columbia	VE7	BC or B
Yukon	VE8	YUK or Y
Northwest Territories	VE8	NWT or NW

6) *SCORING*: Each completed contact is 2 points times the number of sections worked on each band.

Example: 22 contacts in 9 sections on 21 MHz. 16 contacts in 4 sections on 14 MHz, and 12 contacts in 7 sections on 7 MHz = 22 + 16 + 12 = 50 contacts x 2 = 100 points x 20 sections = 2000 points.

(Continued on page 87)



September

VHF QSO Party

Announcement

All set for the September VHF QSO Party? If band openings are even half as good as we had in June, this is one contest you can't afford to miss!

Remember you may pick any two 14-hour periods out of the 35 hours available. All you do is exchange sections for QSO credit, add up your contact points and multiply that sum by the sum of your band-section-multipliers.

Read the rules carefully, then send right away for your free party log forms; a sample is shown below.

Mail your entry to us no later than October 5, 1973. C U then – *WA1PID.*

STARTS	ENDS
1900 GMT Sept. 8	0600 GMT Sept. 10

Operate any two 14-consecutive-hour periods

Rules

1) The September 1973 V.H.F. QSO Party begins at 1900 GMT, Saturday, Sept. 8, and ends at 0600 GMT, Monday, Sept. 10. Entrants may operate any two 14-consecutive-hour periods beginning no earlier than 1900 GMT Saturday (starting on the hour) and ending no later than 0600 Monday. All claimed contacts must be within the two chosen periods and must be made on amateur frequencies above 50 MHz., using authorized modes of operation.

2) Name-of-section exchanges must be acknowledged by both operators before either may claim contact point(s). A one-way exchange, confirmed, does not count; there is no fractional breakdown of the 1-, 2-, or 3-point units.

3) Fixed, portable or mobile operation under one call, from one location only, is permitted. A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest period (with the exception of family stations where more than one call is assigned to one location by FCC/DOC).

While no minimum distance is specified for contacts, equipment in use should be capable of real communications (i.e. able to communicate over at least a mile).

Contacts made by retransmitting either or both stations do not count for contest purposes.

4) Scoring: 1 point for completed two-way exchanges on 50 or 144 MHz.; 2 points for such exchanges on 220 or 420 MHz.; 3 points for such exchanges on the higher v.h.f. bands. The sum of these points will be multiplied by the number of different ARRL sections worked per band; i.e., those with which at least one point has been earned. Reworking sections on additional bands for extra section credits is permitted. Cross-band work does not count. Aircraft mobile stations cannot be counted for section multipliers.

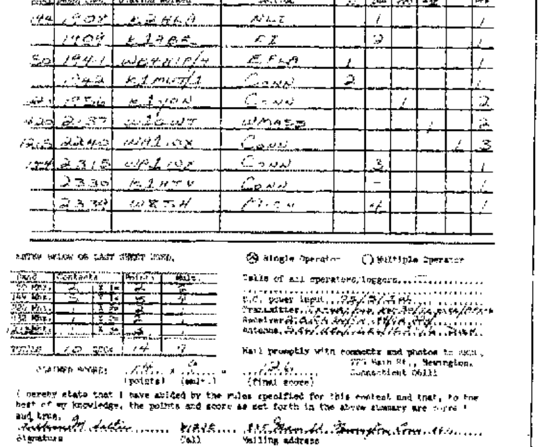
5) Foreign entries: all contacts with foreign countries (such as Mexico and the Bahamas) count for score. All foreign countries are grouped together, and a multiplier of no more than one (per band) may be claimed for contacts with all foreign stations worked. Foreign stations may only work stations in ARRL sections for contest credit and will give their country name.

6) A contact per band may be counted for each station worked. Ex.: W2EIF (S.N.J.) works K1YON (Conn.) on 50, 144 and 220 MHz. for complete exchanges. This gives W2EIF 4 points (1 – 1 – 2) and also 3 section-multiplier credits. (If W2EIF contacts other Conn. stations on these bands, they do not add to his section multiplier but they do pay off in additional contact points.)

7) Each section multiplier requires a complete exchange with at least one station. The same section can provide another multiplier point only when contacted on a new v.h.f. band.

8) Awards: Entries must be postmarked no later than October 5, 1973. A certificate will be awarded to the high-scoring single-operator station in each ARRL section. In addition, the high-scoring multi-operator station will receive a certificate in each section from which three or more valid multiple-operator entries are received. Certificates will also be given to the top Novice in each section where three or more such licensees submit logs and to Novices in sections of less than 3 entries, who in the opinion of the Awards Committee displayed exceptional effort. Awards Committee decisions will be final.

(Continued on page 87)



Have you ever observed strange, seemingly obtrusive operating practices on the popular DX bands? They're not without purpose according to W1RML's Machiavellian explanation in this informative "How to . . ." article.

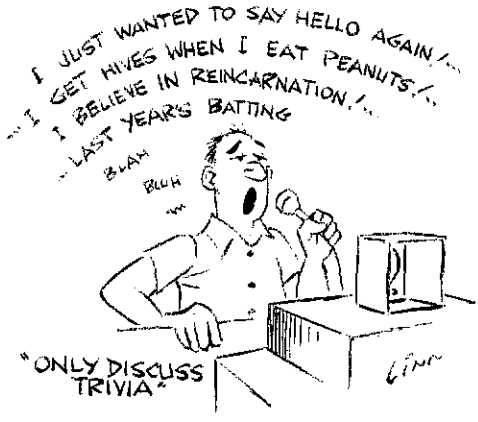
How to Achieve an Impressive DX Score

BY WILLIAM R. LOWRY,* W1RML

NUMEROUS ARTICLES have been written on the intricacies of DX operating and on how to build up a big DX score of a long list of confirmed countries. Surprisingly, all these articles have concentrated on only half the scoring process, and have ignored the other half completely. As every athelete knows, any score is relative to all other scores. For example, a five-minute mile is fast if the next best time is five minutes and ten seconds. A winning total of fifty points is high for a basketball game if the average winning score is forty points. The same principle holds true for amateur radio; so, a DX total of 200 countries confirmed is high if the average operator only has 100 confirmed. Clearly if your DX score is to look good, other operators' DX totals must be kept lower than yours. This means that while you are trying to add to your country total, you must devote some time to holding down the scores of other hams.

Those who are naive may wonder if it is possible to thwart the efforts of other would-be DXers. Of course it is! Fortunately, the techniques to use are not difficult, and can easily be mastered with a little practice. The basic idea is to keep all other operators from working DX – not all DX, of course, as the task would be beyond the capabilities of even the most enthusiastic score killer. On the East Coast, for example, every operator is bound to work the common European countries no matter how hard you try to prevent it. So, you must concentrate your efforts on preventing other operators from working rare DX.

*31 Midwell Rd., Wethersfield, CT 06109.



Basic Principles

There are a few basic, time-honored practices for doing this:

1. *Tune up on the DX station.* When you tune up your rig, never waste an opportunity to keep down someone else's score. Ideally you should find a rare DX station calling, and begin tuning your rig on his frequency just as he ends his call. A good tune-up artist can drag this out for as long as five minutes. If properly done, the DX station may well give up in disgust and not even seek a clear frequency. Don't bother to identify yourself, as there is no point in making enemies unnecessarily.

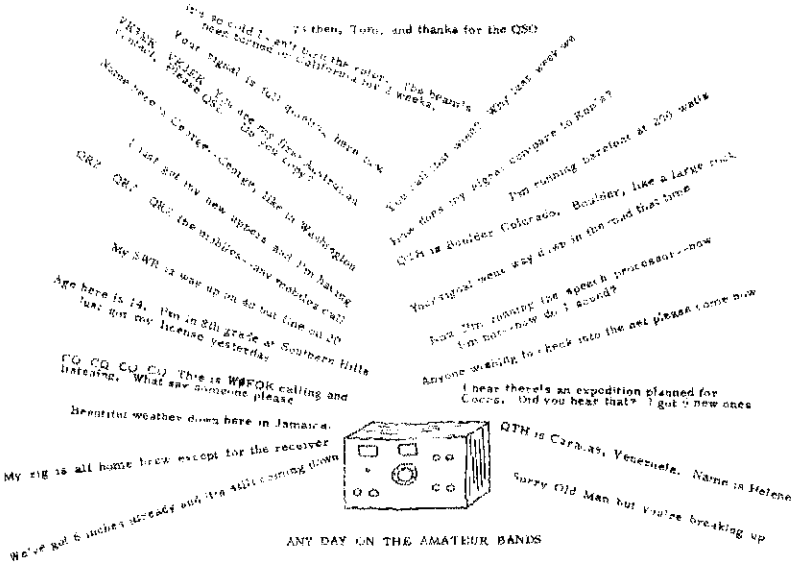
2. *Call CQ on the DX station's frequency.* This can, of course, be done when the DX station has already established contact. In this case, time your calls to coincide with the moment the DX station starts to give out QSL information. This has a highly desirable demoralizing effect on the ham he is working. Less experienced practitioners of this technique will call CQ on top of the DX station's CQ. While this can effectively disrupt communications, it has the unfortunate side effect of making other hams wonder what kind of idiot you are to call CQ when someone else is already calling CQ on the same frequency.

3. *Carry out rag chewing with local hams on popular DX frequencies.* This obviously requires the cooperation of a fellow ham, but usually you will have no difficulty in finding someone with the same motivation and spirit as yourself. The beauty of this technique is that it can be carried out for long periods of time, whereas tuning up or calling CQ on frequency have obvious time limits even when used by the most skillful operator. A drawback is that it is usually good for one frequency only. If the DX station should move frequency it is not considered proper to shift the rag-chewing to his new frequency, as then your intent becomes obvious.

Don't Despair!

If you are a purist, using these techniques may disturb your peace of mind, as you remember that the FCC frowns upon willful interference with the communications of others. In this case, you might be tempted to give up hopes of keeping down the scores of other hams. Don't despair! You can use another tactic that will let you sleep at night

(Continued on page 77)



Let's Start with the Rig†

BY MARGARET KOERNER,* WBØBEM

WHEN TWO radio amateurs meet on the air for the first time, the usual greeting procedure is to exchange locations, first names, and brief reports on how well each station is being heard and understood. Further conversation between them can take any one of a countless number of turns – expected, unexpected, amusing, amazing – but the topic which seems to come up most often, even oftener than the weather, is the equipment or "rig" which each one is using.

As a new or would-be Novice, you will hear these rig discussions on all the amateur bands, and sooner or later will be invited by a full-fledged ham acquaintance to visit his shack and see his individual choice (or borrowed accumulation) of radio equipment. That event, under any circumstances, will be an exciting and inspiring one for you, but if you have no background for looking at an amateur station, your lack of knowledge concerning terms and equipment can keep you confused and tongue-tied, unable to even *listen* intelligently.

This first installment has been designed as a pre-field trip to help with that first visit and other learning situations. It has been written to help you understand amateur radio in a beginning sort of way, and give you a simplified inventory of a ham shack and the equipment which hams include in the word "rig." It will let you have an over-all look at an amateur station and its operation, so that you can see the forest as a whole and not let a multitude of circuit trees keep you from getting that view as you study theory for your license exams. Finally, it should help you picture in your own mind that most important rig of all – the one which you, as an owner, will soon be proudly showing off yourself.

†Part I of a series.

* 2133 9th Street, Boulder, CO 80302.

Before we begin our pre-field trip, there are two problems which must be mentioned.

Problem 1: This is a primer, and primers are for beginners. Not all Novice licensees, however, are beginners. If you, as a Novice or would-be Novice, feel that as far as amateur radio is concerned you are still in kindergarten or even in first grade, this primer is being written for you. If you are way beyond that level, it isn't.

Problem 2: Primers, since they are for beginners, are supposed to be simple, easy to read, and brief. Easy reading, however, is hard writing, and to keep anything simple and brief in a field of knowledge as technical as amateur radio is a difficult, if not impossible, task.

The only realistic goal that can be set for this section and the technical portions which follow is to help some of you understand some of the questions and answers in the *License Manual* and the FCC exams better than you might otherwise understand them.

The Primer, operating as an experimental station, has its beam pointed in the General direction of Novices. Hopefully, its RST (the readability, strength, and tone of its signal) will be sufficient to achieve its goal.

The Basic Three

Every amateur radio station consists of three basic pieces of equipment: a **transmitter**, a **receiver**, and an **antenna**. The first two may be combined into one piece of equipment, a **transceiver**, but the three basics, even though disguised, are still there, and make up what is commonly referred to as the **rig**. Before you become a Novice, you will need only a receiver and an antenna, since your radio role will be that of a listener. After you get your license, or, as it is often called, your "ticket," you

will start using a transmitter as well, and someone else can then start listening to *you*.

1. THE TRANSMITTER (plus Key and Microphone)

A transmitter is essentially a manufacturing plant. It manufactures **(generates)** radio waves which, in their original form, are called **carrier waves;** changes **(modulates)** those waves so that they contain messages or information; makes them stronger **(amplifies)** them; and passes them along to the antenna, which will radiate them out into space. The final product, a message-carrying radio wave which you will label with your own individual call, is that all-important product, your **signal.**

Generating the Radio Wave

The radio wave is generated by a stage in the transmitter called an **oscillator.** The word "oscillate" means to swing back and forth or to vibrate. In a transmitter, the back and forth swing of an electric current between two special parts (a **coil** and a **capacitor**) or the vibration of a special kind of crystal, together with a tube (or transistor) and associated components, generates the radio wave. These oscillations or vibrations occur millions of times per second, and the *number of times per second*, which is controllable by the equipment used, determines what is known as the **frequency** of the wave. An oscillator which generates a radio wave is called a **radio frequency** or **rf oscillator.**

Many services other than amateur radio use radio waves for communication purposes. The FCC, therefore, has allotted certain groups or **bands** of frequencies, between definite frequency limits, for the use of each type of service. Hams call the bands they use the "20-meter band," "40-meter band," etc., since they find it easier to refer to them by their approximate wavelengths than to mention their exact frequencies. Within these amateur bands, there are still smaller groups or bands of frequencies (sub-bands) which the FCC has assigned to amateurs *according to the class of license which they hold.* As a Novice, you will be allowed to operate your transmitter only on those portions of the amateur bands which have been designated for Novice use.

In order to get your transmitter to transmit at the frequency you choose, you can do one of two things: you can plug in a **crystal** – a very small, thin slice of specially cut and ground quartz, enclosed in an appropriate holder and *manufactured for a definite frequency;* or you can use the coil and capacitor combination which is *adjustable as to frequency*. This latter type of radio frequency oscillator is usually called a **VFO** or **variable frequency oscillator.** It can be built right into the transmitter, or it can be a separate piece of equipment, electrically connected to the transmitter and adjustable for the frequency desired.

From 1951, when the Novice class of license was first set up, until November of 1972, FCC regulations required Novices to use crystal-controlled transmitters because they generate specific frequencies with a particularly high degree of accuracy. On November 23, 1972, the FCC issued a number of new regulations, and Novices can now use *either* crystal-controlled or VFO-controlled equipment. (Note: Frequency assignments for various classes of license, including Novice, were changed in November, 1972, for several of the bands, so be sure to check which frequencies are now available to you before operating your transmitter. See the latest edition of the *License Manual;* or the *Member's Guide to the U.S. Ham Bands*, which you can obtain by sending a stamped self-addressed envelope to ARRL; or some other source of current information.)

Modulating the Radio Wave

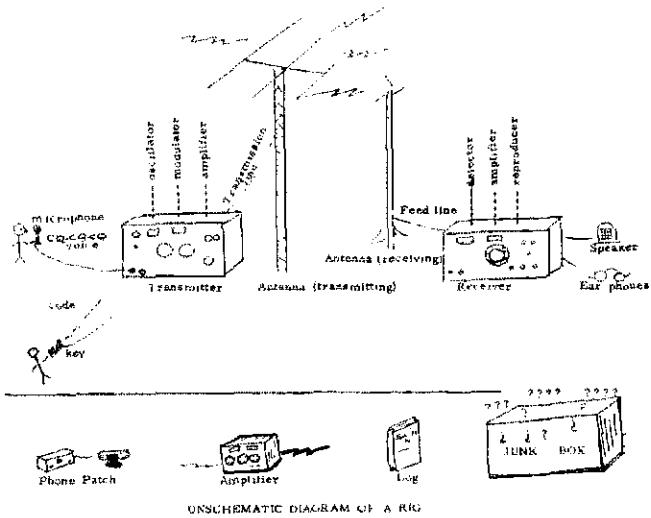
The part of the transmitter which changes the radio wave or carrier wave so that it contains a message is called a **modulator**, and the process by which it does this varying is **modulation**.

While you are a Novice, the FCC requires that your signal be sent in International Morse Code, a form of modulation accomplished by using a kind of on-off switch called a "key" as an accessory to the transmitter. With this key, the carrier wave is broken up into segments representing letters, numbers, and punctuation, and the "dits and dahs" so produced can (hopefully) be translated into messages by persons receiving them. This type of transmission is known as cw, **continuous wave** or **A1**. (The word "continuous" in the name comes from early radio usage, and so the wave is still called continuous even though it is all broken up.) People who use keys to send radio messages are often called brass pounders or finger talkers, and an operator who sends code which is very easy to "copy" is said to have a good fist.

In order to get a license, Novices and Technicians must send and receive code (correctly) at the rate of 5 words per minute. For General and Advanced licenses, 13 wpm is required; for Extra class, 20 wpm. As a rule of thumb, numerals and punctuation marks each count as two letters, and five consecutive letters are counted as one word.

The key used to help form the code can be a straight *hand key* or one of the so-called *speed keys*. With a hand key, which Novices are urged to use until they become proficient and experienced cw operators, each "dit" is made by pushing the key down for a very short length of time and each "dah" is made by holding it down three times as long as for the dit. Speeds of up to about 25 wpm or more can be achieved by a good operator with this type of key. Much faster sending can be accomplished by using one of the many types of speed keys, which operate either semi-automatically or electronically.

The most common type of modulation is *modulation by voice*, with a **microphone** or "mike" being used as the accessory to the transmitter. The microphone receives the voice sounds produced by vibrations of the vocal cords in the larynx, and creates an electrical **audio** signal which



UNSCHEMATIC DIAGRAM OF A RIG

has a much lower frequency than that of the carrier. When this audio is amplified and applied to the transmitter's modulator, the modulator changes the carrier into a message-containing radio wave designated as *A3* or *F3* by the FCC. Amateurs usually call this type of transmission **voice** or **phone**.

Since you will probably have several opportunities to use a friend's microphone while you are still a Novice, and will be using one of your own after you get your General license, two types of microphone operation will be discussed briefly here. Using what is known as *PTT*, which stands for *push-to-talk*, you actually push a small switch, which is usually on the microphone, each time you transmit. With *VOX* operation, the transmitter is triggered by voice sounds alone. With either type of microphone operation you talk *or* you listen, but you cannot do both things at the same time as is possible on the telephone or *landline*, as hams refer to it. (There are times, on both VOX and PTT, when, without meaning to, both hams *do* talk at the same time, in which case neither one of them hears anything. This embarrassing procedure is known as "doubling.")

Another type of modulation, which has been coming into increasing use during the past decade is **slow scan (A5)**, a form of amateur television. This requires the use of a special camera as an accessory for the transmitter. Like voice modulation, however, it is not a type or mode of transmission permitted on the Novice bands.

Amplifying the Radio Wave

Before the radio wave is sent to the antenna, it is often increased in power by an **amplifier**. This consists of one of more "stages" (sections) of vacuum tubes and/or transistors, and is one of the things which determines the strength of the signal and makes it possible for the antenna to send out your signal with enough power to get where you want it to go.

II THE ANTENNA (plus transmission line)

The antenna (or aerial, as it was once commonly called) performs a double service. It not only sends radio signals out into space at the speed of light (186,000 miles or 300,000,000 meters per second) but also picks up signals from other stations, and so plays the position of pitcher or catcher, as needed, with equal skill.

For many reasons, the vast majority of hams use the same antenna for transmitting and receiving. Some amateurs, however, use separate ones for these two purposes, or have different antenna for different bands. They may, in fact, have so many antennas that they are said to have an antenna farm.

The antenna is usually located at some distance from the actual operating position, and a connection must therefore be made between it and the rest of the rig. This connection is the **transmission line** or **feed line**. One of the commonest forms of transmission line is the coaxial cable or **coax** (pronounced co-ax, not "cokes"), which contains two radio-wave conductors and looks like a rubber hose. It must be "matched" electrically with the antenna, or power will be lost from the line while a signal is being transmitted or received. If you hear hams talking about the "SWR" of an installation, they are discussing how well this matching between the transmission line, transmitter and antenna has been accomplished. If they say the SWR (**standing wave ratio**) is low, they will sound pleased, and you can rejoice with them; if it is high, that is their worry, not yours – unless, of course, it is *your* installation they are talking about.

Antennas can be mounted on the roof of a house, on the ground, on a ten foot pole or a 160-foot tower, on a moving car, a ship at sea, or any other of a wide variety of places. Antennas also vary greatly in other ways, including size, number of parts, cost, general appearance, and performance. Much of their performance, in turn, depends on how well they are installed.

TERMS AND TOPICS MENTIONED IN CHAPTER I

1. transmitter
2. receiver
3. antenna or aerial
4. transceiver
5. generate
6. carrier wave
7. modulate
8. amplify
9. signal
10. oscillator
11. frequency
12. rf oscillator
13. band
14. crystal
15. VFO
16. hand key
17. speed keys
18. International Morse Code
19. cw
20. A1, A3, F3, A5
21. microphone
22. audio
23. VOX
24. PTT
25. transmission line, feed line
26. coax
27. matching
28. linear amplifier
29. sensitivity
30. selectivity
31. detector
32. demodulate
33. reproducer
34. phone patch
35. rig
36. ticket
37. 20-meter band, 40-meter band
38. copy
39. brass pounders
40. good fist
41. dots and dashes
42. wpm
43. voice or phone
44. landline
45. antenna farm
46. Q-signals: QRM, QRN, QTH, QSO
47. traffic
48. running barefoot
49. shoes, or a gallon
50. junk box
51. doubling
52. slow scan
53. speed of radio wave
54. the log
55. 1972 FCC regulations

Not explained, but mentioned:

1. coil
2. capacitor
3. SWR
4. wavelength

No attempt will be made in this chapter (though it will be attempted in a later one) to discuss how the different types of antennas do their work of sending out signals at the speed of light, or how they manage to capture anything travelling at that speed. We all know that it can be done, as witness our TV antennas. It is an awesome thing to think of the thousands of radio waves present in the air about us every second of the day or night. Fortunately these waves cannot be seen or heard as they speed through space, and so are not considered by environmentalists as contributing to air pollution. They may, however, be so-considered by hams when they interfere with the reception of desired signals, and at such times are referred to as **QRM**, which means man-made noise. Natural noise, such as atmospheric static, is called **QRN**. (QRM and QRN are examples of a long list of so-called "Q-signals" which hams have set up as a sort of radio shorthand. They are useful as time savers, particularly on cw.)

III. THE RECEIVER

The third basic part of the rig, the receiver, uses a great many different circuits and components to accomplish its work. It is expected to (1) accept incoming signals handed to it by the antenna; (2) choose one signal and reject all others; (3) sort out the message from the rest of the chosen signal; (4) put that message back into the same form – such as cw or voice – by which modulation was effected in the transmitter; (5) amplify the message; and (6) present it, through a speaker or ear phones, to anyone within listening range.

A receiver must have good **sensitivity**, so that it will be able to pick up weak signals as well as strong ones. It must also have good **selectivity**, so that it can select desired signals and reject others.

The process of sorting out the information or message from the signal is accomplished by a part called a **detector**. The detector **demodulates** (*unmodulates*, if there is such a word) the modulated wave. In a transmitter, the modulator adds the message to the carrier; in the receiver, in an opposite role, the detector subtracts it.

Finally, we have the receiver's **reproducer**, which gives us that message, in hearable form, via earphones or a speaker.

The Rest of the Rig

An endless number of variations occur even in what we have defined in this Primer as the three basic pieces of the rig. Few shacks, moreover, are equipped with just those three and nothing more, and if we use the word rig in a general sense, any equipment used in the operation of the station can be considered as part of the rig.

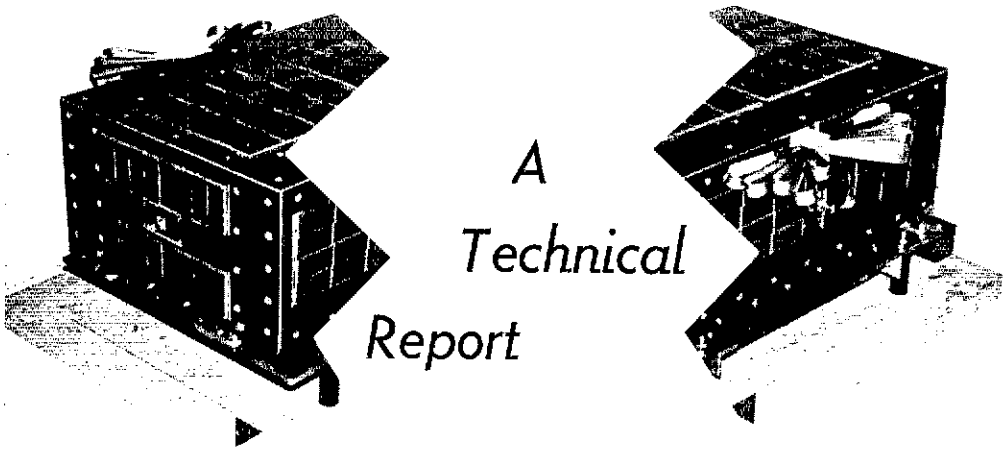
The equipment you may see in any particular shack depends on the interests of the owner, the amount of money he has to spend (or has spent), the space available, the tolerance level of his family, and the strength of his collector instinct. Out of all the possible items he may own, four have been selected for brief discussion in this chapter. The rest are being placed – at least temporarily – in the "too numerous to mention" category.

THE RADIOLOG. Every licensed amateur is required by the FCC to keep a record or log of the transmissions made from his station. This log contains certain required items of information, such as date and time, call of the station contacted, band used, type of transmission (code, voice, etc.), and information about any message or "traffic" which has been passed on, by request, to other people. This record must be kept available for one year from the date of the last entry, but most hams keep all logs permanently. Additional information, such as the location (*QTH*) and name of each person contacted is usually recorded, but is not required by the FCC.

THE AMPLIFIER. Many amateurs wish to strengthen their signals more than they have been

(Continued on page 77)

The Sixth Amateur Satellite



A Technical Report

BY JAN A. KING,* W3GEY

PART II

What makes Oscar tick?
In this article, W3GEY, the person responsible for coordinating the development and construction of the spacecraft continues with an interesting system-by-system description. Part I appeared in July QST, *page 66.*

Command Decoder System

In order to achieve the desired flexibility in the operation of Oscar 6 and to provide effective control of the spacecraft's rf emissions (since Amsat is the licensee of the two on-board transmitters), a reliable command capability was developed. The command system design finally arrived upon is very flexible and is planned for use in future flights of the amateur satellite series.

Unlike the simple analog tone decoding system flown on Oscar 5, the new command system is a digital decoder which produces a single output pulse when the proper digital word is recognized by the decoding logic. The uplink encoded command signal is comprised of a series of "1" and "0" tones which form the command word. The demodulated audio tones from the command receiver (a subsection of the two-to-ten meter repeater) are first passed through a bandpass audio filter to improve the signal-to-noise ratio of the command data. This bandpass is sufficiently wide to pass all of the tone frequencies comprising the command word. The data is then limited to remove amplitude variations in the audio. The usual limitations of a limiter are imposed here. The limiter must act on signals at the lowest useful amplitude level; however, it should not act on noise.

The limiter output passes to the "1" and "0" detection band-pass filters. The resultant outputs are then converted to the digital data with very little distortion from the original ground transmission. This is accomplished by diode pump detectors and differential limiters. The digital word is serially loaded into a shift register using clocking information derived from the logic transitions of the data itself. The data is simultaneously checked by two counters to assure that the proper number of bits are contained in the message and that a specific number of them are "1" bits. The decoder thus has *error detection* capability but no *error correction* capability. If the proper conditions are not satisfied the decoder rejects the command and awaits new data. A proper command word enables the AND gates between the register and the decoding matrix, and the data passes in parallel to the matrix where a single output is selected and held high for the period of the monostable (M-1).

The Oscar 6 system makes use of 21 command functions although the decoder, which was designed for long range needs, is capable of decoding up to 35 separate commands.

The decoder was constructed in a standard large module (7.9" × 3.4" × 1.5") or (20.1 cm × 8.6 cm × 3.8 cm) on three stacked boards. The circuitry utilizes 18 transistors and 32 integrated circuits. When no command tones are present the decoder requires about 2.5 mA of current (.025 W at 10 V), and during the decoding process requires only 3.5 mA. Dr. Peter Hammer, VK3ZPI, of WIA-Project Australis in Melbourne, Aust., worked for two years to develop this system which is providing the reliable lifeline needed between the earth and the spacecraft.

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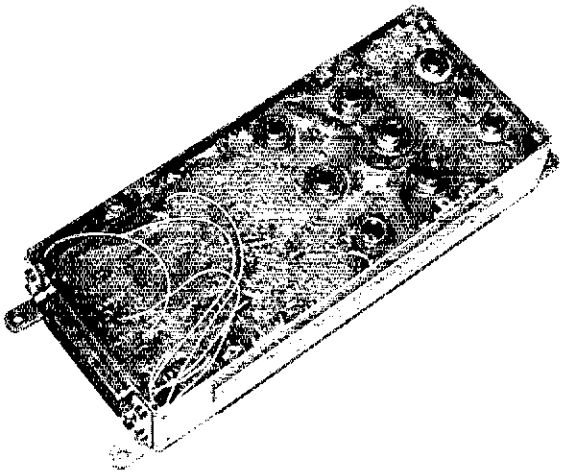
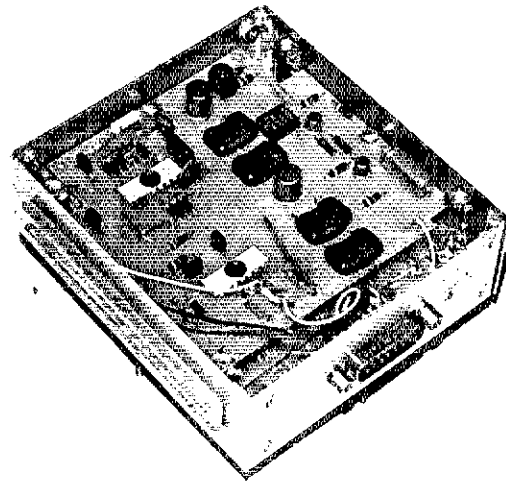


Command Decoder



Codestore

Codestore

Codestore is a novel system using a reprogrammable shift register memory to transmit fixed length binary messages loaded on ground command. In the case of Oscar 6, the shift register memory used is 896 bits in length and when the binary format used is Morse code, about 15 to 20 words can be stored and retransmitted to receiving stations on the earth using the spacecraft's 435.1 and 29.45 MHz beacon transmissions. Codestore's use in experiments is limited only by the imagination. It represents the opportunity to conduct a QSO in non-real time between any two stations on earth by storing and forwarding information from one station to the other. Such a system can be used to relay orbital information and public service announcements as well as to demonstrate emergency message transmission via satellite.

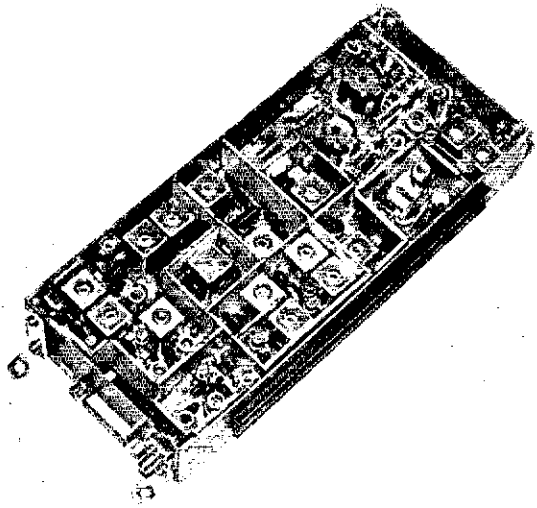
Perhaps somewhat on the elaborate side but still well within the capability of this system is the loading of Codestore data from a remote unattended platform such as a sea buoy or "hush" sensor. An experiment of this type could demonstrate how a simple spacecraft such as Oscar 6 can be used for remote data collection such as environmental data retrieval. Amsat is in need of personnel (and ground equipment) to perform such experiments, so if such ideas are of interest to you, please let Amsat know how you might help.

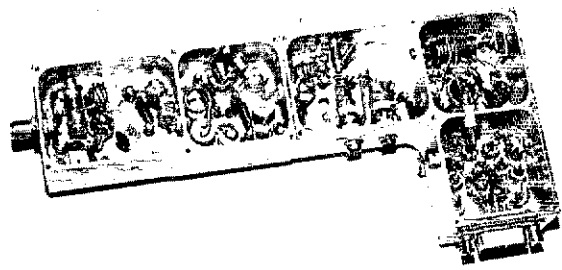
The Codestore electronics is fairly straightforward despite the novel concept of the device. Audio from the spacecraft command receiver is the source of Codestore's input data. Like the command decoder, the data consists of "1" and "0" tones in an afsk format. In this case a "1" implies *key-down* while a "0" ultimately means *key-up*. Each bit encoded actually consists of two tones; the data tone (a "1" or "0" tone) is always followed by a signal known as the autoload tone. The purpose of the autoload tone will be described shortly.

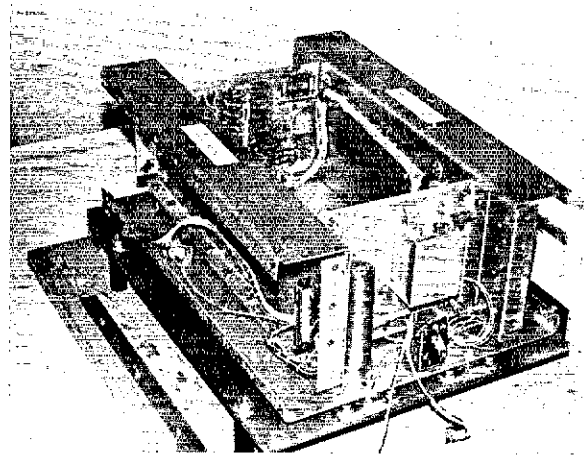
The audio input is first ac coupled to a transconductance amplifier (similar to an op-amp), operated in an open-loop configuration so that for signals above a few millivolts this amplifier acts as a limiter. The data is then fed to the "1" and "0" bandpass filters which respond only to their respective tones and eliminate the autoload tone. Due to the slow risetime characteristics of the LC network used to form the filter, additional limiter/comparator stages are used which provide the required degree of system noise immunity and produce a saturated output when the signal exceeds the established bias condition on the inverting inputs of the transconductance amplifiers.

The signals are then diode rectified to produce the proper logic levels for loading the memory. The only non-standard circuit within the design is a type of digital filter in the shift register clocking circuit (IC No. 5). The clocking information for the registers is derived from the data bits themselves in a rather roundabout fashion. When Codestore is in the load mode (ready to accept data) and if neither a "1" nor "0" logic output is high at the rectified output of the filters, the reset line of a decade counter is held high and prevents the counter from accepting pulses from the clock oscillator. When one of the data lines goes high the reset is removed and the counter begins to count clock pulses. If the data remains high long enough the ninth clock pulse will yeild an output on the No. 8 output of IC No. 5 and the shift register clock line goes high and is held in this condition until both data lines again return to the low condition which reenables the reset line.

This circuit, then, assures that short noise bursts (i.e., less than 9 clock periods) of sufficient amplitude to trigger the limiter/comparator will not be accepted as data. When the shift register clock line goes high the data at the output of the "1" filter is loaded into the memory. Thus a "1" is clocked into the memory when this line is high and a "0" when it is low. And so on until the memory is loaded. After loading, the Codestore system is placed in the run mode and the clock oscillator is continuously enabled allowing the data to cycle through the memory and to the ECL where the data may be selected to modulate the beacon transmitters. The oscillator has an 88-ms bit rate which corresponds to a Morse code speed of about 13.4 wpm. Codestore is switched to the run mode where it stays a majority of the time in an effort to conserve spacecraft power.







Above: Two-to-ten meter repeater.
Upper right: 435 MHz beacon transmitter.
Lower right: Oscar 6 internal structure.

Another circuit in the Codestore system was designated the "autoload" filter due to its functional similarity to an RTTY "autostart" circuit. The autoload tone mentioned previously occurs every half bit in the message sequence and actually proceeds the first bit in the transmitted sequence for a duration of about one second. The autoload tone is detected by a filter circuit very similar to that of the Codestore "1" and "0" filters. The rectified output of the filter charges a capacitor through a series resistor. This RC time constant establishes the time duration requirement for the autoload tone before Codestore is placed in the load mode. Once the tone has been present for about one second, the autoload circuit will generate a "load" command pulse which places the run/load latch in the "load" mode. The autoload filter then detects the autoload tone which occurs every half bit in the spaces between the data tones. A burst of current from the filter output keeps the capacitor charged above the established threshold level and the system remains in the load condition. When the message terminates and the autoload tone is no longer present, the capacitor will discharge below the threshold and a "run" command pulse is generated which allows the latch to be placed back in the run condition which begins the playback of the newly loaded message. The autoload circuit allows stations not equipped with command encoders to load Codestore directly. A backup is provided by the command system so that if the autoload circuit fails, the command system may also be used to generate the run/load pulses.

The Codestore system is contained on three small standard module boards and assembled in one of the standard modules. The Codestore experiment draws 1.2 mA of current in the load mode from the +10 V supply and only 800 microamps in the run mode. The memory board which contains 14 sixty-four bit static shift registers (more than 1800 transistors) requires 100 μA at 10 V for its normal operation! Once again, Codestore represents a space spin-off for the amateur community. The development of the Codestore hardware has demonstrated to the designers an ideal Morse code storage device which can be used for contests as well as dozens of other everyday applications. In terms of memory size, complexity and cost it is far superior to diode memories or x-y memories requiring a great deal more hardware. For example, a 2048-bit memory may now be obtained by combining two ICs[4] which together are the size of a 16 pin dual inline package. A memory of this size could hold several sentences of Morse data. If a similar sized memory using diodes were considered one begins to see the savings. Unlike many read-only storage devices, the Codestore concept is easily reprogrammable. Data has been loaded in the breadboard systems using paper tape and dot/dash buttons. A keyboard or keyer paddle could also be used.[5]

Two-to-Ten Meter Repeater

Development work on a linear two-meter input, ten-meter output repeater for use in Oscar satellites began in late 1970 with the design assistance of Karl Meinzer, DJ4ZC. The repeater breadboard was completed in the spring of 1971 and is a linear frequency-translator device designed to receive single-sideband and cw uplink transmissions in the frequency range 145.90 to 146.00 MHz, relaying them in the downlink frequency range 29.45 to 29.55 MHz.

A block diagram of the two-to-ten meter repeater is shown in Fig. 1. The repeater uses a 2N3478 rf transistor as a two-meter preamplifier,

[4]Signetics Corp. - 2533. A 1024-bit shift register in an 8 pin DIP, available for about $10.

[5]For further information on codestore ground circuits write J.A. King, W3GEY, c/o Amsat, P.O. Box 27, Washington, DC 20044.

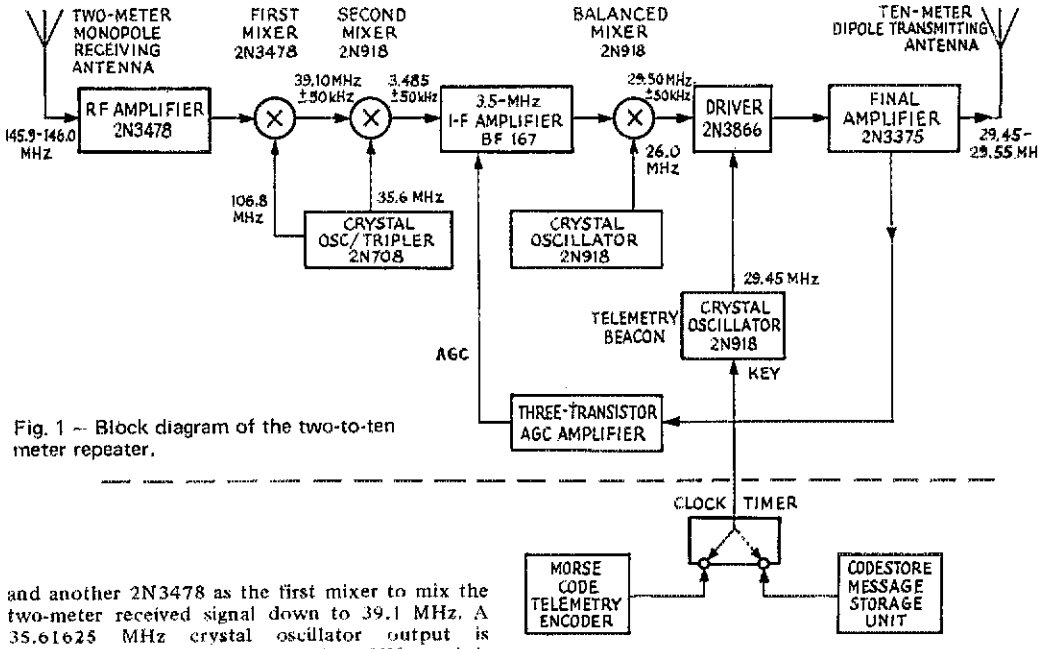


Fig. 1 — Block diagram of the two-to-ten meter repeater.

and another 2N3478 as the first mixer to mix the two-meter received signal down to 39.1 MHz. A 35.61625 MHz crystal oscillator output is multiplied by three to 106.84875 MHz and is mixed with the amplified two-meter signal to provide this 39.1 MHz first i-f frequency. The signal is then fed to a 2N918 second mixer, which uses the 35.61625 MHz crystal oscillator energy a second time to mix down to a second i-f frequency of 3.485 MHz, providing a gain of approximately 20 dB in the process.

The 3.485 MHz i-f signal is then amplified approximately 35 dB in a single BF167 i-f amplifier stage, after which it is up-converted to a frequency of 29.5 MHz in a 2N918 balanced mixer, using a 2N918 crystal local oscillator at 26.015 MHz. The balanced mixer achieves a gain of nearly 25 dB, and its maximum output is on the order of one milliwatt at 29.5 MHz. The signal is then amplified to a maximum of about 1 to 1.3 watts output using a 2N3866 driver and a 2N3375 final amplifier, both operating from the satellite's 24-volt rechargeable nickel-cadmium battery. Age voltage is developed in a three-transistor age amplifier, which senses the emitter current of the final amplifier and controls the gain of the BF167 i-f amplifier. The age amplifier circuit may be enabled or disabled by ground command. The age amplifier was designed for ssb operation and thus has been set for an attack time of .1 seconds and a decade time constant of 2.2 seconds.

The repeater also contains the beacon oscillator which operates at 29.45 MHz, the same frequency used by the last satellite, Australis-Oscar 5. The beacon signal is injected at the input to the driver stage, and the beacon is keyed by the Morse code telemetry encoder or the Codestore message storage unit, which are selected alternately at approximately 15-minute intervals by a clock timer device in the satellite experiment control logic.

The repeater makes use of input and output filtering in order to reduce spurious inputs and outputs. Input filtering consists of a bandpass circuit centered on the input frequency (145.95 MHz) and a high Q series resonant notch filter centered at 174 MHz. The notch filter was required to attenuate television band signals from interfering with the transponder on a spurious response frequency which could not be eliminated from the transponder without redesign. The output filtering consists of a triple pie-tuned lowpass network which was designed for low insertion loss and maximum attenuation of passband harmonics. It may be noticed that the system bandwidth is limited only by the normal roll-off of the parallel resonant tuned circuits in the i-f and final stages (i.e., no crystal filter was used in the design). With the Q of these circuits being quite low the burden of the harmonic attenuation is left to the output lowpass filter. It is important, in particular, that the 5th harmonic of the output, which falls close to the input passband, be attenuated as greatly as possible to prevent a possible feedback condition and desensitization of the receiver. When the output filter is properly tuned the fifth harmonic is attenuated nearly 70 dB from the full output of the repeater.

Additional circuitry contained within the two-to-ten meter repeater includes the command receiver, which has a separate i-f amplifier, detector and audio gain stages, and miscellaneous telemetry monitoring circuits so that the repeater's critical parameters may be measured.

435 MHz Beacon Transmitter

The ITU Space Conference of 1971 established the Amateur Satellite Service and provided frequencies for this purpose. Perhaps the most valuable allocation in this regard (certainly the one worked hardest for) was the frequency band from 435 to 438 MHz. In an effort to start making use of this allocation as quickly as possible it was decided to fly a 435.10 MHz beacon transmitter on-board Oscar 6. It is hoped that the experiments performed with this beacon will make an effective first use of this allocation.

Due to the higher space-loss at this frequency (nine times that at two meters) the beacon power output required is much higher than for past Oscar telemetry beacons operating in the 10 meter and 2 meter bands. The Oscar 6 uhf beacon has a power

output of 300 to 400 mW depending on the battery voltage which supplies the beacon power directly. Due to the rf power required of the beacon and the minimal power capability of the spacecraft, the most important feature of the beacon design is its overall efficiency. The final transmitter efficiency achieved was better than 25% which is nearly as good as can be done while maintaining good harmonic suppression and overall frequency stability.

Fig. 3 is a complete schematic of the 435 MHz beacon transmitter. The oscillator at 54.3875 MHz utilizes a JAN TX 2N2222 high speed switching transistor which is used in many high reliability applications in the aerospace field. The first multiplication stage is a passive quadrupler stage which employs a snap recovery diode. The double tuned circuit L3, L4 is tuned to 4 times the oscillator frequency, while the series resonant circuit containing L5 acts as a bandpass filter at 217 MHz. A buffer stage using a 2N916 provides additional gain at 217 MHz and serves to isolate the driver and final – the two keyed stages – from the oscillator, thus minimizing frequency pulling of the oscillator during key-down conditions. A 2N3866 frequency doubler provides about 25 mW of rf drive at the output frequency to the final stage. The final is a 60677 RCA uhf power transistor which was selected for high operating efficiency. The output is matched to a $\lambda/4$ monopole cut to give best SWR (about 1:5:1). It should be noted that several series and parallel resonant traps are used throughout the design to minimize spurious and harmonic outputs. All undesired signals from the beacon are more than 40 dB below the output signal on 435.100 MHz.

Other Oscar-6 Design Considerations

COS/MOS INTEGRATED CIRCUITS. The task of maintaining a positive power budget with a spacecraft capable of supplying only three watts on an orbit average is not a trivial one. Careful attention must be given to the use of each milliwatt of power and the first consideration in each design must be to minimize current consumption. Complex logic systems such as the Australis command decoder and the Morse code telemetry encoder could not have been developed within these power constraints without the use of a particular family of integrated circuits. Complementary symmetry MOS devices (designated COS/MOS by RCA, manufacturer of all such devices used in Oscar-6) make use of a complementary pair of MOS transistors in series for each active element within the device. No matter which state the element is in ("1" or "0"), one of the MOS transistors is ON while the other is OFF. Since the complementary pair are in series and one device is always off except during switching periods, the resultant current flow is zero except for very small leakage currents. Using this technique most COS/MOS devices achieve standby (quiescent) current drains of less than 10 nanoamperes (0.01 μA). Since the COS/MOS devices used in Oscar 6 were used at very low speeds, which maintains these low current drains, entire subassemblies containing 10 to 14 devices can be run on a few microwatts of dc power. An added bonus gained by using these components is that supply regulation may be poor since they will operate at any voltage between +3 and +15 V. This IC family has many other advantages such as high noise immunity as well as finding use in many quasi-linear applications since the transfer characteristic of a complementary pair has a narrow linear region. COS/MOS input impedances are typically 10^{12} ohms while the output impedance is about 800 ohms which implies that many COS/MOS inputs may be tied to a single output without loading down the driving device.

In all, 90 of these devices were used in Oscar 6, many of which were MSI (medium scale integration) devices. All except the shift register memories were tested and screened to aerospace standards by RCA and the Applied Physics Laboratory of Johns Hopkins University.

ANTENNAS AND THE ATTITUDE CONTROL SYSTEM. Fig. 2 shows the configuration of the spacecraft as it would appear in orbit. If a coordinate system is assigned to the satellite as shown, it becomes easy to explain the antenna arrangement and demonstrate the spacecraft's attitude relative to the earth. The 435.1 MHz beacon utilizes a $1/4\lambda$ monopole on the –X surface while the 2 m monopole antenna utilized for the transponder input is located on the +X facet. The 10 m dipole extends along the +Y and –Y axis, 8.5 feet in each direction. The 10 m dipole was constructed from standard 1/2" measuring tape so that it could be folded alongside the spacecraft during launch. The shorter antennas were made of .030-inch piano wire and were gold plated to provide a good rf conducting surface. These antennas were carefully folded under the spacecraft during the launch phase.

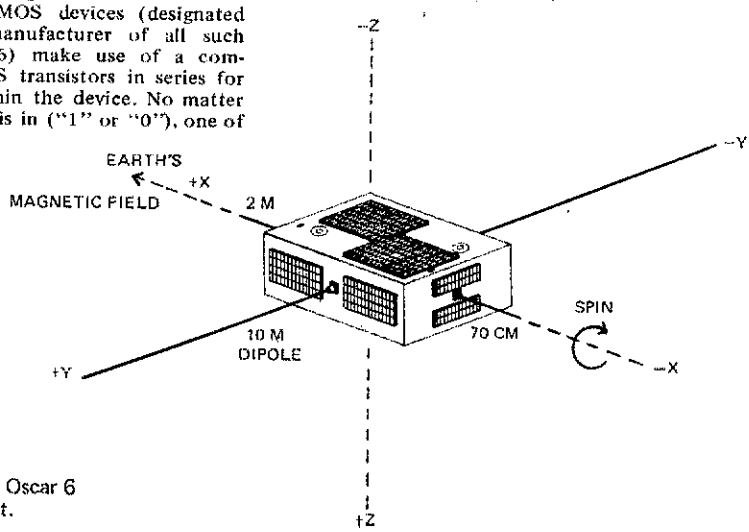


Fig. 2 – Configuration of Oscar 6 as it would appear in orbit.

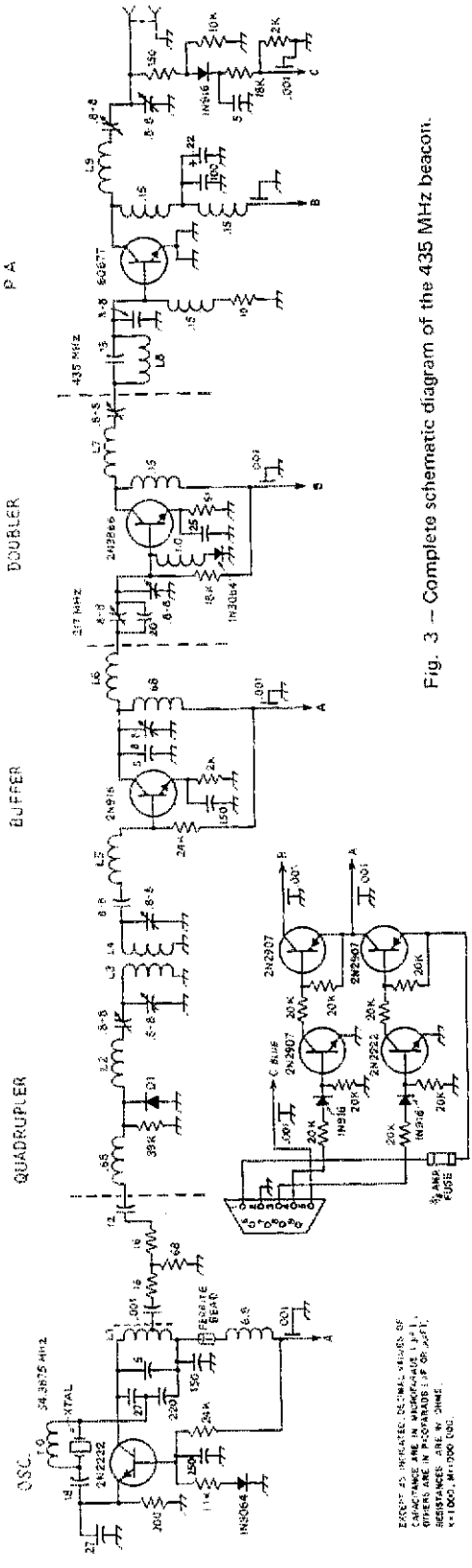


Fig. 3 — Complete schematic diagram of the 435 MHz beacon.

The spacecraft stabilization system is identical to that of Australis-Oscar 5 and makes use of the earth's magnetic field to cause the spacecraft to rotate about one axis twice per orbit. For details on the magnetic capture system the reader is referred to an earlier article summarizing the results of Australis-Oscar 5.[6] A strong permanent magnet was mounted in Oscar 6 parallel to the X-axis (i.e., parallel to the 2 m and 70 cm antennas). The net effect of this orientation is that these antennas always favor stations at medium latitudes (between 45°N and 45°S. The spacecraft spins about the magnetic axis and thus the 10 m antenna rotates as seen from the earth, resulting in tip nulls which are periodic in nature. To avoid this undesirable effect, to some extent at least, the spacecraft spin rate is reduced by a set of 12 hysteresis damping rods oriented perpendicularly to the magnet (X) axis. These permalloy rods, made of soft iron, cut through the earth's magnetic flux lines as the spacecraft spins about the X-axis and "absorb" rotational energy about this axis. After a few months in space the satellite's spin rate has now slowed to a few rotations during a pass over any listening station. The spin rate will eventually dampen to almost zero. Most of the fading heard on 10 m at the present time is probably because of polarization and the ionospheric effects. Occasional antenna nulls will, however, continue to occur and will be perhaps as long as a few minutes duration.

Acknowledgements

In a program of this sort it is difficult to give proper credit to all those who have given of themselves to bring about its successful completion. Perhaps it would be a simpler task to thank the entire amateur fraternity for their support of the Oscar 6 program. The monetary contributions and many letters of comment and encouragement were most instrumental in the successful launch of Oscar 6. The international acceptance of the Oscar program has been and will continue to be a driving force to assure the future of the Amateur Satellite Service.

Since this article has been a technical review of Oscar 6 I wish to acknowledge, in particular, those individuals and groups (or corporations) who have made major contributions toward the design and construction of the spacecraft.

Amsat is most grateful to the following organizations for their donations to the Oscar 6 effort: National Aeronautics and Space Administration (Delta Project Office) and Goddard Space Flight Center: launch of Oscar; RCA Corporation: donation of COS/MOS Integrated Circuits and rf transistors tested to Aerospace Standards; Therm Corp (under direction of Bob Sprole, W2QJT): fabrication of most of the mechanical parts for Oscar 6; Yellow Springs Instruments (YSI): donation of thermistors for Oscar 6 and AOB; Motorola Semiconductor Products: donation of rf and switching transistors and technical support concerning device applications; Texas Instruments Corp: donation of TTL integrated circuits; J.W. Miller Corp.: donation of rf coil forms and other inductor materials used in the 2 m/10 m repeater; National Semiconductor: donation of operational amplifiers used in Oscar 6; Transco: donation of Aerospace coaxial relays; Communications Transistor Corporation (CTC):

(Continued on page 106)

[6] Australis Oscar 5, Dec. 1970, *QST*.

In May at Rochester, N.Y. and again in June at Orlando, Florida, A. Prose Walker, W4BW, Chief of the Amateur & Citizens Radio Division, FCC, addressed hamfest and convention gatherings on "Electronic Exploration or Social Discourse." It was a particularly searching look into present-day trends in amateur radio and what they might portend for the future. Reproduced here are the portions of his talk we believe deserve particular attention by the body of amateurs.

Planning for the Future

BY A. PROSE WALKER, W4BW

QUESTIONS like the following occupy some of our thinking at the Commission. We think they have a significant relation to our future.

1) Should the licensing structure of the Amateur Service remain "as is," or should there be a "no-code" license framework above 144 MHz with which to attract *greater numbers* of people who say that the code requirement is the main reason they are not amateurs? If the answer is yes, what kind of a licensing structure should it be, and what privileges should accompany each class of license?

2) Would you redefine the scope of the Amateur Radio Service? Should it be different from that contained in Section 97.1 of the Rules? If so, in what manner would you revise it and what goals should apply to any such revision of the "basis and purpose" of the Amateur Service?

3) What should be done to enable maximum utilization of all facilities at our command to provide emergency communication to our nation in time of disaster and crises? Should the Amateur Service as a whole including RACES, AREC, the Disaster Service and Citizens Radio Services be organized in such a manner that whenever and wherever an emergency occurs, someone would be available to provide communications? How should such a program be carried out and *who* should take the initiative in making the proposal?

4) The Commission is giving thought to a different examination system for Amateurs than presently used. Certainly, giving amateur exams is not very efficient use of engineering talent. Suppose we *should* make some change in the system, is it possible that our examinations could be administered properly by some other organization?

Could it be handled satisfactorily by the ARRL with the necessary safeguards to ensure the integrity of the examination system?

Should it be administered by the Civil Service Commission who could use examination points in about 200 cities, contrasted with the 60 which FCC now uses?

If we have a sufficient number of examining points, would there be any further requirement for the Conditional Class license except for the ill and physically handicapped and the military man overseas?

5) We have around 30,000 Conditional Class licensees now, and without doubt many of them obtained their licenses fraudently. Even after moving to a city where there is an FCC Office, many refuse as long as possible to take the examination, and what they dream up as reasons would make your head swim!

What should we do with such licensees?

Give them a period of time within which to take the exam or revoke their license?

Should we make the Conditional Class license non-renewable?

Should we limit their operating privileges to something less than the General Class, who *have proven* their qualifications by taking the supervised exam?

or

Should we be big-hearted and "grandfather" them all in as General Class licensees even though we are reasonably sure that a high percentage are not qualified?

What *is* the best combination of things on this subject *for the good of Amateur Radio?*

6) After more than 50 years of Amateur Radio and technological advances from semaphore to satellite, is it judicious or unwarranted to ask the amateur service to accept certain technical standards applicable to either their commercially purchased equipment or their emissions on the air? It has been traditional that no such standards, except for minimal requirements treating with interference capabilities such as harmonic and spurious emissions, have been applied to the Amateur Service. The original reason for this was that amateurs once designed and constructed their own equipment and therefore such standards could not be imposed. But those days are past. Nowdays, most amateurs purchase commercially manufactured equipment.

Would it be in the interests of the amateur purchaser to know that equipment could be relied upon to meet certain minimum standards and be worth his money?

Such standards could include occupied bandwidth, harmonic distortion, spurious emissions and related criteria, perhaps involving incentives for having a clean, narrow-band signal, such as a "power-bandwidth relationship" (but nothing as ridiculous as some of the figures that have been carelessly offered in derision of the idea).

7) How can we improve the rule making process within the structure of the Administrative Procedure Act; Evaluation of petitions on file

indicate that most of them are submitted with a particular personal objective in mind by the petitioner. Generally, little or no consideration is given the overview of the service structure; the ramifications of the proposal on others; would it be in the interests of the Service as a whole? There appears to be a requirement for much better liaison and coordination among amateurs before petitions come to the FCC. We spend an inordinate amount of time on individual petitions. With some coordination, a great deal more could be accomplished by dealing with major substantive proposals. You may provide your own answer to the mechanism of doing this.

8) You know that subsequent to the last general World Administrative Radio Conference of the I.T.U. in 1959, there have been significant developments in both submarine cable expansion and satellite communication. It is a new "ball game" now, and perhaps *we can hope* that in the future it may be possible to either *expand* existing HF amateur bands or even *obtain some additional ones* at appropriate locations in the spectrum. In this work, which has *begun already at home* and will eventually go into the international arena via the ITU, the hard questions will be asked, and must be answered:

> What is the significance of whether amateurs can communicate between any two points on earth for a maximum period of time?
>
> Is it necessary or desirable for amateurs to communicate any better than they do now, and if so, for what reasons other than a pastime?
>
> What contributions to scientific knowledge could be made by the addition of some amateur bands?
>
> What contributions to international relations would be realized?
>
> If affirmative to the latter, how would it be accomplished? – through DX contests? . . . general communication? . . . exchange of certain scientific data?
>
> . . . could amateurs accept the challenge of emergency communication on a worldwide basis as possible justification for obtaining more bands? . . . if so, what kind of organization and planning would be required and what are the frequency requirements for such a service?
>
> What is our program for implementing the Amateur Satellite Service which was provided for us by the ITU at the WARC-ST in 1971?

9) In view of the forecasts of the world's amateur population by the year 1980 (around 1,000,000 amateurs) we must face the probability of greatly increased congestion in the hf bands. If the ITU made a valid decision when it decided that amateur radio is a "Service," then we must not exceed the level which would discourage a large number of amateurs by reason of interference. The subject suggests additionally that efficient utilization of the bands may be required. Techniques must be employed to reduce occupied bandwidth and improve communication efficiency so we may accommodate the greatest number of amateur signals within the minimum number of kHz per band.

If you make certain reasonable assumptions of normally used transmission rates in wpm for cw, RTTY (both narrow and wide shift), ssb, dsb, nbfm and wbfm, throw in *bandwidth required*, and compute the possible words/minute/kHz you find some startling answers. If you choose a band segment of 100 kHz in the hf spectrum, you find that within that segment you can accommodate 1000 cw signals, 333 narrow shift RTTY, 100 wide band RTTY, 33 ssb signals, 16 dsb, 16 nbfm and 3 wbfm signals. Keeping our units straight in relation to Hertz and kilohertz vs. wpm/kHz we find that those 1000 cw stations can transmit 200 wpm per 100 kHz; the 333 narrow-shift RTTY stations 200 wpm/100 kHz; the 100 wide-shift RTTY stations 60 wpm; the 33 ssb stations from 41-67 wpm depending on how fast you talk; the 16 dsb stations from 20-83 again depending on your talking speed, the 16 nbfm the same figure, and the wbfm stations a measly 3.57 per 100 kHz. If we do not obtain any additional amateur bands and if the world's amateur population grows at the forecast rate, our chief problem will be to accommodate the maximum number of amateur signals within the minimum number of kHz per band. Think it over!

10) Our present method of utilizing amateur bands makes no overall provision for unrestricted experimentation because the entire bands are devoted to *simply communicating* with stipulated emissions in the respective sub-allocations. This is generally true throughout the world, although there are more sub-allocations in some countries than others because of the greater number of amateurs.

> Would there be merit in setting aside portions of certain amateur bands for such experimentation?
>
> If so, what types of experiments should be conducted and what would be hoped for as accomplishments?

Perhaps this kind of attention to experimentation would tend to bring amateur radio a little out of the *social* and back into the *technical* area. Would this perhaps be an inducement for various administrations of the world to look more with favor on the amateur service? As an example, the establishment of "experimental" sub-allocations might stimulate experiments in such esoteric modes of communication as pseudo-noise multiplex communication where you are dealing with a negative signal/noise ratio, redundancy and error correction techniques, and other similar technical matters. *Please do not misunderstand me*, I'm not suggesting that all of amateur radio be devoted to things of this nature. There will always be a price for the amateur who just wants to talk to a fellow "ham." But it perhaps is becoming the main purpose of amateur radio to *socially communicate* rather than the more *basic reasons* upon which to *depend for the continuation* of Amateur Radio.

If the Commission finds it desirable to issue either a Notice of Proposed Rule Making or a Notice of Inquiry on any of these issues, it means that *we are asking for your thoughts and advice on them.* Do not use the opportunity to vent your spleen at the FCC because they didn't do something else you wanted! Submit your well-reasoned arguments, to convince us of the correctness of your position, substantiated with fact, not emotion or fiction. Don't let your sentiments about your hobby blind you to the purpose for which you are writing your comments. You want to convince the FCC that *they* should do what *you* propose! The only way to do that is with convincing, substantiated information. That is not the easiest thing to do, and probably is why we receive many emotional comments, devoid of pertinent factual information. Use the prerogatives you have under the Administrative Procedure Act to submit com-

(Continued on page 106)

How to Achieve

(Continued from page 64)

untroubled by visions of pink tickets. It is especially useful on the phone portions of the DX bands, but it has been observed occasionally on the cw portions as well.

4. *Work the DX station yourself.* If you have already worked the DX station before, by all means work him again – and again – and again! Remember, every time you work him, someone else can't. This is especially important during the declining phase of the sunspot cycle. If you block someone now, it is possible he might not have another chance to work the DX station for a number of years.

You should realize that this tactic has a secondary purpose of keeping other operators discouraged and demoralized. (You might even get some of them to quit ham radio.) To attain those objectives, the following must be observed: *Quickly establish the fact that you have worked the other operator before.* A good way to do this is to remark casually, "I just wanted to say hello again." Not only will this infuriate all the other hams listening who have not worked him before, but it will also indicate that you have nothing important to say, which is the second principle to follow in this situation – *only discuss trivia.* If you talk about something important, the other hams who are listening and waiting will understand and standby patiently. But if you discuss trivia – you may literally drive some of them up the wall! If you find it difficult to find something unimportant to say, you can always discuss details of your equipment, even though you have covered this subject very thoroughly in past QSOs. Don't worry. Most DX operators are polite and will not remind you that you have. And of course, the bigger and more elaborate is your equipment, the more you will discourage the average ham who can't afford that kind of setup. An optional tactic is also available when working the DX station. *Ask him to listen for a friend.* This is recommended only in the case where the friend has also worked the DX station before. Be sure to pick someone who can be relied on to follow the principles previously discussed in this paragraph.

This brief review of currently popular techniques should be enough to get you started. After you have attained a reasonable degree of proficiency in each tactic, try combinations of them. Invent new ones! Observe others in action, and copy their techniques! While all this may be somewhat time consuming, remember it is a very important aspect of making your score impressive, and as your proficiency grows, you will have the added satisfaction that comes from doing anything well. QST

Let's Start With the Rig

(Continued from page 68)

amplified by the basic transmitter, so they build, buy, or borrow an extra piece of equipment to do this. If you are listening to a radio conversation or *QSO* (often pronounced Q-so) and hear someone talking about his "linear," he is referring to an additional amplifier often used in voice communication. If he says he is "running barefoot" he means he is using only his transmitter; if he has "shoes" on, or is running a "gallon" (full legal power) he is using an additional source of power.

THE PHONE PATCH. This small piece of equipment (not used on Novice bands) connects the telephone to the rig, and is used for service to the public. By this means friends are united, relatives receive important family news, and sudden plans or changes of plans can be made even while one of the amateurs is mobile. In times of disaster, phone patch traffic to and from affected areas is widespread, and hundreds of phone patch messages – some of them heartbreaking, most of them heartwarming – are handled by ham operators. Running phone patches can be one of the most interesting and rewarding activities of amateur radio.

THE JUNK BOX. This is not a single item of equipment but rather a long time accumulation of equipment, pieces of equipment, pieces of pieces of equipment, and objects that were never meant to be pieces of equipment but in an emergency might conceivably double for them. They may all be contained in an actual box, but many of them are too big, too strangely shaped, or too something to be contained in anything, so they are placed under, over, and behind furniture in and outside of the shack. Wherever they are placed, they require careful guarding. Unseen forces move them around or carry them off; seen forces demand their removal, or at least their shifting, at frequent intervals. And no insurance policy has yet been written which will adequately cover their value.

Amateurs enjoy helping other amateurs, so all junk boxes hold items which are kept on hand to lend or give to beginners or other hams who will be delighted to receive them, as thousands of grateful amateurs will testify. Also included are all those items which the owner hopes he can someday swap for things he needs that someone else has in *their* junk box and may be hoping to swap, in turn, for things in his.

If all the junk in all the junk boxes in all the shacks in all the homes of all the radio amateurs in all parts of the world could somehow be put into one giant junk box . . . . Well, *think* about it, anyway.

[NOTE: In order for the rig to do its work of transmitting and receiving, it must have some source of power. That source, *electricity*, will be discussed in a later part.] QST

Strays

Stolen Equipment

A VW camper containing a Drake ML-2, No. 10582 (had broken on-off switch) was stolen. Notify Lawrence W. Briggs, W3MSN, 5108 Boulder Dr., Oxon Hill MD 20021, or the Prince George County Md. Police.

– . . . –

A Drake TR-4 was stolen in Sunset Hills, Mo. from Lee J. Delworth, WB6RDW, 1125 N. Gardenia, Lompoc, CA 93436. Reward offered.

The Post Office Department promises faster mail service with Zip codes. Use Zip codes.

AMATEUR RADIO PUBLIC SERVICE

NTS RACES AREC

In the Public Interest, Convenience, Necessity HRH

CONDUCTED BY GEORGE HART,* W1NJM

MISSIONARIES

MISSIONARY WORK HAS BEEN going on for centuries. It is the basis of many cultures in civilization. Today, amateur radio is involved in it, communicating to and from religious missions all over the world with personal and morale traffic to assist in the good work of spreading humanitarianism in the name of religion.

But as beneficial as this type of missionary work is, it isn't what we intend talking about in this month's column. Because, you see, the word "missionary" can be applied to many people other than those wearing clerical collars and performing conversion or other duties pertaining to a church or denomination. It can be applied to anyone involved in a task having to do with persuasion to a cause.

It is said by some that the only *QST* readers who read this column are those having a special interest in emergency or traffic work. We hope this is not strictly or entirely true; but we are sure that there is a large element of truth in it, that most of the readers are in this category. Nothing surprising or dismaying about it either, really. No doubt most of the readers of the DX column are DXers and most readers of the VHF Column are VHFers, too – although we'll wager the YL column has *quite a contingent of OM readers!*

The point we are trying to work up to (and about time, too!) is that since public service work is less pure, unadulterated fun than most other ham radio pursuits, and since there is a greater necessity for it in safeguarding the amateur's future, the need for missionaries is paramount – missionaries who can and will spread the word, preach the gospel, beat the drum for better, more organized emergency preparedness, more efficient net operation and, above all, more participation by *the brethren in this important amateur radio* activity.

Where will these missionaries come from? From you, friends – you who are reading this column because you are among the relatively few who are interested in amateur radio public service. One naturally conveys one's interests to one's friends, families and acquaintances, but in this particular field there is an even greater necessity for it. Just as heathens don't usually flock to religion without being enlightened, amateurs don't usually take part *in public service operating activities without being* initially persuaded to do so. That's where you missionaries come in.

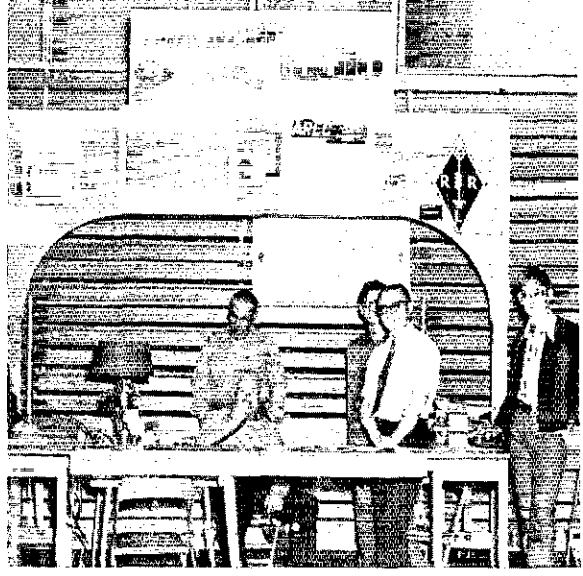
Let's all be missionaries for public service. Don't leave it to your AREC, RACES or NTS leaders. Look at it this way, you are sharing something that you find satisfying, enjoyable and altogether worthwhile in amateur radio – the knowledge that you are doing something far more elevating than catering to your own whim for personal pleasure. You are part of a minority that is contributing a great deal more than its share to the betterment of the service we all love. Be proud of it, and let your friends, fellow club members, convention attendance acquaintances, on-the-air contacts and every other amateur you come in contact with know it. And let them know why. And lead them in the path of righteousness, amen. Be a missionary for amateur radio public service.

*Communications Manager, ARRL.

Guest Preacher

We are indebted to WN4ZIN for sending us copy of a "sermon" by WA4FFW, EC for Alamance County, N.C., which he mailed to all local amateurs. We present a boildown herewith, omitting quotes because we have liberally para-

On May 5, the Pensacola FM Repeaters Assn. participated in a Bike-Hike sponsored by the Escambia Co., Youth Assn. Fifteen checkpoints were manned along the 50 mile course with the central base of operation at the starting point. KØBAD is shown at the central operating position while WB4QNW confers with a hike official.



Some 800 persons visited the amateur radio booth displayed by the AREC 10B Kansas group at an exhibit at a regional science fair held in Pratt, KS, on April 13. Seated is WØBZL and standing (l. to r.) are WØTEC, a visitor, WBØIXU and another visitor. *(Photo by WØOF)*

phrased and adapted to make it general. Give WA4FFW credit for the thoughts, but don't hold him responsible for the phraseology.

During the past year there have been several tragedies, one being the devastating Agnes Flood, and more recently the disastrous earthquake in Nicaragua. Ham radio again supplied the initial and only communications link from those areas to the outside world. It is easy for us, sitting in a nice warm home reading about it in the paper, not to be stirred by such tragedies; but when you monitor the bands and listen to messages of distress and agony pouring out of the stricken area, it's a different story.

No one ever knows when such conditions will occur here. According to the rules which allow us to enjoy amateur radio, each and every amateur has a moral obligation to prepare at least himself if not his station to serve in the event of emergency. The emergency does not have to be in your own back yard. Stricken people in far-away areas need someone in other parts of the world who know how to receive and relay their messages to proper destinations often thousands of miles distant. It takes amateurs with training to do this – training you are not required to have to get your license, training you cannot acquire by chewing the rag, working DX, participating in contests, even building complicated gear.

Sure, we all say we would help in time of need, but do we? And are we qualified? How many of you know how to put a message in correct form for transmission? How many really know the correct phonetic alphabet? How many know how to count the number of words or groups in a message? One cannot become ready for such things unless he spends the necessary time to prepare himself and equipment. Not everyone can afford emergency power, or to take time off from work or participate in organized traffic nets, or attend local planning sessions, but each and every one of us could devote some time assisting in the organization of a local emergency group, and each of us could perform one or more of the above at one time or another. Newcomers, old timers, all in between, novices techs, generals and above, all are eligible. Some amateurs operate daily, some weekly, some monthly and some never, but they continue to renew their licenses. I often wonder if any thought is ever given by the average amateur to the number one reason why we are entitled to obtain an amateur license to begin with, public service? How many of us have ever actually done any public service work? With our great numbers and vast reservoir of skills, there is no reason why we could not become a large and useful emergency communications medium.

It is downright disgusting for a country with the amateur population of ours to have 30,000 (about 11%) members in its emergency-preparedness organization. There is not a single amateur, when reading about emergency communications handled by amateurs, who does not feel proud. Why, then, don't more come forward and share in the efforts?

If you want to fulfill the ethical and moral obligations you owe to amateur radio and join in with the others who care about the welfare of the general citizenry, get in touch with your ARRL emergency coordinator, your c.d. radio officer, your NTS net manager, or takes steps to set up something along these lines if none now exists. Remember, experience is a hard teacher because she gives the test first, the lesson afterward. – *W1NJM.*

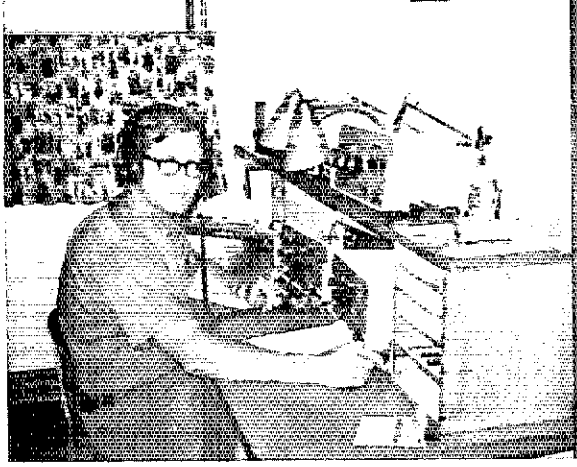
More REAL WINNERS

February 1973 *QST* (page 68) listed 11 clubs known to have curtailed or cancelled their Field Day activities to devote their energies to emergency communications connected with Hurricane Agnes and were identified as the REAL WINNERS OF FIELD DAY. A supplementary list of three more clubs appeared in May 1973 *QST* (page 87). Three other similarly deserving clubs have been brought to our attention:

- Amateur Radio Club of Kodak Office Recreation Club, WA2MBW, Rochester, NY.
- Howard County Radio Club, Ellicott City, MD.
- Rochester Amateur Radio Association, K2JD, Rochester, NY.

Traffic Talk

■ A recent Texas CW Traffic Net Bulletin reminds readers of a few points that net stations should keep in mind when they report into a net. Although aimed at cw net operation, the principles apply equally well to most voice net



Central Area Net Manager WA0MLE is shown here on the left at his home operating position. At the right Dave is pictured with (l. to r.) VE4LG, RM; VE4EA, ORS and former RM; and VE4FQ, SCM during an informal meeting in Winnipeg last March.

operation. "Once you check into a net you are to stay there, unless you get QNX from the NCS or ask to be excused. Don't just disappear into thin static air! If you find it necessary to leave for a few minutes let the NCS know. Check to be sure you are zero beat! It's pretty hard for an NCS, with a modern selective receiver and loud static to hear you if you're too far up or down and he does not have time to hunt for you! Failure to be recognized by NCS the first time may be because you're not zero beat. Or perhaps HE hears some weak station you DON'T and is waiting to answer him. To copy a message in bad QRN may not be fun, but it's mighty good training for the time YOU may be in an emergency area trying to send and receive messages."

■ *Procedural points.* The "place of origin" in the preamble of a message is not always the location of the originating station; it is the name of the city or town from which the message was started. If an "out of-towner" is visiting with you and files the message at your station, use your town as the "place of origin." However, if the message is sent to you by mail, telephone, or otherwise not in person, from a town other than yours, *that* town should be used, not yours.

■ *National Traffic System.* Daytime National Traffic system has been operational for several months now. The Continental Traffic Net meets daily at 1730 GMT on 14313 kHz. Some region nets are very active and doing well despite generally poor band conditions. A few region nets are struggling along without much support from "traffickers" within their region. Still other regions have no appointed leaders and no region nets. DNTS is currently in a trial period and will be for several more months. For DNTS to be successful, we need dedicated leaders and interested supporters. Presently, there is no leadership (i.e. net managers) in the Central Area (see December 1972 *QST*, pages 51-53) and in the Eleventh Region (Eastern Canada). Your help is needed. Check with your section net to find details of DNTS activity in your area. DNTS needs *you!*

■ *May reports.* Lots of NCS trainee activity on EAN in May because of vacations, business trips etc. says K2KIR. CAN is still plagued by poor conditions on both 80 and 40. W1EFW cites the need for more traffic on 1RN. Such scarcity is hard to understand and makes it seem futile to brave the conditions for so little traffic. K2KTK is pinch-hitting for W2FR on 2RN and indicates that Howie will be issuing certificates again when he returns to the helm. One session of D2RN saw 76 pieces of traffic being passed! May was the first 100% rep. month on 3RN since Mar. '72. W3NEM hopes it will continue. WA3QOZ is having trouble finding stations to operate 20 meters and represent D3RN on CTN. D4RN activity is still hampered by bad conditions. Plans are being made for an RNS meeting at the No. Alabama DX Club Hamfest in August. TWN is having better luck with conditions on 80 than the skip on 40.

A family affair? You bet. The Nail family (l. to r.) WN6IZE, WB6CBW, W6BSW and WN6IZC helped man the amateur radio booth at the Oakland (CA) Hobby Show held Apr. 6-8. WA6BBG (extreme right in picture) coordinated the event. This was the fourth year for appearing in the show and plans are now underway for next year's participation.

Net	Sessions	Traffic	Rate	Avg.	% Rep.
EAN	31	1387	1.042	44.7	97.8
CAN	31	877	.690	28.3	98.0
CTN	26	176	.114	6.8	41.2
1RN	62	422	.330	6.8	96.8
2RN	62	565	.693	9.1	99.0
D2RN	30	140	.436	4.6	63.2
3RN	62	511	.477	8.2	100.0
D3RN	28	94	.224	3.4	84.6
4RN	56	447	.354	8.1	89.1
D4RN	11	19	.084	1.7	25.3
RN5	62	696	.353	11.2	93.6
RN6	62	671	.456	10.8	100.0
RN7	62	305	.363	4.9	51.8
8RN	56	310	.295	5.5	84.4
D8RN	22	30	.109	1.4	38.7
9RN	62	365	.374	5.9	92.7
TEN	62	520	.410	8.4	85.5
ECN	62	210	.244	3.4	93.6
TWN	60	295	.214	4.9	63.5
TCC Eastern	123[1]	591			
TCC Central	91[1]	426			
Sections[2]	3286	13458			
Summary	*4195*	*22515*	*EAN*	*5.5*	
Record	*3237*	*29677*	*1.313*	*18.4*	

[1]TCC functions not counted as net sessions.

[2]Section and local nets reporting (96): APSN (AB), MTN (MB), APN (Mar), Champlain Mininet, GBN ODN OPN OQN (ON), WQ-V/UHF (PQ), AEND AENM AENO (AL), ATEN (AZ), OZK (AR), NCN Org.Co.40M-AREC SCN (CA), SSN (CO), CN CPN NVHFTN (CT), DEPN DTN (DE), FAST FMTN FPTN GN NFPN QFN TPTN VEN (FL), GSN GTN (GA), IMN (ID, MT), ILN (IL), KPN KSB KSWX QKS-SS (KS), KYN/KSN (KY), LAN (LA), SGN (ME), MDCTN MDD (MD-DC), EMN EM2MN WMN WMPN (MA), MNN (MI), MSPN PAW (MN), MNN MSBN (MS), JC2AN MOSSB MSN WEN (MO), MTN (MT), NJN NJPN NJSN (NJ), NLI NYCLI-VHF-TEN NYS (NY), CN THEN (NC, SC), BNGMEN BNR COAREC-10M OSSBN (OH), OLZ OPEN (OK), BSN OSN (OR), EPA GCRN KSSN WPA (PA), TNN (TN), TEX TEX-SS TTN (TX), BUN UCN (UT), VN VSBN (VA), NSN WSN (WA), WVPN (WV), BEN BWN WIN-E WIN-L WSBN WSSN (WI).

Transcontinental Corps

W3EML reports poor conditions and mix-up on a few sked times yield more unsuccessful functions and trimmer traffic totals. A TCC-Central certificate has been earned by WB5FDP. In April, K5MAT issued a TCC-Pacific certificate to WBØAXW.

Area	Functions	% Successful	Traffic	Out-of-Net Traffic
Eastern	123	82.9	1575	591
Central	91	85.7	960	426
Summary	*214*	*84.5*	*2535*	*1017*

The TCC roster (May): Eastern Area (W3EML, Dir.) – W1s BJG EJI NJM QYY, W2s FR GKZ, WA2s CNE ICU UWA, W3s CB EML, K3MVO, WA3OGM, W4s SQQ UQ, K4s FAC KNP, WB4s OMG SGV, W8s PMJ VDA/4, K8KMQ, WA8PIM. Central Area (KØAEM, Dir.) – W4OGG, K4BSS/4, WB4s KPE YCV, W5s GHP MI QU SBM TNT, WB5FDP, W7WAH/5, W9s CXY DND, WØs HI IYP ZHN, KØDDA.

Independent Net Reports (May)

Net	Sessions	Traffic	Check-ins
20 Meter ISSB	23	1872	355
North American Traffic	27	302	511
Mike Farad	26	79	203
Early Eighty Free	31	101	143
Northeast Traffic	31	207	259
Ohio Valley Teenage	35	100	320
7290 Traffic	44	432	1691
YL	5	17	16
Clearing House	27	228	374
Hit & Bounce Slow	16	75	117
IMRA	50	672	1756
75 Meter ISSB	31	342	1290

BRASS POUNDERS LEAGUE

Winners of BPL Certificates for May Traffic

Call	Orig.	Recd.	Rel.	Del.	Total
W3CUL	229	984	901	74	2188
KØONK	118	587	525	15	1245
W1PEX	90	596	488	41	1215
WØWYX	57	417	114	299	887
W3VR	159	311	263	19	752
WA3IYS	54	278	270	2	604
WB4AIW	20	283	234	49	586
K3PIE	25	274	258	16	573
WA8MCR	5	282	258	24	569
K4SCL	101	258	151	20	530
WA9EED	31	306	172	11	520
WNØHTR	175	242	8	90	515

BPL for 100 or more originations-plus-deliveries

WN9HWV	152	WNØGQL	128	WB4ZMK	112
WAØMLE	146	K9HDP	126	WN8MZZ	108
WA3RCI	134	WA3SCR	125	WB5EIN	106
W4TJF	130	K6UYK	117	WBQCU	105
WAØAUX	129	WA3PXA	116	WN8MKL	103

BPL Medallions (see July, 1968 *QST*, p. 99) have been awarded to the following amateurs since last month's listings: WB2ADW, WB5EIN, WNØGQL, WNØGVR, WNØHTR.

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.

Public Service Diary

■ At 1640 on Apr. 19, K4KVF/5 reported to WB5CIT via the WA5VKZ repeater that an elderly woman was stranded in her car on Highway 90 in San Antonio, TX. WB5CIT autopatched the report to police. - (WA5YXS, SEC STex)

■ Observing signs of tornado activity in Sedalia, MO, at noon on Apr. 20, WØENW, Pettis Co. EC/RO, and WBØHYX, Pettis Co. c.d. Director, began weather observation and warning activities at the c.d. Emergency Operation Center. A 6-meter net was activated at the EOC using club station WAØSDO. At 1320, WBØEPH/Ø observed severe twisting activity in southwest Sedalia and advised that the city be warned. Sirens were sounded and a tornado warning was issued. WBØHYW and WAØJSI observed conditions from nearby towns. Thunderstorm activity continued until 1500 when warnings were cancelled and the net secured.

Warnings were issued again at 1830. At 1915, the 6-meter net was activated with WBØBLZ as NCS until WAØSDO was activated. A tornado struck a mobile home park inflicting heavy damage. Flash flooding existed in many surrounding areas. When mobile weather observations ceased, the mobiles were dispatched to the mobile home park to aid in damage survey and rescue communications. The net secured at 0200 on Apr. 21. - (WØENW, EC/RO Pettis Co.)

■ During a severe weather alert on Apr. 24, loss of telephone service rendered teletype inoperative at a radio station in Bartlesville, OK, thus leaving the city without weather information. The station manager alerted Bartlesville ARC President, WB5EZC. WB5BUM/mobile was dispatched to the station, maintaining contact with WB5s EZC ETT (through the WA5LDJ repeater) who monitored the Tulsa weather watch repeater. Information was relayed to WB5BUM until teletype service was restored two hours later. - (WB5ETT)

Here's the gang that attended the Kansas All Nets Picnic held in Salina, KS, on May 20.

■ On Apr. 29, two cars collided ahead of WB8BWB/mobile on I-75 in Butler Co., OH. Police were notified using the WB8CRS repeater's autopatch. Assistance arrived within minutes. - (WA8COA, SEC OH)

■ Between May 1 and May 31, Houston (TX) area amateurs reported 22 inoperative traffic signals, 12 fires, 23 automobile accidents and summoned 12 ambulances to accident scenes using the WR5AAA repeater. Eleven amateurs participated. - (WA5ABA, EC Harris Co.)

■ A tornado struck Willard, OH, shortly after 1800 on May 10. Within a half hour, WB8AMR and K8WLP (with Red Cross van and supplies) arrived in Willard and WA8KCZ and K8IQB with WA8QQM were enroute. These mobiles covered the police station, hospital and shelter relaying messages for supplies, reports on the number of dead and injured and requests for additional manpower. By noon on May 11, K8IQB had lists of names registered at the shelter and those in and discharged from the hospital, which facilitated health and welfare traffic. K8KWO established a 75-meter portable station in Willard. The Firelands Amateur Radio Red Cross Emergency Communications Club station, WB8DHS, was activated in Sandusky handling traffic with the disaster area. The Ohio Single Sideband Traffic Net was in emergency session for most of the disaster period. Amateur activity continued until 1900 May 13. - (K8ONV)

On May 11, WB8s JJU IVV and WA3QNI/8 learned that additional help was needed in Willard and arrived at the Communications Center about midnight. The center was manned by W8DQR, K8OTN and WA8KCZ, with W8KDK and WB8KKU at checkpoints. WA3QNI handled incoming and outgoing traffic on 75 meters, assisted by WB8IVV via 2-meter link at W8AZL's home. WB8JJU and WA8CGN were assigned to checkpoints. When WB8IVV and WA3QNI had to return to Toledo, WA8CGN took over the 75-meter station, later to be replaced by WB8EAV. - (WA8CGN)

■ On May 10 at 2030, a tornado hit southeastern Columbus, OH. The RACES group of Columbus was called to help restore communications and provide support for the rescue branch of c.d. They also served in support of Red Cross Mobile Canteen and the mayor's office to help relocate homeless families. Nine amateurs participated. - (W8JJE, RO Columbus and Franklin Co.)

■ While listening on 20 meters at 0030Z May 11, WB4UBA heard YV5BPG calling for a New York station. Hearing none, WB4UBA answered and learned that an elderly lady was gravely ill and YV5BPG was trying to notify relatives since outside telephone lines on his end were tied up. WB4UBA made the call. - (WB4UBA)

■ At about 0800 on May 11, a tornado struck the Joplin, MO, area. At 1000, WØENW organized an emergency net on 75 meters. WAØIIK proceeded into the disaster area. WBØJYX/Ø set up at the EOC handling traffic including one emergency message to the c.d. director in Miami, OK. WØPME received a list of casualties and handled health and welfare inquiries until relieved by WAØYNC and WBØCIW at 2030. Ten amateurs were net controls and about 125 inquiries were handled. The net closed at 2330. Approximately 172 amateurs participated. - (KØVVH, SCM MO; WØENW, Pettis Co. EC/RO)

■ On May 13 at 1130, K2UJX received an urgent request to help locate a Peace Corps couple in a remote area of Venezuela to inform them of a death in the family. K2UJX relayed the request to K1UJB on the WA2ZVQ repeater. K1UJB, W2EYD, K2UJX, WA2s AUU ZNS and WB4QYS searched 20 and 15 meters for a YV station. After 30 minutes, a station in Caracas was found and the message was passed. The next day, word was received that the message had been delivered. - (Jersey Shore ARS Bulletin)

■ A tornado struck Fort Payne, AL, about 0100Z May 19, taking out all electric power and telephones. Shortly afterwards, W4DGH/mobile was on the air at the damaged area. The Sand Mountain Repeater Assn. responded with communications back-up for police who had lost use of their base station. Mobiles W4s DGH OCS, K4VZU, WA4BFN and WB4STN provided radio contact for policemen patrolling the stricken area, while WA4SWA operated portable from police headquarters. Operations continued until Ø700 May 20 when power was restored to the police base station. K4WSS manned the WB4QFV repeater acting as liaison for c.d. - (W4DGH, SEC AL)

■ Beginning 0100Z May 21, LU5HFI coordinated a search for a rare drug, available only in Philadelphia, PA, to save the life of a girl suffering from a blood clot in the brain. Through efforts of W3HAO, assisted by several other amateurs, the head of the medical team who

Public Service Honor Roll May 1973

This listing is available to amateurs whose public service performance during the month indicated qualifies for 30 or more total points in the nine categories below, as reported to their SCM. A defineation of the points awarded for each function is given in the category key at the end of the Honor Roll listing Please note maximum points for each category. Those making fewer than 45 points are listed with point totals only.

Category	*(1)*	*(2)*	*(3)*	*(4)*	*(5)*	*(6)*	*(7)*	*(8)*	*(9)*	
Max. Pts.	*10*	*10*	*12*	*12*	*12*	*20*	*3*	—	*5*	*Totals*
WA8ETX	10	10	12	12	12	8		4	5	73
W4OGG	10	10		12	12	14		12		70
WB5AMN	10	10		12	12	20			5	69
WA3QOZ	10	10	12	12	12	12				68
WB4SVH	10	10	12	12	12	5			5	66
WA3PXA	10	10	12	12	12		3		5	64
WA3RCI	10	10	12	12	6	6	3		5	64
WA3SCR	10	10	12	12	12		3		5	64
WB8JAD	10	10	12	12	12	1			5	62
WA1MSK	10	10	12	12	12				5	61
WA2TRK	10	10	12	12	12				5	61
KØBAD/4	10	10	12	12	12				5	61
WBØAXW	10	10	12	12	12	4				60
WBØHBM	10	10	12	12	12	3				59
WB5EIN	10	10	12	9	12		3	1		57
WB2AEH	10	10	12	12	12					56
WB2CHY	10	10	12	12	12					56
WA2CNE	10	10	12	12	12					56
WB2OYV	10	10	12	12	12					56
WA3DUM	10	10	12	12	12					56
W7OCS	10	5	12	12	12				5	56
WB9AHJ	10	10	12	12	12					56
WA1NLD	10	10	9	12	12					53
WBØCZR	10	10	12	9	12					53
WB4WHK	10	10	3	12	12				5	52
WAØMLE	10	10	12		12		3		5	52
WB2NOM	10	10	12	6	12					50
K3KAJ	10	10	12	6	12					50
WA3PLC	10	10	6	12	12					50
WB2FEX	10	10	12	12					5	49
W3ABT	10	10		12	12	5				49
WA6TVA	10	10		12	12				5	49
W7BQ	10	10	9	9	6				5	49
W7GHT	10	10	12		12				5	49
K7OUF	10	10	12		12				5	49
WA9EED	10	7	12		12		3		5	49
WB9KVN	10	10	12		12				5	49
KØMRI	10	10	12		12				5	49
VE3FQZ	10	10	12		12				5	49
WB5DBK	10	5	12		12	4			5	48
WB4FDT	10	10	12	3	12					47
WA6DEI	10	10	12	3	12					47
WA7JQS		10		12	12	13				47
W7LBK	10	10	12	3	12					47
WA5VBM		10		12			20		4	46
WA2AYC	10	10	12		12	1				45
WA3ATQ		10			12	20	3			45
K3DCB	10	10	12		12	1				45
WA8UPI	2	10		12	12	4			5	45
WBØBIY	10	10	12		12	1				45
WØOVI	10	6	12		12				5	45
VE3GT	10	10		12	12	1				45

K3OIO	44	W5RB	39	W3YA	34
W4ZJY	44	WB6AKR	39	K4KNP	34
WB5DLW	44	WB8KZD	39	W4UQ	34
K5YTA	44	K9HDP	39	WB5FML	34
WB6ZVC	44	WB9LHI	39	K6YBV	34
WB8CSH	44	W9MUC	39	WA7BDD	34
K8MLO	44	WNØGQL	39	WB8ALU	34
WA9QVT/4	44	WNØGVR	39	WA8ETW	34
KØBIX	44	WØHI	39	WB8KXV	34
WBØHSZ	44	VE3AWE	39	W9EI	34
VE3FRG	44	VE3DPO	39	W9FWH	34
VE3GJG	44	VE3EWD	39	W9KRR	34
VE3SB	44	VE3GFN	39	W9QLW	34
WB4EKJ	43	WA2EUO	38	WAØFMD	34
WB5EDS	43	K2VGD	38	VE3DVE	34
WA1LIR	42	W3FCS	38	VE3EHF	34
K4ONW	42	K3MVO	38	WA7QAR	33
K2BDX	41	W5ABQ	38	WB8IMI	33
WA2DGZ/1	41	WA1MYK	37	WA3RKH	32
WA3QDH	41	WB5FMA	37	WB4HKP	32
W5VZO/4	41	WA8ZNC	37	WB4SKJ	32
WA7TXV	41	W3QU	36	WN4YQS	32
W7WAH/5	41	WA7LQV	36	WB6PGK	32
W8GLC	41	WA2UOO	35	W7BUN	32
WB9VOT	41	WA4IQS	35	W7PI	32
WA1KVI	39	K4TXJ	35	WB8JGW	32
K1SXF	39	WB4WXX	35	WNØFSL	32
W1UBG	39	W6DEF	35	WNØHTR	32
WB2LZN	39	W6INH	35	WB2FNK	31
W2RUF	39	W7DAN	35	WB4VYU	31
W3LOS	39	WB8KKI	35	WA8BCX	31
W3NEM	39	W2FIR/5	34	WA5ZBN	30
K4FCZ	39	WA3IIV	34	WN8MZZ	30
W5GHP	39	WA3QIA	34	WN8NCD	30

*Denotes multioperator station.

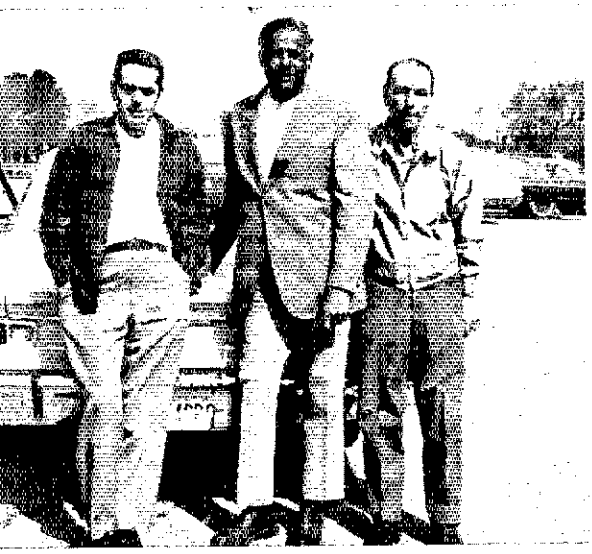
Category Key: (1) Checking into cw nets, 1 point each; (2) Checking into phone/RTTY nets, 1 point each; (3) NCS cw nets, 3 points each; (4) NCS phone/RTTY nets, 3 points each; (5) Performing assigned liaison, 3 points each; (6) Legal phone patches, 1 point each; (7) Making BPL, 3 points regardless of 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.

developed the drug at Temple Univ. was contacted and he advised that the drug was still in the experimental stages and might prove dangerous to the patient. The information was relayed to LU2HFI who translated it to LU2HBX who was in contact with the attending physician. The doctor decided against using the drug. - (WA6FXM)

■ A tornado hit Union City, OK, on May 24. Approximately 20 amateurs responded to the call to establish communications from Union City to Oklahoma Co. Red Cross and EOC. About 12 mobiles traveled to Union City and a portable station was manned at the high school where officials assembled disaster-stricken families. Both the K5CFM and WA5YTI repeaters handled considerable traffic from 1630 until early in the morning of May 25. - (W5ZKO, from Mid-Oklahoma Repeater, Inc., Newsletter)

■ Members of the Ventura Co. AREC provided assistance for the Sheriff's Office, California Highway Patrol and ambulance service when a jeep plunged over an embankment in the remote Sespe area in Ventura Co., CA, on May 25. One man was pinned under the jeep and 4 others injured. WA6VUY, camping nearby at Lions Camp called on the WA6SIN repeater and was answered by WA6LLI whose wife, WB6URX called police. WA6LLI took his mobile to the camp and WA6UEO assumed net control on the repeater. Since police were unable to communicate out of the canyon, WA6LLI was utilized to request an emergency vehicle and ambulance. K6YLQ proceeded to Reyes Peak to provide 2-meter simplex communication. WA6DEI and K6s VIE ITY traveled by Scout with higher-power rigs to the scene. WB2LRS acted as relief with WA6LLI and WB6MWJ set up station at the Sheriff's Office The injured were treated at the hospital and the deceased was brought out to the coroner who had been notified by radio. - (WA6DEI, SCM SBar)

■ A tornado ripped through the Brent-Centreville (AL) area on May 27 at 1905 killing 4 persons and injuring about 75. W4ZEJ moved into the area, setting up a 2-meter station at the



On April 14, the Southern Peninsula Amateur Radio Klub and Area 2 AREC furnished communications for the Leukemia Society Walk-a-Thon in Hampton, VA. All traffic was handled as formal traffic to give operators experience. Eleven amateurs participated. The three shown are (left to right): WN4UEI, WN4DLH and K4LBJ.

National Guard Armory at 2200 and using the WB4QEX repeater in Birmingham. At 2300 W4s HCV TXM and WB4SVH arrived with 75- and 2-meter capabilities and set up at Bibb Co. Hospital Information relayed by W4HCV prevented a critical water shortage. Red Cross Disaster Services Chairman, W4WLF, and WB4VFA arrived at 2330 and established a 2-meter station at the temporary RC Hq. and shelter in a church. WB4OVR help link Brent and Centreville throughout the night while operating at the shelter. WA4KYI and WB4s SVH CWE brought in more equipment on the morning of May 28 and started a communications center at another church, providing communications out of the area and handling many health and welfare messages. Operations were secured at 2000. - (WB4SVH, EC Tuscaloosa Co.)

■ On May 27, tornadoes struck parts of Greenville and Lyman, SC, causing extensive damage. Immediately the Blue Ridge Radio Society contacted the Red Cross, with club members and RC officials setting up an emergency communications center at the RC building. Amateurs provided a 2-meter link with the Greenville Hospital, whose switchboard had become overloaded with calls, enabling the RC to make quick next-of-kin reports on the injured. When lightening extinguished the repeater, a mobile relay was dispatched to Paris Mountain, keeping communications open. Greer Radio Club members and their repeater greatly assisted in the communications which closed down at 0800Z after 8 hours of continuous operation. Some 40 amateurs were involved. - (WB4RTU)

■ While returning home from the Knoxville (TN) Hamfest on May 27, K4VOS/mobile and WB4FVM/mobile were in contact with each other when a car ahead went out of control smashing into a bridge. WB4FVM got help through the Knoxville repeater. K4VOS directed traffic while his wife helped a man and two children from the wreck. - (Bays Mtn. Radio Club Newsletter)

■ At 1600Z on June 4, W4JLO advised Coast Guard Net NCS, K4CG, that WB2GFX/maritime mobile was on frequency with emergency traffic. K4CG contacted WB2GFX whose ship was standing by a Spanish freighter that had a heart attack victim aboard. K4CG relayed the information to the Coast Guard's rescue coordination center and the US Public Health Service Hospital in New York. By computer the Coast Guard advised the location of the nearest vessel carrying a doctor and the hospital advised methods of patient care. This information was relayed through WB2GFX to the freighter. - (W4KFC, Roanoke Div. Dir.)

■ On June 7 at 2142, WB6TZG contacted WB6OFH on 2 meters and advised him that her telephone was out of order. Since her husband, W6OA, is disabled with a heart condition, telephone service is imperative. WB6OFH called the telephone company and full service was restored at 2242. - (WA6UAM)

■ The file contains several reports of alerts where amateurs were deployed for emergency communications, but emergency situations did not develop or amateur communications were not needed. Space does not permit for details, but here is a chronological list:

Feb. 21 - Search for lost people near Forks, WA, with a possible link set up by two amateurs. - (W7RJW, EC)

Feb. 27 - A truck accident severed telephone cables in Alliance, NE, and Western Nebraska Net members and several other amateurs stood by. - (KØOAL, SCM)

Mar. 16 - Forty Chemung Co. AREC and AF MARS stations kept tabs on rising water levels in the Elmira, NY, area. - (K2DNN, EC)

Mar. 17 - Several amateurs volunteered to aid police in a canoeing mishap in Lafayette, IN. - (WB9KVN)

Mar. 17 - AREC members stood by during heavy snow in Genesee Co., MI, which threatened power and telephone service. - (WA8WQU, EC)

Mar. 26 - An overturned tank car in Louisville, KY containing toxic liquid; several amateurs kept tabs. - (K4ISI, EC)

Apr. 4 - Hillsborough Co. (FL) AREC on alert during heavy rains. - (WB4TUP, EC)

Apr. 20 - A tornado watch in Johnson Co., MO involved more than a dozen amateurs. - (KØBIX, EC)

Apr. 25 - Nine amateurs formed a weather-alert net as thunderstorms, hail and winds swept through Williamson Co., TX. - (WB5FMA, EC)

May 20 - WA4ZAU repeater users and Virginia Sideband Net stations participated in a tornado alert. - (WA4BUE, RO)

May 30 - Electrical blackout in Tampa, FL, with more than 12 Hillsborough Co. AREC members on alert. - (WB4TUP, EC)

June 6 - Thunderstorms in Bergen Co., NJ, posed a threat of flash floods. Three amateurs monitored Waldwick Emergency Net frequency. - (WA2EXX, EC)

We received 35 SEC reports for May activities, representing 10,935 AREC members. That's only a slim increase over last May's low of 34 reports with 10,898 members. We welcome Alabama to the reporting roster: Ala, Alta, Ariz, BC, Colo, Conn, EBay, ENY, EMass, Iowa, Kans, Ky, Mich, Miss, Mo, Nebr, Nev, NFla, NTex, Ohio, Okla, Org, Oreg, SV, SDgo, SBar, SFla, STex, Utah, Va, Wash, WVa, WMass, WNY, WPa. QST

IARU News

INTERNATIONAL AMATEUR RADIO UNION, THE GLOBAL FEDERATION OF NATIONAL NON-COMMERCIAL AMATEUR RADIO SOCIETIES FOR THE PROMOTION AND CO-ORDINATION OF TWO-WAY AMATEUR RADIO COMMUNICATION

"HAM'S WIDE WORLD" INTERNATIONAL SCREENINGS

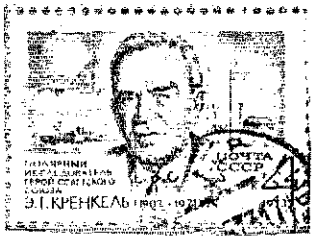
In addition to approximately eighty copies of the film "The Ham's Wide World" in VE and W circulation, there are several prints which *ARRL* has made available for showings in other countries. One such copy has been widely shown in Great Britain during the past year, including a broadcast over Ulster television. This copy has now been sent to the *Reseau des Emetteurs Francais* for circulation in France, and subsequently will be forwarded to the *Deutscher Amateur Radio Club* for showings in Germany.

Other copies of the film have had one or more showings in Australia, Cambodia, Greece, Indonesia, Malaysia, Nauru, Singapore, South Africa, Sri Lanka, Switzerland, and Thailand. While the sound track of the film is in English, the possibility of producing Spanish and French versions is under study.

DIPLOMA GUGLIELMO MARCONI

The *Associazione Radiotecnica Italiana* announces the "Diploma Guglielmo Marconi" to commemorate the work of this great scientist. This award is intended to celebrate the experiments carried out by Marconi in various parts of the world and to call them to the attention of radio amateurs.

QSL cards for contacts with 40 specific locations around the world since January 1, 1973 are required to earn the award. Further details may be obtained from *ARI*, Via Scarlatti 31, I-21024 Milan, Italy.



This Russian stamp commemorates Ernst Krenkel, RAEM, whose unique callsign was well known in the amateur radio world until his death in 1971. The stamp depicts Krenkel's career as a Polar explorer. In his honor, the *Central Radio Club of the USSR* has been renamed the *Krenkel Central Radio Club. (Thanks to UW9PT for sending the stamp.)*

WORKED ALL CONTINENTS AWARD

The IARU Worked All Continents award is issued for confirmed two-way contacts with each of the six normally-inhabited continents of the world. The basic award is made without regard for band or mode, but several special endorsements are available. Applications are submitted to the IARU member-society in the applicant's country. When the application has been verified by the member-society, IARU headquarters issues the certificate. Only applications from the U.S. and Canada, and from countries in which there is no IARU society, should be submitted directly to IARU/*ARRL* headquarters.

During 1972, a total of 1695 WAC awards were issued. Of these, 763 were endorsed for ssb, 9 for SSTV, 8 for RTTY, and 9 for 1.8 MHz. Special endorsements also are available for phone (not limited to ssb) and 3.5 MHz. QST

The *Seccional La Guaira* of the *Radio Club Venezolano* hosted Roy, WB2DXW and XYL Frances on their recent trip to Venezuela. The trip was the culmination of hundreds of contacts with YVs which Roy made while learning Spanish on the air. Frances is shown here (seated on the left) surrounded by members of the club.

Hamfest Calendar

Alabama – The North Alabama Hamfest is August 19 in Decatur. For info, write: N.A.H. Assoc., Inc., Box 9, Decatur, AL 35601.

Delaware – The 2nd Annual Delmarva Hamfest is August 19, 10 AM-2 PM at Delaware State Fairgrounds, Harrington. Flea Market, 2-meter fm transmitter hunt, homebrew equipment contest, QSL card contest, talk-in on 2 meter fm, 3.905 MHz. Registration $2 advance, $3 at gate. Contact: Delmarva Hamfest, Inc., Rt. 2, Box 90, Laurel DE 19956.

Illinois – The 8th Bel-Rock Hamfest is Sunday, August 26, at the Boone County Fairgrounds, north of Belvidere on Rt. 76. Free coffee and donuts 9:30-10 AM. Lunch stand on the grounds. Talk-in 146.94. Join the Saturday night campers. *Advance tickets $1.50, $2 at the gate. For info or* tickets write: Big Thunder ARC, Box 252, Belvidere IL 61008.

Illinois – East Central Illinois Hamfest is Sunday, September 2 at Douglas Park in Danville. (Take the Bowman Ave. exit of I-74 and follow the signs.) Flea market opens at 6 AM. Talk-in on .34/.94. Camping facilities nearby. Write: WA9IAC, 1615 N. Bowman, Danville IL 61832.

Illinois – The Chicago Amateur Radio Club's 4th Annual Hamfest and Mini-Auction is September 30 at 2 PM at St. Viator's School parking lot. (3606 N. Kedvale, N.W. corner of Addison St.) Swaps, refreshments. Advance tickets $1; $1.50 at gate. Contact: Don De Jong, W9KUI, 6158 W. Grand Ave., Chicago IL 60639.

Indiana – The Tippecanoe ARA and the Indiana Radio Club Council's Annual Indiana Radio Club Council Hamfest is August 19 at the Tippecanoe County Fairgrounds. (Located at 1100 Teal Rd. Ind. Rt. 25, Lafayette) This family hamfest features flea market, games, trailer parking, awards and more. *All tickets $2. Write:* WB9FOT, 2233 Delaware Dr., West Lafayette IN 47906.

Iowa – The Annual Iowa 75 Meter Net Potluck Picnic is August 26 at Riverview Park, Marshalltown. Swap tables. Lunch served at noon; coffee and pop furnished. All welcome.

Kansas – The Annual Kansas-Nebraska Hamfest is August 5 at the Moose Bldg., 113 West 5th, Concordia. Hidden transmitter hunt, games, contests and an auction.

Kansas – The Wichita Amateur Radio Club's Annual Hamfest is September 9 at the Sedgwick County 4-H Building. (Located on the N.W. corner of West St. and Central Ave. in West Wichita; talk-in on 3.920 MHz, 7.275 MHz, 146.34 MHz, 146.94 MHz) MARS, ARRL, and Kansas Net Meetings. Games and free pop. 10 AM-4 PM. Admission $1.75. For info write: Todd Gearheart, WBØIRY, 1320 Summitlawn Ct., Wichita KS 67212.

Kentucky – The 3rd Annual Greater Louisville Hamfest is August 26, 8 AM-6 PM at Oldham County Fairgrounds, La Grange S.R. 146 off I-71. Admission $1. Fleamarket $1. Ladies program, refreshments, parking. Contact: Guy E. Partridge, K4KZH, 8276 Walker Rd., Louisville KY 40258.

Missouri – The Southwest Missouri Amateur Radio Club's Annual Hamfest is Sunday, August 25. Registration begins at 9:30. Located at the pavilion on the north side of Lake Springfield in Springfield. (Directors on .31/.91 or .94) Swap table and many other activities.

Nevada – The Sierra Hamfest is Saturday, August 18 at the California Bldg. in Idlewild Park, Reno.

New Jersey – The East Coast VHF Society's Antenna Measuring contest and Hamfest is Sunday, August 5 at Trenton State College. Flea market, free admission.

New York – The Worldwide TV-FM DX Assoc.'s 5th Annual Convention is August 2-5 in Dunkirk NY.

New York – *The 1973 Historical Radio* Conference sponsored by the Antique Wireless Asso. is September 7, 8 at Canandaigua. Programming for old time operators, historians and collectors. For details write: Lincoln Cundall, W2QY, 69 Blvd. Pkwy., Rochester NY 14612.

New York – The 1973 Hamburg International *Hamfest near Buffalo and Niagara Falls is Septem*ber 15. Write: Valerie Orgera, K2KQC, 187 Main, Hamburg NY 14075.

Ohio – The 16th Annual Warren Hamfest is Sunday, August 19 at Yankee Lake Amusement Park, Yankee Lake from 7AM to 6 PM; For info, write: R. D. Kelley, WB8GFG, 822 Moore St., Hubbard OH 44425.

Ohio – The 26th Annual Findlay Hamfest is Sunday, September 9, Riverside Park, Findlay. Advance tickets $1. Write: C. Foltz, W8UN, W. Hobart, Findlay OH 45840.

Pennsylvania – The 18th Annual Hamfest sponsored by four York County clubs is September 2, rain or shine, at Flicker's Grove. (Half mi. west of York Airport or 10 mi. west of York, Pa. – signs posted) Registration fee $3, XYL's and children free. Free flea market. Begins 9 AM. Talk-ins 146.16-76; 146.28-.88; 146.94; remote via *450. Transmitter hunt 2 and 6 meters. Free Bingo* and picnic tables. Write: LeRoy Frey, K2POR, 1705 S. Albemarle St., York PA 17403.

Pennsylvania – The Uniontown Amateur Radio Club's 24th Annual Hamfest is Saturday, September 8 on the club's grounds on the Old Pittsburg Road just north of town. For more info write: Joseph M. Sofranko, Sec., 438 Braddock Ave., Uniontown PA 15401.

Pennsylvania – The Skyview Radio Club's 11th Annual Swap n' Shop is Sunday, September 9 at the clubgrounds (6 mi. E. of Kensington; 15 mi. N.E. of Monroeville; or follow signs from jct. of Rt. 366 and 380 to club grounds). Check-in on *29.0 MHz and 146.94. No fees, free parking, lots* of shade, refreshments available. Write: K3ZCA, 239 Michigan Ave., Lower Burrell PA 15068.

South Dakota – The Hub City Radio Club's Annual South Dakota Picnic is August 4 in Aberdeen SD.

Tennessee – The 14th Annual Cedars of Lebanon Hamfest is August 26 at the Cedars of Lebanon State Park (10 mi. south of Lebanon on Rt. 231 S.; talk-in mobiles 50.25 and 3.980 MHz). Bring food to feed your party, pot luck at 1:30. Drinks available. Bring gear to swap, sell or *auction. Three camp grounds nearby. Thirty min.* from Opra Land U.S.A. More info from W4WJW, Tenn. Phone net 3980 kHz, weekdays 6:45 AM or write: 203 W. Main St., Gallatin TN 37066.

Texas – The 8th Annual Northwest Texas Emergency Net Picnic and Swaptest is Sunday August 5 in Levelland. Bring your family and picnic basket. Free registration. Mobile talk-in 3950 kHz and 146.28-88 or 146.34-94.

Vermont – The Burlington Amateur Radio Club's 1973 International Field Day is Sunday, August 19 at the Old Lantern, Charlotte. Flea market, contests demonstrations, special events for ladies, teens and children. Refreshments available all day; camping facilities. Saturday night Happy

Hour 6-12 PM. Talk-in on 2 fm. Registration $3.50 at gate, $3 advance. Write: Bob Sanford, South Hero VT 05486.

Virginia – The 23rd Annual Hamfest of the Shenandoah Valley Amateur Radio Club is the weekend of August 4,5. Saturday evening is the banquet and Sunday is an all day session in the Winchester Armory.

Virginia – Air Force MARS first Annual Eastern Division Conference is September 7-9, in the Quality Inn in Pentagon City. The highlights of the conference is the banquet Saturday 8th with guest speaker Sen. Barry Goldwater, AFA7UGA. Representatives from all the states of the Eastern Seaboard are expected. For info write: Eastern Division MARS Conference, P. O. Box 2836, EADS Station, Arlington VA 22202.

Washington – The Radio Club of Tacoma's "Hamfair - 73" is the weekend of August 18-19 at the Pierce County Fairgrounds near Graham (directly south of Puyallup on Meridian Ave.). Manufacturers displays, technical seminars, games, contests, bunny hunts, swap n' shop, snack bar. Registration advance includes Saturday dinner $6; at door just registration $3. Camping space $1.50 per night. Sunday logger's breakfast $1.50. (3965 kHz and 146.76 MHz monitored for mobiles.) Write: Emil Koth, K7GPK, 13616 10th Ave. East, Tacoma WA 98445.

West Virginia – Sunday August 26 a Hamfest is held in Bluefield City Park. Flea market, hospitality room. For info write: Ralph Tiller, K4CGF, Rockgap VA 23466. QST

COMING ARRL CONVENTIONS

August 4-5 – Michigan State, Escanaba.
September 14-16 – Roanoke Division, Reston, Virginia.
September 29-30 – New England Division, Hyannis, Massachusetts.
October 5-6-7 – Midwest Division, Lincoln, Nebraska.
October 6-7 – Tennessee State, Memphis.
October 13-14 – Pacific Division, Santa Cruz, California.
October 20-21 – Southwestern Division, Los Angeles, California.

NOTE: Sponsors of large ham gatherings should check with League Headquarters for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL Hq. for up to two years in advance.

VE/W

(Continued from page 62)

7) *REPORTING*: Follow the sample log shown. Check sheets (or ARRL Op. Aid 6) are required for every entry consisting of 200 or more QSOs. *ANY 200 PLUS CONTACT LOG OMMITTING CROSS-CHECK SHEETS OR A SUMMARY SHEET WILL NOT BE CONSIDERED FOR COMPETITIVE QST LISTING OR AWARDS.* Such logs will be counted as check logs and processed accordingly. Entries must be postmarked no later than October 31, 1973.

All entries become the property of the committee and none can be returned. Participants are encouraged to submit station photos and comments.

Log sheets will be available from the address shown, upon receipt of self-addressed legal-size envelopes and IRCs or Canadian stamps.

8) *AWARDS*: A trophy will be awarded to the high scoring Canadian and to the high scoring US entry. Certificates will be awarded to the highest scoring cw and phone entry in each section. A minimum of 25 QSOs is required. Cerfiticates for the high scoring multioperator entries will be issued only when there are at least three entries per section. Phone and cw scores will be listed separately.

9) *MAILING*: Please make sure that your call and section are on each page, and especially on the top left hand corner of your envelope. Mail logs to: VE/W Contest Committee, VE2IZ, P.O. Box 2206, Dorval Stn. 780, Quebec, Canada.

10) *DISQUALIFICATIONS*: If the claimed score of a participant is reduced by 2% or more, log may be disqualified. Score reduction does not include correction of arithmetic errors. Score reductions may be made for taking credit for unconfirmed QSOs and/or multipliers, duplicate contacts and/or other scoring discrepancies. QST

VHF QSO

(Continued from page 63)

9) Disqualifications: If the claimed score of a participant is reduced by 2 percent or more, the log may be disqualified. Score reduction does not include correction of arithmetic errors.

Score reductions may be made for taking credit for unconfirmed QSOs and/or multipliers, duplicate contacts, banned countries, and/or other scoring discrepancies.

If a participant is disqualified, he will be barred from submitting an entry in the next annual running of that specific contest, (e.g., disqualification from the 1972 phone SS prohibits submission of an entry for the 1973 phone SS, but 1973 cw SS participation is okay).

The calls of all disqualified participants will be listed in the *QST* report of the contest.

Any participant on the borderline of disqualification but not actually disqualified may receive a warning letter from the Communications Manager.

For each duplicate contact that is removed from the log by Hq., a penalty of 3 additional contacts will be exacted. The penalty will not, however, be considered as part of the 2% disqualification criteria. QST

Strays

The Southern Counties Amateur Radio Association will operate a special event station in conjunction with the Miss America Pageant in Atlantic City, New Jersey. The call for the last two years has been WX2MAP, but this year the call will be WP2MAP since Atlantic City considers itself the "World's Playground."

Operation will be from August 26 to September 9, in the Pageant Headquarters at the Haddon Hall Hotel, Atlantic City. Operation will be on 80 through 10 meters: cw frequencies will be 30 kHz inside the band edge, ssb frequencies will be 10 kHz inside the General Class portion of the phone band, when possible. A special QSL will again be issued; send cards to K2JOX; an s.a.s.e. would be appreciated.

Happenings of the Month

FCC PROPOSES CB IN 224 - 225 MHZ

Docket 19759 Would Create 40 Channels

- ***ARRL Election Notice***
- ***RACES Filing Extension***
- ***More Time for Repeater Licensing***

See first item, League lines, page 10.

FCC 220 PROPOSAL

FCC has proposed the creation of a new Class E Citizens Radio Service, with frequencies to be taken from the amateur allocation, 224-225 MHz (the public notice appeared on page 51, July, *QST*). The Commission drew on petitions filed by Wayne Green (RM-1633); the Electronic Industries Association (RM-1747); Reed Electronics School (RM-1656); F. C. Hervey (RM-1761); George Jacobs, W3ASK, and Stuart Meyer, W2GHK (RM-1793); and United CBers of America (RM-1841), in formulating the proposed rule-making in Docket 19759. There would be 40 channels at 25 kHz spacing under rules to be drawn up later.

The Commission recognizes (at paragraphs 8 and 9, for instance) the difficulties it has had with the Citizens Radio Service at 27 MHz, but says that this is a separate subject which will be considered in other FCC inquiries or proceedings. Thus, filings by amateurs and groups should be **based on more than mere protest** against the type of operation common on the Class D Citizens Band.

Comments may be filed by anyone on or before September 20, and "reply comments" in rebuttal to the arguments of others can be filed through October 22. There was a great deal of internal discussion at FCC before this proposal emerged; **its eventual adoption is by no means a foregone conclusion. Thus, well-reasoned, thoughtful non-emotional comments by great numbers of respondents may well alter the outcome of this proceeding.**

The official viewpoint of ARRL toward the specifics of this docket will have been determined by the Board of Directors on July 19, just about the time this issue is placed into the mail. The League earlier of course, filed an opposition to the EIA petition, RM-1747 (See page 81, *QST*, for April 1972).

The text of the notice follows:

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D. C. 20554

In the Matter of

The creation of a new class of Citizens Radio Service and the reallocation of frequencies between 224 MHz and 225 MHz in the band 220-225 MHz now allocated for shared use by stations in the Amateur Radio Service and Government Radiolocation Stations for that purpose

Docket No. 19759. RM-1633, 1656, 1747, 1761 1793, 1841

NOTICE OF INQUIRY AND NOTICE OF PROPOSED RULE MAKING

Adopted: June 6, 1973 Released: June 12, 1973

By the Commission: Commissioners Johnson and Reid concurring in the result.

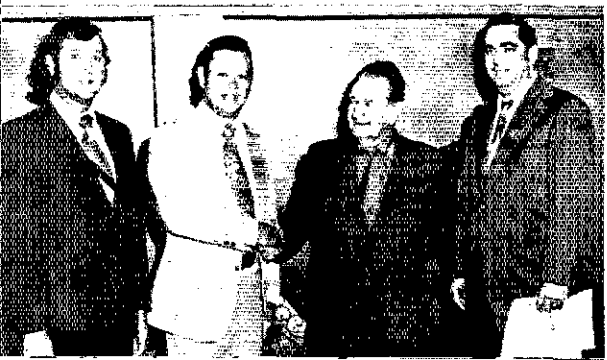
1. Notice is hereby given in the above captioned matter.

2. The following petitions have been received which are applicable to this matter:

a. RM-1633 (Wayne Green petition) filed May 25, 1970 – Proposes to make part of the 220 MHz amateur band available for "Hobby Class" amateurs and to limit 27 MHz Citizens Band operations to "business and personal business" use.

b. RM-1656 (Reed Electronics School pe-

(Continued on page 90)



Enrique Gabuardi, YN1EGL, second from left is congratulated by the Honorable Henry Milander, Mayor of Hialeah, Florida for his relief work following the Nicaraguan earthquakes. Looking on are John Gonzalez, the mayor's assistant, at left, and Rafael M. Estevez, WA4ZZG, president of Sociedad Internacional de Radio Aficionados, Inc. and an assistant director of the ARRL Southeastern Division.

Governor Dolph Briscoe of Texas signs HB 142, allowing call letter license plates on pickup trucks in addition to passenger cars. Looking on from left, State Representative W. C. Sherman, sponsor; W5JAX and WA5DCH of the Arlington ARC, and ARRL West Gulf Director W5EYB.

ELECTION NOTICE

To All Full Members of The American Radio Relay League Residing in the Atlantic, Canadian, Dakota, Delta, Great Lakes, Midwest, Pacific and Southeastern Divisions:

An election is about to be held in each of the above-mentioned divisions to choose both a director and a vice-director for the 1974-1975 term. These elections constitute an important part of the machinery of self-government of ARRL. They provide the constitutional opportunity for members to put the direction of their association in the hands of representatives of their own choosing. The election procedures are specified in the By-Laws. A copy of the Articles of Association and By-Laws will be mailed to any member upon request.

Nomination is by petition, which must reach the Headquarters by noon of September 20. Nominating petitions are hereby solicited. Ten or more Full Members of the League residing in any one of the above-named divisions may join in nominating any eligible Full Member residing in that division as a candidate for director therefrom, or as a candidate for vice-director therefrom. No person may simultaneously be a candidate for both offices; if petitions are received naming the same candidate for both offices, his nomination will be deemed for director only and his nomination for vice-director will be void. Inasmuch as all the powers of the director are transferred to the vice-director in the event of the director's resignation or death or inability to perform his duties, it is of as great importance to name a candidate for vice-director as it is for director. The following form for nomination is suggested:

Executive Committee
The American Radio Relay League
Newington, Conn. 06111

We, the undersigned Full Members of the ARRL residing in the . . . . . Division, hereby nominate . . . . . as a candidate for director; and we also nominate . . . as a candidate for vice-director; from this division for the 1974-1975 term.

(Name Call City Zip Date)

The signers must be Full Members in good standing. The nominee must 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 his election. No person is eligible who is commercially engaged in the manufacture, sale or rental of radio apparatus capable of being used in radio communications, is commercially or governmentally engaged in frequency allocation planning or implementation, or is commercially engaged in the publication of radio literature intended in whole or in part for consumption by radio amateurs.

All such petitions must be filed at the headquarters office of the League in Newington, Conn., by noon EDST of the 20th day of September, 1973. There is no limit to the number of petitions that may be filed on behalf of a given candidate but no member shall append his signature to more than one petition for the office of director and one petition for the office of vice-director. To be valid, a petition must have the signature of at least ten Full Members in good standing; that is to say, ten or more Full Members must join in executing a single document; a candidate is not nominated by one petition bearing six valid signatures and another bearing four. Petitioners are urged to have an ample number of signatures since nominators are occasionally found not to be Full Members in good standing. It is not necessary that a petition name candidates for both director and for vice-director but members are urged to interest themselves equally in the two offices.

League members are classified as Full Members and Associate Members. Only those possessing Full Membership may nominate candidates or stand as candidates; members holding Associate Membership are not eligible to either function.

Voting by ballots mailed to each Full Member will take place between October 8 and November 20, except that if on September 20 only one eligible candidate has been nominated, he will be declared elected.

Present directors and vice-directors for these divisions are — *Atlantic:* Harry A. McConaghy, W3SW and Jesse Bieberman, W3KT; *Canada:* Noel B. Eaton, VE3CJ and A. George Spencer, VE2MS; *Dakota:* Larry J. Shima, WØPAN and Edward C. Gray, WAØCPX; *Delta:* Max Arnold, W4WHN and Franklin Cassen, W4WBK; *Great Lakes:* Alban A. Michel, W8WC and Richard A. Egbert, W8ETU; *Midwest:* Ralph V. Anderson, KØNL and Paul Grauer, WØFIR; *Pacific:* J. A. Doc Gmelin, W6ZRJ and Albert F. Gaetano, W6VZT; *Southeastern:* Larry E. Price, W4DQD and C. James Roux, K4THA.

Full Members are urged to take the initiative and to file nominating petitions immediately.

For the Board of Directors:

July 1, 1973
JOHN HUNTOON, W1RW
Secretary

Ray Meyers, W6MLZ, (right) of San Gabriel, California, was honored at the Dayton Hamvention as "Amateur of the Year." Ray is Secretary-Treasurer of the Old Old Timers Club and editor of its magazine, "Spark-Gap Times"; a past director of the Southwestern Division, ARRL, and quite a piano player! Russ Gardner, W8TPC, makes the presentation as Hamvention awards chairman. *(Thx to Bill Biddle, K8UZ, for the photo)*

VE3UD APPOINTED TO STUDY GROUP

J.C.R. Punchard, VE3UD, has been appointed to Study Group 2 of the Canadian CCIR organization, at the recommendation of ARRL Canadian Division Director Noel B. Eaton, VE3CJ. The International Radio Consulting Committee (CCIR) known by the initials taken from its name in French, is an arm of the International Telecommunication Union. In many of the countries contributing to the work of CCIR there are parallel organizations at the National level preparing information for the international group.

VE3UD also is chairman of the Canadian Radio Technical Planning Board, an "industry" group which advises the Department of Communications on technical matters.

CANADIAN LICENSE FIGURES

Amateur licenses in force in Canada as of March 31 totaled 13,120, an increase of 4.1% over a year earlier.

There have been some reorganizations within the Department of Communications, which account for the two holes in the chart to follow. The Pacific Region, with Hq. in Vancouver covers British Columbia and Alberta Central at Winnepeg, handles Saskatchewan, Manitoba, the Northwest Territories and the Yukon; Ontario and Quebec cover the respective provinces from hq. in Toronto and Montreal; and the Atlantic Region serves the remainder of Canada from Moncton, New Brunswick.

REGION	*1969*	*1970*	*1971*	*1972*	*1973*
Pacific	1777	1728	1778	1886	2013
Western	1108	1096	1117	2221	
Central	1163	1177	1171		2316
Ontario	4523	4388	4493	4778	4989
Quebec	2157	2138	2193	2220	2225
Atlantic	1333	1379	1403	1499	1577
TOTAL	12061	11906	12155	12607	13120

RACES DEADLINE POSTPONED

At the request of ARRL, the Federal Communications Commission has granted an extension of time for filing comments on Docket 19723, its inquiry into the Radio Amateur Emergency Service (RACES), from the original July 1 date to September 4, 1973.

The Board of Directors of ARRL will have formulated its position on the matter at its meeting on July 19, about the mailing date for this issue. The Minutes will appear next month.

SALEM, OHIO, GETS NEW ZONING LAW

After a two-year struggle, the amateurs of Salem, Ohio have succeeded in getting a change to the zoning ordinance which in effect removes the height limitation so far as amateur and home TV antennas and antenna supports are concerned.

Commercial TV and radio towers still require individual approval by the zoning board. It was the addition of the word, "Commercial," at the proper point which changed the application of the ordinance. Our thanks to Fred Kraus, W8SPR, for keeping us posted on the progress of this matter. Fred reports, incidentally, that the ARRL "Legal Kit" was very helpful in persuading the ordinance committee that this change should be made.

(Continued from page 88)

tition) filed June 24, 1970 – Proposes to move Citizens Band from 27 MHz to the 220 MHz amateur band and to return 27 MHz frequencies to U. S. Government.

c. RM-1747 (EIA petition) filed February 5, 1971 – Proposes a new "Class E" Citizens Band service between 220 and 222 MHz; 80 channels; 25 kHz channels; 100 watts maximum power. Would not alter Rules for 27 MHz Citizens Band.

d. RM-1761 (F. C. Hervey petition) received February 26, 1971 – Proposes to shut down 27 MHz Class D Citizens Band as now provided in "Parts 95 and 15" temporarily and reassign frequencies "to those Mobile Radio Services in greatest need"; and to create a new "Hobby/Personal Radio Service" in parts of the 220-225 MHz band as a substitute for present Class D Citizens Band.

e. RM-1793 (George Jacobs and Stewart Meyer petition) filed May 10, 1971 – Proposes to establish a new "VHF Radiotelephone License" in the Amateur Radio Service anywhere

above 144 MHz (suggests 221-224 MHz); phone only; 100 watts maximum power; no code test. Would not change Citizens Band rules.

f. RM-1841 (United CB'ers of America) filed July 1, 1971 – Proposes to use 27 MHz for "Hobby (Class H)" use only; transfer "all emergency and call channel operations" to 220 MHz.

3. All of the foregoing petitions propose, in various ways, Citizens Radio use of a portion of the band 220-225 MHz and will be considered in this proceeding. The most detailed petition was submitted by the Electronic Industries Association (EIA). As proposed by EIA in RM-1747 a new Class E category in the Citizens Radio Service would be created for the same type of use now authorized to Class D category stations, i.e., personal and business radiocommunications. As proposed, the Class E category would provide 80 FM channels occupying 2 MHz within the 220-225 MHz frequency band. Channels would be allocated for specific types of communications, e.g., intra-station, inter-station, business, weather advisory, emergency, marine, in-plant, traffic control, etc. Most Class E stations would be authorized 25 watts power output. A small number of channels would be reserved for one watt, local use stations. Certain public safety agencies would be licensed to operate Class E stations at 100 watts for use in emergencies. Antenna structures could be either 20 feet above the nearest man-made or natural object within 500 yards, or 60 feet above existing terrain. Licensees would be required to notify the Commission and the Federal Aviation Administration should antenna height exceed the maximum permitted near airports. The petition proposes a simplified licensing procedure which includes self-assigned station call signs. The petition further proposes that a station could be placed into operation immediately upon filing of the application and, should the Commission fail to act upon the application within 30 days, the license would automatically become validated. While the petition does not contain an estimate of the size potential for the proposed Class E category, informal estimates run as high as 10 million licensees. The Commission is also in receipt of considerable correspondence both in favor and in opposition to the reallocation of the band for any uses other than are now authorized. The American Radio Relay League, Inc., (ARRL) has filed a petition in opposition to that of EIA (RM-1747) requesting denial of the EIA petition and that the Commission issue a notice of inquiry inviting suggestions and proposals for increasing the efficiency and effectiveness of the Citizens Radio Service.

4. The band 220-225 MHz is currently allocated internationally in Region 2 to the Amateur and Radiolocation services on a co-equal basis. Nationally, however, Radiolocation is the primary service and Amateur the secondary service. The latter service is further constrained by footnote NG13 to the national Table of Frequency Allocations specifying that in an area in Texas and New Mexico about 175 miles wide and 110 miles in latitude centered essentially on the White Sands Missile Range, normal amateur operations are not permitted in the band between 5:00 AM and 6:00 PM, Monday through Friday. In view of the Government use of the band for radiolocation, the Commission has inquired as to the possibility of the band being shared with some form of Citizens Radio Service operations. The Director of the Office of Telecommunications Policy has advised that sharing to accommodate additional operations of a disciplined Citizens Radio Service would be practicable in the band 223-225 MHz. Such use would be subject to reception of possible interference from radiolocation operations, particularly in coastal, North Central and the Northwestern areas of the United States. Moreover, operations would not be permitted between the hours of 5:00 AM and 6:00 PM, Monday through Friday in the areas around the White Sands Missile Range, New Mexico, and in Franklin and Gulf counties in northwest Florida. These limitations, as well as the views of the Director, Office of Telecommunications Policy on this matter, are set forth in Appendix 2 of this Notice. (Letters dated August 19, 1971 and March 29, 1972, with attachments).

5. As implied above, the use of a portion of the band 220-225 MHz for other than Amateur or Radiolocation services would be a derogation of the international Table of Frequency Allocations of which the United States is a proponent. Therefore, it is possible that objections from Canada and Mexico may require a prohibition against any other operations in some border areas. Pending resolution of that matter, mobile stations would be constrained from operations within ten miles of the border and base stations within 25 miles of the border. If suitable arrangements with Canada and Mexico can be effected, this prohibition may be modified to conform to the nature of the agreement.

6. The Citizens Radio Service was established by the Commission in 1945 (Docket No. 6651) as a radio communication service of fixed, land, and mobile stations intended for short distance personal or business communications, and for radio signalling and control of remote devices by radio. Due to a lack of suitable low cost equipment for the then existing Classes A, B, and C services, Citizens Radio grew slowly and reached a total of only 40,000 licensees by 1958. At that time it was decided to establish a Class D Citizens Service in the 27 MHz region to permit voice communications of a general or business nature. Although interference had to be accepted from Industrial, Scientific and Medical (ISM) equipment, to which the frequency 27.12 MHz was primarily allocated, it was believed the Citizens Radio Service, due to its relatively low priority, could nevertheless make effective use of the spectrum. Consequently, although not ideally suited to the short distance concept of the Citizens Radio Service because of its sporadic long distance transmission characteristics, the 27 MHz region was allocated for such use. It was expected that equipment operating in the 27 MHz band could be produced at considerably less expense than equipment operating in VHF or UHF bands. Growth has been phenomenal, with the number of licensees increasing from 49,000 in 1959 to 868,013 in 1971.

7. The 27 MHz Class D Citizens band is divided into twenty-three channels with seven channels authorized for communications between units of different stations and one channel to be used solely for emergency communications involving the immediate safety of life and the immediate protection of property, or communications necessary to render assistance to a motorist. A wide variety of communications is permitted in the Class D Citizens Radio Service. As the number of licensees increased, however, so did complaints against the use of the service for the transmission of long duration base-to-base messages, hobby type communications, technical violations such as use of

Clarence Tuska, ex-1WD, ex-1ZT, (left) cofounder and first secretary of ARRL, examines a receiver he made 50 years ago. Looking on: Charles Brelsford, K2WW, president of the Antique Wireless Association and ARRL Atlantic Division Director Harry A. McConaghy, W3SW.

high powered amplifiers, and general pollution of the spectrum. Such abuses resulted in certain prohibitions against the Class D CB Service including: (1) communications as a hobby or diversion; (2) transmission of obscene, indecent or profane words, language or meaning; (3) communications not directed to specific stations or persons; (4) the transmission of advertising or soliciting the sale of any goods or services; (5) transmission of music, whistling, sound effects or any material for amusement or entertainment purposes; (6) communications about the technical performance of equipment; (7) relaying messages for a person other than the licensee or member of his immediate family.

8. The Commission has been examining a number of various proposals directed toward promoting the effective use of the Citizens Radio Service or reducing widespread Rule violations. These proposals will be the subject of further Commission inquiries and proceedings with regard to Class D enforcement problems. The immediate proceeding, however, will address only the possibility of allocating additional frequencies to meet the requirements of the general public for improved radiocommunication services not now effectively provided by the Class D Citizens Radio Service and, at the same time, relieve some of the heavy concentration of stations on channels available to the Class D service. Such stations constituted nearly 47% of the total number of radio stations authorized by the Commission, as of June 30, 1971.

9. The Commission proposes in this proceeding to establish a form of fixed and mobile service in the band 224-225 MHz. The band would be divided into 40 channels at 25 kHz spacing. Eligibility for this service would be similar to that for the present Class D service, i.e., any person eighteen years and older who meets the basic criteria for Commission licensing. However, the Commission does not intend that the abuses of its Class D rules, and associated enforcement problems, shall be extended to this new service. Accordingly, before this service is permitted to become operational the Commission will establish new Class E rules and enforcement procedures, based on the information provided in response to paragraph 10 of this Notice and such other relevant information as it deems appropriate.

10. With a view toward achieving the above objectives regarding the reallocation of the band 224-225 MHz specific comments and substantiating data are invited on the following:

a. Specific services and types of operations which should be provided, including limitations and reasons therefor. Estimated growth over 10-year period.

b. Economic, sociological and other public interest benefits which would be derived.

c. Effect on Class D Citizens Band operations at 27 MHz.

d. Nature and probable impact of operational limitations imposed as a result of interagency and international objections or conditions of use.

e. Detailed technical parameters which should be adopted regarding equipment to be used, including detailed studies of extent of effective coverage and use to be expected in different environments such as urban areas with high density population. In addition, detailed recommendations should be made regarding total spectrum space required to meet various objectives, channeling, maximum power, antenna limitations, channel capability, frequency control, etc. Additional comments on recommended receiver characteristics are also invited, as well as estimated equipment costs to the user.

f. The feasibility, cost, operational use and potential effectiveness of automatic transmission of call sign or station identification as an aid to self or Commission enforcement, or for other purposes.

g. Appropriate measures to be followed regarding initial and updated registration of Class E operations for purposes of achieving efficient channel utilization, enforcement follow-up, etc.

h. The feasibility and desirability, including estimated social and economic impact, of phasing out either personal or business use of Class D service @ 27 MHz in favor of the surviving use, in conjunction with the establishment of a new Class E service.

i. The feasibility, desirability, and legality of Commission confiscation, under certain conditions, of equipment operated illegally.

11. Any schedule for implementing the new radio service operations at 224-225 MHz will have to consider the availability to the Commission of budget allocations in order to provide for the additional administration and enforcement of rules. EIA has estimated that the proposed Class E Service could produce 10 million licensees. The Commission solicits comments on this and other estimates of total licensee impact as well as the methodology and/or calculations that support such estimates. Comments are also requested regarding possible procedures for licensing and enforcement which would minimize the administrative burdens resulting from such a large number of users.

12. In the event that a portion of the 220-225 MHz amateur band is reallocated to other services, detailed amendments to the rules governing all services involved will be developed and proposed

APPENDIX

Part 2 of Chapter I of Title 47 of the Code of Federal Regulations is amended as follows:

1. Sec. 2.106 (amended)

United States			Federal Communications Commission				
Band (MHz)	*Allocation*	*Band (MHz)*	*Service*	*Class of Station*	*Frequency (MHz)*	*Nature of services of stations*	
5	6	7	8	9	10	11	
***	***	***	***	***	***	***	
220-224	G, NG. (US34)	220-224	Amateur. (NG13)	Amateur		AMATEUR	
224-225	G, NG. (US121)	224-225	Fixed. Mobile. (NG68) (NG69)	Base Fixed. Mobile.		FIXED. MOBILE.	

2. NG13 is amended to change the pertinent band limits from 220-225 MHz to 220-224 MHz.
3. New footnotes NG68 and NG69 are added in appropriate numerical sequency to read as follows:

NG68 In those portions of the States of Texas and New Mexico in the area bounded on the south by parallel 31° 53'N, on the east by longitude 105° 40'W, on the north by parallel 33° 24' and on the west by longitude 106° 40'W and in the State of Florida the counties of Gulf and Franklin and the contiguous water areas of the Gulf of Mexico extending to 30 miles off shore, the frequency band 224-225 MHz is not available for use by fixed, base and mobile stations between the hours of 0500 and 1800 local time Monday through Friday, inclusive, of each week.

NG69 Pending the outcome of coordination with Canada and Mexico, fixed and mobile stations are not authorized to operate within ten miles of the international boundary with these countries; base stations are not authorized to operate within twenty miles of the international boundary with these countries.

4. US34 is amended to change the pertinent band limits from 220-225 MHz to 220-224 MHz.
5. A new footnote US121 is added in appropriate numerical sequence to read as follows:

US121 The only non-Government service permitted in the band 224-225 MHz is by stations of the fixed and mobile services. These stations shall be on a secondary basis to and not cause harmful interference to the Government radiolocation service.

after review of the comments received in response to this proposal. The proposed amendment of Section 2.106 (Table of Frequency Allocations) is set forth in the attached Appendix I.

13. Action herein is being taken pursuant to authority contained in Sections 4(i), 303 and 403 of the Communications Act of 1934, as amended.

14. Pursuant to applicable procedures set out in Section 1.415 of the Commission's Rules, interested parties may file comments on or before September 20, 1973, and reply comments on or before October 22, 1973. All relevant and timely comments and reply comments will be considered before final action is taken in this proceeding. The Commission, additionally, in reaching a decision in this proceeding, may also take into account other relevant information before it.

15. In accordance with the provisions of Section 1.419 of the Commission's Rules, an original and 14 copies of all comments, replies, pleadings, briefs, or other documents shall be furnished the Commission. Responses will be available for public inspection during regular business hours in the Commission's Public Reference Room at its headquarters in Washington, D. C.

FEDERAL COMMUNICATIONS COMMISSION

Ben F. Waple, Secretary

EDITOR'S NOTE: Appendix 2 consisted of letters from the Office of Telecommunications Policy and the Department of the Air Force, the thrust of which is included in the text of the notice. However, a few extracts are of interest:

". . . radio channels could be made available for a General Public Radio Service, having as its prime objective the satisfaction of many currently unfulfilled communications needs of a nation on the move — travelers, sportsmen, hobbyists, and quasi-business activities. Propagation characteristics of 225 MHz, coupled with carefully developed FCC rules, could afford a high fidelity, orderly communications service, responsive to the needs and interests of the private citizen. . . . While the

(Continued on page 106)

James E. McAlister, WA5EKA, won the Cover Plaque Award for December 1972 with his article, "Simplified Impedance Matching and the Mac Chart." The plaque was presented by Delta Director Max Arnold, W4WHN, at left. *(Photo via Lester Woosley, W5EIJ)*

Correspondence From Members-

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

TREED

● Mr. Foskett should be congratulated! ("Putting Up Wire Antennas – the Easy Way," June *QST*). I should have consulted him before I went and bought a vertical. Why wasn't this vital info in *QST* months ago? My dipole that never stayed up would have! Also, I would have been able to use my maple trees, instead of resorting to hanging out of second story windows. Why couldn't I think up something like that. Three cheers! – *Joshua Grosse, WN8OGH, Ann Arbor, MI*

● Mr. Foskett's ideas are quite good but I am alarmed at the way he has apparently strung his bow. Most bows sold now-a-days are the "recurved" type and Mr. Foskett's appears to be strung backwards.

Reverse stringing of a recurved bow is an immediate danger to the archer because the fracture point of the bow arms is severely lessened. Exceeding the fracture point could subject the archer's facial area to flying plastic splinters. Furthermore, pure plastic bows will quickly sun-weaken and they will also distort out of shape when subjected to direct heat. Fiberglass laminated bows cost only $5 or so more and are virtually indestructible in normal use.

Archers should always plan their shot carefully with the impact zone foremost in their mind. I have found that shortly after dawn is the most advantageous time for shooting. The wind is usually at its daily minimum, there are no children around to protect and finally, the neighbors won't be up to decide that that radio nut has finally gone bananas!!! – *William B. Shepherd, W3ZSR, Bowie, MD*

● W1ECH's article describes the method I have used for some time with good success but with one major difference. For a bow and arrow I substitute a good sling-shot and a heavy nut. This method has a few advantages. Your son or younger brother may have a sling-shot that you can use. I personally prefer one that goes by the trade name of "Wrist-Rocket." And, when you make mistakes you need not worry about recovering the lost nut; the replacement cost is minimal. A contrasting colored nut can be helpful in locating your good shots. The cautions W1ECH mentions apply very much here too.

If you are having trouble getting those knots through the tree you might try the following: Pull the knot down, streamline it by wrapping it cleanly with black plastic electricians tape, and try again. If that still doesn't help and your line is in the exact spot you wanted there is one thing left to try. Pull the knot back down, unwrap all that tape and untie the knot (if you can), take the two ends and splice them together by overlapping them six inches and wrapping and streamlining the overlap with black tape. Try once again and if that doesn't do it you can rest assured the likes of Murphy is up in that tree. – *Karl E. Grunewald, WA8ZAV, East Lansing, MI*

● A very good description by Gary, W1ECH, on an easy way to get up an antenna, especially on Field Day.

For the past several years the "Band Dit-Dahs" of WNY, using the call of K2JD/2, has solved this problem in a slightly different manner. We use a mortar constructed of a piece of two-inch iron pipe, about eighteen inches long, securely anchored in a pail of sand. The bullets are made of wood, to the nose of which is fastened a length of binder twine. Black powder is used, an amount necessary to get it over the tree but not into the next county. A good way to start off Field Day with a bang. – *Linc Cundall, W2QY, Rochester, NY*

THRILLED

● I'll be damned! (Woops – didn't really want this in *QST* anyhow . . .). Got the '73 *Handbook* the other day and – transistors!! It's only been 25 years now since transistors were publicly discovered. This discovery on the part of the ARRL has thrilled me so much that I'll try again to read *QST* (skipping the articles on regenerative receivers has left little in the past).

I believe in the furtherance of amateur radio, and, assuming that the Audion was presented in the *Handbook* no sooner than 1936 (30 years after its patent), the ARRL does too. – *Roy W. Lewallen, W0ETU, Denver, CO*

ASTOUNDED

● I was astounded after reading the letter written by Bob Rooney, W2AET/W2QCI, in the May issue of *QST*.

In our Modern Age of Society it is very disheartening to read of an amateur wanting to streamline our traffic message service in such an unorthodox way. Emergency power is Mr. Rooney's only justification of amateur traffic nets today. I disagree wholeheartedly with the entire letter! In reality, to excel in anything there is much studying and research to be done. Also hard work, experimentation and perseverance is involved. We may falter many times but that makes us strive harder to reach our goal. In other words, you don't give a small child a pencil and tell him to *write*, he has to be *taught*. The child *will learn* to write after many mistakes and much practice.

I put our amateur nets in this same category. If a crisis should arise, we have well experienced, disciplined, dedicated, trained and knowledgeable amateurs who can handle any situation due to their training and experience in our traffic nets. – *Mary Blankenship, WB4TTC, Madison, TN*

PRICE OF FREEDOM

● Gentlemen, I have been remiss. Though I have not yet put my thoughts in writing, I am very

much disturbed by the tenor of many of FCC's recent decisions. There are also many good things that have been ordered in the past few months, but the things I do not like remind me of the times in our history when attempts were made to put a stop to this most noble of hobbies. I was concerned about these things when the dockets were announced (that is, the parts of them which were announced), yet I did not write to you or to my director or senator or representative or the FCC. It is still true – perhaps even more true than ever – that the price of freedom is vigilance. I read the League's replies to the Commission, and I thought they were clear, accurate, and persuasive concerning the subjects contained in the dockets. Two questions come to my mind: (1) What went wrong? Why, in spite of brilliant ARRL replies, did the Commission act as it did? (2) What can be done to improve the situation and minimize the chances of this happening again?

It appears to me that the Commission was not interested in what we thought. What were they interested in then? In the big-money industries? That would not be surprising. Consumer groups have long made strong cases that federal agencies tend to protect the industries they are supposed to regulate at the expense of the public they are supposed to protect. Was the Commission interested only in the reports of its own civil service staffers? Was the Commission interested only in protecting itself in advance from possible telephone company complaints? Was it a combination of those things? I presume that none of us knows that. However, we should consider every possible reason and act in the light of knowledge and informed guesses.

How can we help bring things back into balance? Or, is that an impossible dream? One thing is certain: we cannot get any results if we do not do anything. "They" cannot consider our ideas if we do not tell them our ideas. "They" will think we do not care about what they did if we do not do anything. In fact, amateur radio will not continue to exist as the effective emergency communications system it is if the FCC promulgates more orders in the philosophy exhibited in recent ones. Therefore, it seems we must get to the FCC, and we must get to our elected officials and government representatives. What I mean is, we must go to FCC and over the head of the FCC to take our case to those who will be most affected in the long run: the public, and government agencies. As the only amateur national organization, ARRL has the means and the responsibility to galvanize amateurs to a battle plan.

The very existence of amateur radio is threatened by FCC philosophy, if it continues to be carried out. We have been threatened in the past, and we have been saved by the effective actions of the League. Those old files should be reviewed, and we should come up with a plan to reverse this dangerous trend. – *Clifford E. Chamney, K@BIX, Warrensburg, MO*

CONTEST OBSERVATION

● Now let's see if I follow the argument correctly: Contests should be abolished because they cause so much QRM. But that QRM is caused by the operation of so many stations participating in the contest. Therefore contests should be abolished because so many amateurs participate?

Still, the majority should not be able to deny the rights of the minority in any case. But observation indicates that no band is every completely filled with contest activity with the possible exceptions of 40 and 75 phone on SS and FD nights. – *Tom Ashley, WB4SIJ, Lexington, KY*

DX DEVICE?

● "Range Measurements with Oscar 6" in May *QST* is very fine, although applicable to only a small group of radio amateurs. It seems to me that DJ4ZC is a specialist in the field applicable to the type of measurements he describes, for which reason I would like to see that he writes a related article on measurements useful to the broad scope of DX-operators

For example, by using a layout of equipment similar to that which he describes in the referenced article, DJ4ZC could describe (in detail and in specific terms of circuits and number-tables) range measurements which can be used to determine the height of the E and F layers and the density of the layers, before and while the DXers go on the air. Thus, they could determine the position of their antennas (more down or more upward directed) to get the reflection of their signals into the desired "impact" area. By the cleanliness and sharpness of the return signal (or their defused splatter) they could estimate the degree of success they would have by transmitting at a given time.

Because DJ4ZC mentions the use of a tone-signal, one could probably perform the measurement without the use of a true pulse, which is not allowed in many amateur bands.

In place of using a slowscan device, he may be able to devise an assembly which includes the use of an old black and white TV, easily obtainable by hams.

It may be possible to continuously monitor the return signal, thus visually indicating to the operator of the DX transmitter the probable effectiveness of the outgoing signal, relative to the display shown on the TV screen.

The whole thing seems to be a very interesting project for DXers, especially due to the simplification of the equipment as described by DJ4ZC. Though, I may be the only one who has that opinion. – *Ernst E. Seiler, WA4RMF, Madison, AL*

50TH ANNIVERSARY

● November 27 will be the 50th anniversary for amateur two-way communications across the Atlantic Ocean.

My idea is to have a reunion at ARRL Headquarters for amateurs who carried on two-way communications across the Atlantic in 1923, including old timers and present-day amateurs who wish to participate. – *C. H. Jackson, K2DV, Bellmore, NY*

APPALLED

● I was appalled by the ignorance displayed in the letter from OT Jack Quinn, W6MZ, in the June issue. Contrary to his statement that ARRL is a "national magazine," ARRL is a national *organization*, which publishes an international magazine, *QST*, as one of its many functions. His statement is only a reflection of his obvious prejudice.

The remainder of Mr. Quinn's letter consists mainly of expressions of opinion, to which he is certainly entitled. I have no comment on these, other than to express my complete agreement with his concluding sentence. – *Earl D. Crawfis, W7KS, Phoenix, AZ*

FCC APPROVED

● One of the best features of any magazine are the manufacturers ads, which provide one with information on what is new in the industry and gives you basic information on new products, service, etc. Recently, while reading June *QST*, I noticed one ad that caught my eye . . . one phrase especially, so I thought I would pass it on. Cush Craft is advertising its fm antennas as "FCC APPROVED" in very large letters. *Baloney!* They mean that they have filed the antenna pattern with the FCC. So far, the FCC has not accepted or rejected anything for amateur use. FCC type acceptance is for the commercial services. Well, you might ask, why get all up-tight about Cush Craft's FCC Approved antennas?

Just think of those words – and the possibility of setting a bad precedent. The FCC has made a mess of repeaters by requiring strict control and other rules which indicate they are not in favor of free experimentation for repeaters. I don't like the thought of the FCC extending its "approval" to other ham gear. FCC approval does not mean superior performance, compliance with rules, etc. You could get "FCC APPROVAL" on an antenna made with a one-inch wire stuck in an apple, if you took the time to file the radiation pattern on the dang thing, despite the fact it wouldn't work well. Let's keep those words out of the ads and avoid FCC approval or FCC rejection of any ham gear. – *R. A. Voss, WB4WVC, Lynchburg, VA*

[EDITOR'S NOTE: We tend to share your view. But the fact is that FCC has issued literature liberally using the word "approved,' and listing Cush-Craft's several antennas under the "approved" caption. The ad in *QST* is, therefore, simply quoting an official FCC document.]

SELF IMPROVEMENT

● I found the way to improve your license without working!

About a year ago I started teaching amateur radio in our local community school system. In the class there were students ranging from 11 years to retirement age. I spent ten weeks with them, teaching theory and code (that was one of the hardest parts of the job). By the time the term was done, they had learned enough to get licenses in some cases, and to remain interested in the rest. And I had improved my speed from its long-standing 3 or 4 wpm to 13 or 14. I did it with practically no work on my part. Just teaching them had familiarized me with the code.

I have held a Technician license for about ten years, and would probably have it for another ten were it not for the class. My Conditional arrived two weeks ago, and I plan to take the Advanced this summer when I arrive in a city. The cost of the code practice for me wasn't bad, either, since I got paid to do the teaching.

Moral – if you've let ham radio slip through your fingers, and haven't done much with it recently, try to teach it to someone. It'll help *both* of you. – *Jon E. Wennerberg, WA8GDW, Houghton, MI*

THE RIGHT PRESCRIPTION

● Now you tell me. Editor's Note 1 in the article "A Modified 20-Meter Delta-Loop Beam," by W8PJ, (June *QST*) says one does not buy linseed oil and boil it.

It was some 28 years ago I boiled linseed oil and never saw such a mess. Needless to say, for over a quarter century, I have stayed away from construction articles that prescribed boiled linseed oil. Now that I know what it is maybe I can try my hand at homebrew projects again. – *Ed Howell, W4SOD, Folly Beach, SC*

STATE OF THE ART

● If a digital logic designer used vacuum tubes in his designs, he would not keep his job. If an audio designer used tubes, his designs would be considered absurd. Even Citizen's Band radio equipment is solid state. There are *only a few* applications where tubes are really needed.

Yet amateurs use tubes without questioning it. It is not a legitimate excuse that semiconductors are not developed enough or are not economically enough priced. If amateurs demanded semi conductors, the research would go into their development and marketing. If you say that there is no solid state equipment to buy, you are right. There are very few completely solid state (not hybrid) circuits marketed (Swan and Heath are the ones that come to mind). But who says that you have to buy ready made or pre-packaged kits? No one!

Perhaps the League has something to do with it. Their construction articles run about half vacuum tube/half semiconductor – but the large projects are tube.

But it is hams themselves who must demand solid state equipment. According to Section 97.73:

> "Spurious radiation from an amateur station . . . shall be reduced or eliminated in accordance with good engineering practice."

The state-of-the-art is not vacuum tubes. That good engineering practice happens to be in solid state. – *James Kucera, WN0JLS, St. Paul, MN*

NOVICE COMMENT

● It seems to be one of the great sports of hams to run around telling each other how bad CBers are. The letters "CB" when they appear in a ham magazine are often accompanied by "pardon the expression" or simply "(ugh)." We like to tell each other what a mess the Citizens Band is; full of *QRM, illegal operation and inconsiderate slobs.* Right?

Who are we trying to kid? Is it CBers who jam W1AW every code session? Is it CBers who swing vfos across 40 meters at full power? Is it CBers who start calling CQ at 1 kW on top of a Novice QSO?

Let's stop being "holier than thou" and turn a little of our criticism on ourselves. Not all of the inconsiderate slobs are CBers – and we don't have the excuse that we don't know any better. – *Mitt Nodacker, WN7TFE/8, East Cleveland, OH*

● My friend and I have been noticing that there is not much Novice activity on ten meters. I think since Novices got the new band they should use it. So come on Novices, join the "band wagon." – *Don Holmes, WN0JBN, Florissant, MO*

● This sheet of paper was going to be used to copy W1AW code practice at 0230 GMT on 7080 kHz, but try to compete with 3 cw stations and a foreign ssb station. It's disgusting how inconsiderate those lunkheads are that QRM W1AW.

(Continued on page 99)

CONDUCTED BY LOUISE RAMSEY MOREAU,* W3WRE

YL Activities

IN *CQ-YL*, the story of women in amateur radio, Louisa Sando, W5RZJ, states that although "vastly outnumbered by her brother hams, nonetheless her influence is felt in every facet of amateur radio." We might add that the feminine touch is not limited to this country but is world wide.

The calls and names of women operators have become outstanding in the broad field that the amateur service covers. The communications work done in emergencies shows that women have participated in every type of major disaster. The now discontinued Edison Award was not only presented to a YL, but during its existence many women received commendations for their work.

We are busy each July setting up the very important ATAWAR network to keep communications going along the route of the annual "Powder Puff Derby." The record of the ladies in MARS has been outstanding in all three services for traffic handling, and for phone-patch service for armed forces personnel. This is a part of the YL story that has been well publicized and it involves only a few of the activities of women amateur radio operators. So, what else do we do? Mainly the less colorful things that don't seem to attract publicity, but are a part of our service to the amateur as well as to the public.

Through YLRL's program to assist other women we are bringing *YL Harmonics*, and news of our activity to the sightless YLs in this country whether they are members of the club or not. Each issue of the magazine, plus news from amateur publications is taped for these operators so that they can keep abreast of YL news. The Ontario Trilliums have an active program of helping blind people acquire the necessary qualifications to receive a license, and they are working in veterans hospitals with both code and theory classes and assisting them in getting started on the air after the license has been received. We are a part of the Handicapped Net, and have organized and help "Handi-Hams" not just assisting in classes, but in some cases designing aids to make operating easier for those who have difficulty tuning, or operating the equipment.

Through our international nets, the YLISSB, the women making personal visits in "Colegas y Amigos," the YLRL "Adoptee" program by which the gals in DX countries are able to overcome the problem of red tape in international exchange and enjoy membership in this oldest of world wide clubs for women operators, we have evolved our own people-to-people program of meeting, helping, and understanding the people in other countries around the world.

We plan and conduct code classes for the beginners. We are found in the radio booths at fairs and community events. We speak about our hobby, and explain the Amateur Radio Service at various civic organizations.

We set up a station and make special schedules to enable students to talk to people in other countries and learn about them first hand so that

VE8FD, Julie Duncan, the only YL in the Yukon Territory, at present using the Yukon 75th Anniversary prefix VA8FD. *(Photo courtesy VE8CD)*

*YL Editor, *QST*. Please send all news notes to W3WRE's home address: 305 N. Llanwellyn Ave., Glenolden, PA 19036.

their books have a greater significance. We maintain club sponsored programs to demonstrate amateur radio in the schools. We schedule practice sessions to enable aspiring newcomers to learn the strange "language" of cw net participation, and of traffic.

True, as Louisa put it, in the grand total of the amateur census we are a very small minority, but we are a busy one. Name the activity and it is an almost sure bet that there will be a YL in there working somewhere.

YLRL Howdy Days

The 1973 YLRL "Howdy Days" is an informal QSO-party style contest that is limited to YL operation only to act as a get acquainted activity for women operators.

Rules: Scores will be based on contacts with licensed women amateur radio operators only. All bands and modes of emission may be used. Cross band operation is not permitted. Net contacts do not count. Only one contact with each station will be counted.

Scoring: Score two points for each YLRL member worked. Score one point for each non-YLRL member worked. *No* multipliers.

Awards: Top scoring YLRL member will receive her choice of a YLRL pin, charm, or stationery. Non-YLRL member will receive a one-year membership in YLRL. A certificate will be awarded to the high score Novice log.

Logs must be mailed to Eila Russell, WA8EBS, 4348 W. 223rd Street, Fairview Park, Ohio, 44126. Please remember that the logs must be received by October 15, 1973, to qualify.

Trillium YL CW Net

The Ontario Trilliums have organized a cw practice net that is exactly what the name implies. The net has been established for beginners who would like to take part in net operation but are unacquainted with procedures. Not a formal traffic net, it is open to all interested persons who would like to take part in this type of activity. All amateurs who are interested are welcome to participate on Wednesdays at 0100 GMT on 3.695 MHz. The net uses the club call VE3TOT.

1973 TOT Officers

The Ontario Trilliums, Canada's oldest YL club announces the officers for the club year June 1973 to June 1974.

President, Barbara Newman, VE3BFN; Vice-president, Irene Williams, VE3BEI; Secretary, Audrey McDermott, VE3CCO; Treasurer, Evelyn Phipps, VE3EPT; Publicity Mgr., Shirley Lewis, VE3GNG; Editor *TOT Topics*, Thelma Woodhouse, VE3CLT; Membership, Thelma Tuttle, VE3ARG.

Members of TOT have done an outstanding service in giving assistance to sightless, and handicapped amateur radio operators in code and theory, as well as helping them get started on the air after they have received their licenses.

VE8-land's 3 YLs

Fans of Robert Service, or James Oliver Curwood, imagine all sorts of colorful pictures when the Yukon or the Northwest Territory is mentioned. But to YL operators it's been tough to log a VE8 unless VE8HH was on the air, for until September, 1971, she was the only YL in that district.

Licensed in 1960 as VE7BDH, Vera and the OM moved to Yellowknife in 1965 where she received her present call. She spends much of her time on cw as well as ssb. Although casual rag chewing is Vera's favorite activity, the move to the Northwest Territory where radio is an important link in many instances has kept her busy in traffic, and phone patch operation.

The Yukon was represented in the YL story in 1971 when Julie Duncan moved from Calgary to Haines Junction, and her call was changed from VE6AHF to VE8FD. As with the other amateurs in the Yukon, Julie will be using the call VA8FD for the rest of the year to commemorate the 75th Anniversary of the Klondike Gold Rush.

Until very recently VE8HH, and VE8FD were the only YLs in that district. In May 1973, VE8NN, Diana, became the third woman to represent VE8 in the YL picture in Canada.

WB2YBA New YLRL WAS-YL Custodian

The YLRL announces the appointment of Chrstine Haycock, WB2YBA, 361 Roseville Avenue, Newark, NJ 07107 as Custodian of the WAS-YL Award. Chris replaces Irene Akers, W3RXJ, who has held that office for some time. It has been requested that all correspondence regarding that certificate be addressed to WB2YBA.

1973 MINOW Net Officers

The Minow Net announces the election of the following women as club officers for the year 1973-1974. President, Frieda Raymond, W7PVG; Vice-president, Joan Gallagher, WA7BDD; Secretary-Treasurer, Patricia Smith, WA7GMX. The election took place at the 10th Anniversary Banquet of the net in Coeur d'Alene, Idaho.

VE8HH, Vera Hines first YL to be licensed in the 8th Canadian District in 1965. *(VE8CH photo)*

Frieda Raymond, K7PVG at the microphone, with Joan Gallagher, WA7BDD. Frieda and Joan are the 1973 President, and Vice-president of the MINOW Net. *(K7UBC Photo)*

1973-1974 YL Net Directory

DAY GMT	*FREQ.*	*NET NAME*	*NCS/MGR.*
Daily			
1600	14.332	YLISSB	Varies
Mon.			
1300	3.950	Buckeye Belles	WA8EKQ
1300	3.695	N. E. Codettes (cw)	Varies
1400	3.930	UP YL	K8KIT
1530	3.915	LARK	Varies
1600	21.373	YLISSB	K8ITF
2300	3.915	Honey Bee	W7HHH
2330	28.650	PJYL (cw)	K3ZDN
Tues.			
1230	3.935	Blue Ridge	WA4UWK
1400	3.933	Floridora	W4BWR
1430	3.940	Jayhawker	WØJUV
1500	7.175	Novice (cw)	WNØGQL
1530	3.940	Jayhawker	WØJUV
1600	7.135	MINOW (cw)	Varies
1700	7.235	Ironing Board	WA6UBU
1800	21.150	Novice (cw)	WNØGQL
1900	14.160	CLARA	VE6APB
0000	3.970	Buckeye Belles	W8MBI
			WA8KMT
0300	3.780	YL Net	VE4ST
Wed.			
1200	3.933	Georgia Peaches	Varies
1330	3.910	Yankee Lassie	Varies
1330	3.770	Maritime Sparkettes	VE1YL
1400	3.950	YL Welcome	Varies
1500	50.335	Buckeye Belles	K8CEN
1900	50.650	New Englanders	Varies
1900	14.288	YL Open House	WA5JFZ
0200	51.300	Chix-on-Six	Varies
0100	3.933	Floridora	Varies
0300	3.780	YL Net	VE5HO
Thurs.			
1400	3.950	YASYL	WA8ARJ
1400	7.277	Georgia Peaches	Varies
1400	3.940	TYLRUN	WA5MPM
1600	7.280	TYLRUN	WA5MPM
1800	14.295	Tangle Net	KØEPE
0130	3.970	PJYL	K3ZDN
0030	3.770	Maritime Sparkettes	VE1YL
0500	3.935	Working Girls	WA6ISY
Fri.			
1400	7.270	Midwest YL	Varies
1600	3.919	MINOW	Varies
1600	21.272	YLISSB	K8ITF
1830	14.313	MINOW	WB6RFE
2100	3.721	Novice	W1YPH
Sat.			
1200	13.221	YLISSB	SM5EAC
1400	3.910	Hawk Roost	K9ILK
1700	14.140	Ontario Trilliums	VE3BFN
1900	14.070	YLISSB	WA9KQS
2100	3.770	Ontario Trilliums	VE3AYL
Sun.			
1200	14.332	YLISSB	SM5EAC
1900	14.070	YLISSB	WA9KQS

QST

Correspondence *(Continued from page 96)*

I don't know how long code practice lasts because I've never been able to finish copy, but those ignoramuses can at least stay off the air until code practice is over. — *Joel Harrison, WN5IGF, Judsonia, AR.*

● I would like to make a gripe, which for me is a bit rare, concerning the great Generals, Advanced and Extra Class DX hunters while on the 15 meter Novice band. Recently we (the Novices) were privileged to have TR8PB work some of us for the continent of Africa. A pile-up of sorts ensued. Guess who was on top of the pile-up? W5s, K4s, WB2s, etc. All trying to work him with their 3 element beams and 250 watt to 1 kW rigs. The little guys with 20 watts and dipoles didn't stand a chance. TR8PB did what was necessary. He QRTed and about 15 Novices, myself included, lost a fine chance to gain Africa. — *Julius "Jules" Fazekas, III, WN2EOO, Port Chester, NY*

● As a Novice, I treasure the 100 kHz between 21.1 and 21.2 MHz, as I only have a 15 meter antenna. I do appreciate when a General or higher works the Novice segment to help Novices, but when I hear a WA5 calling CQ DX, or a WH6 being grabbed by a WA6 on the Novice band I get a little disgusted. How can an inexperienced Novice such as I compete with a General running at least over 200 watts? — *Michael Berro, WN6VDT, Los Angeles, CA*

● I spend a lot of time in the Novice bands working the newcomers and very often giving them their first DX station. About 60 percent of the time it works out fine, but for the rest, nothing. Either they don't respond when I call CQ or they do not reply when I answer their CQ. It's not that they cannot hear me, I get fine reports from the ones I work. They just don't answer.

Now this wouldn't worry me so much but for the statement of one Novice. He replied to me, when I answered his CQ, saying "Don't think I'm allowed to wrk u OM"!!!! Fantastic now here's the answer! Could it be that all the others don't answer because they fear FCC reprisals for working another station which doesn't have a WN prefix? If this is so, you've a problem on your hands people. How about letting your budding hams know that they can work *us* too? — *Bruce Allen, VE3EJF, Kingston, Ontario, Canada*

August 1923

. . . West coast signals bombarded Australia and New Zealand ham receivers, and stations as far east as the third call area were heard, in successful Transpacific listening tests. Daylight transcons are the next organized project aimed at breaking more records. Almost-commonplace DX takes the glamour from the "Calls Heard" column, greatly reduced in size.

. . . New amateur regulations are published in full – occupying an entire half-page of *QST!* We're stuck with compulsory quiet hours (8 to 10:30 pm local time, and Sunday mornings), but most hams have observed them voluntarily anyway. The basic band is 150 to 200 meters, but any spark or modulated cw has to stay above 176; special licenses will permit cw up to 220 meters, issued only to Extra First Grade operators, a new class requiring two years experience and 20 wpm capability.

. . . ARRL's Publicity Department, formed to "tell the truth about the ham" in self-protection against the inroads of broadcasters, seems to be making headway. Division publicity managers and assistants handle local problems such as BCI, and Hq. sends news bulletins at regular intervals to some 500 newspapers.

. . . Increased knowledge of propagation was a major result of the extensive "fading tests" project sponsored by ARRL for the Bureau of Standards. A summary report of the tests, actually held in 1920-1921, highlights this issue.

. . . Operating and regulatory developments have pre-empted most technical articles this month, but the final installment of the extensive treatise on filters has plenty of "meat" to digest.

August 1948

. . . Lab gear designs are now including extensive preventive measures for TVI. W1TS describes a rig with an output pair of 807s – stabilized, shielded, and with filtered supply and keying leads.

. . . Surplus BC-453s are selling like hotcakes for use as Q5ers. W9AEH goes one better by dropping down to 72 kc. for his second i.f. and claims 1 kc. bandwidth at 1000 times down.

. . . W2BIQ tried the "new" Clapp oscillator described in the May issue and finds it every bit as stable as claimed. The editor has discovered, however, that W8EB/W2EB presented an almost-identical circuit in November 1941 *QST!*

. . . Ed Tilton continues his push for more activity on 220 Mc. with a description of a 300-watt driver/amplifier in use at W1HDQ. The plates of 4-65As "show only a slight color."

. . . W2OEU related the story of Dr. Mahlon Loomis, one of several inventors who appear to have made some startling but unrecognized discoveries in wireless well before Marconi.

. . . The "Dash Master" by W6TZK produces continuous dashes electronically, but lets the "bug" provide dots mechanically, thus simplifying electronic key construction.

. . . Our long-time emergency alert signal, QRR, has been reassigned for use by international regulations, so the Communications Department announces "QRRR" as the new amateur SOS. – *W1RW*

ARRL QSL Bureau

The function of the ARRL QSL Bureau is to facilitate delivery to amateurs in the United States, its possessions and Canada, of those QSL cards which arrive from amateur stations in other parts of the world. All you have to do is send your QSL manager (see list below) a stamped, self-addressed envelope, about 5 by 8 inches in size, with your name and address in the usual place on the front of the envelope and your call printed in capital letters in the upper left-hand corner.

Cards for stations in the United States and Canada should be sent to the proper call area bureau listed below. Recent changes are in bold face.

W1,K1,WA1,WN1 – Hampden County Radio Association, Box 216, Forest Park Station, Springfield, MA 01108.

W2,K2,WA2,WB2,WN2[1] – North Jersey DX Assn. P.O. Box 505, Ridgewood, NJ 07451.

W3,K3,WA3,WN3[1] – Jesse Bieberman, W3KT, RD 1, Box 66, Valley Hill Rd., Malvern, PA 19355.

W4,K4 – North Alabama DX Club, P.O. Box 2035, Huntsville, AL 35804.

WA4,WB4,WN4 – J. R. Baker, W4LR, P.O. Box 1989, Melbourne, FL 32901.

W5,K5,WA5,WB5,WN5[1] – ARRL W5 QSL Bureau, Box 1690, Sherman TX 75090.

W6,K6,WA6,WB6,WN6 – No. California DX Club, Box 11, Los Altos, CA 94022.

W7,K7,WA7,WN7 – Willamette Valley DX Club, Inc., P.O. Box 555, Portland, OR 97207.

W8,K8,WA8,WB8,WN8 – Columbus Amateur Radio Assn., Radio Room, 280 E. Broad St., Columbus, OH 43215.

W9,K9,WA9,WB9,WN9 – Northern Illinois DX Assn., Box 519, Elmhurst, IL 60126.

WØ – Reggie Hoare, WØOYP, P.O. Box 115, Mitchellville, IA 50169.

KØ,WAØ,WBØ,WNØ – Dr. Phillip D. Rowley, KØZFL, Route 1, Box 455, Alamosa, CO 81101.

KP4,WP4[1] – Alicia Rodriguez, KP4CL, P.O. Box 1061, San Juan, PR 00902.

KV4 – Graciano Belardo, KV4CF, P.O. Box 572, Christiansted, St. Croix, VI 00820.

KZ5 – Lee DuPre, KZ5OD, Box 407, Balboa, CZ. Box 407, Balboa, CZ.

KH6,WH6[1] – John H. Oka, KH6DQ, P.O. Box 101, Aiea, Oahu, HI 96701.

KL7,WL7 – Alaska QSL Bureau, Star Route Box 65, Wasilla, AK 99687.

VE1 – L. J. Fader, VE1FQ, P.O. Box 663, Halifax, NS.

VE2 – A. G. Daemen, VE2IJ, 2960 Douglas Avenue, Montreal 301, PQ.

VE3 – R. H. Buckley, VE3UW, 20 Almont Road, Downsview, ON.

VE4 – D. E. McVittie, VE4OX, 647 Academy Road, Winnipeg R3N 0E8, MB.

VE5 – A. Lloyd Jones, VE5JI, 2328 Grant Road, Regina, SK. S4S 5E5.

VE6 – D. C. Davidson, VE6TK, 1108 Trafford Dr. NW, Calgary 47, AB.

VE7 – H. R. Hough, VE7HR, 1291 McKenzie Rd., Victoria, BC.

VE8 – Yellowknife Centennial Radio Club, P.O. Box 1944, Yellowknife, NWT, Canada.

VO1 – Ernest Ash, VO1AA, P.O. Box 6, St. John's, NF.

VO2[1] – Goose Bay Amateur Radio Club, P.O. Box 232, Goose Bay, LB.

SWL – Leroy Waite, 39 Hannum St., Ballston Spa, NY 12020.

[1]These bureaus prefer 4 1/4 by 9 1/2 inch or No. 10 business envelopes.

QSL Bureaus for other U.S. Possessions and for other countries appear in the "IARU NEWS" section of the June and December issues of *QST*.

How's DX?

CONDUCTED BY ROD NEWKIRK,* W9BRD

H o w :

Already! Time to tack three more quick volumes onto your "how's" photo album index. Marvelous DX years, weren't they? Taking up where we left off, then:

— 1970 —

(July) HBØs AFM GJ, PJ2PS; (August) YVØs AI BPU BPJ, VKØHM, KA1C, VU2OLK, 9N1MM, VU2 group, YU3s TBM EY; (September) VP9RK, 4Z4s AI BG, 4X4AE, ET3USA staff, CP5AD, UW3EH; (October) KJ6s BZ CF, JY1, GC3GS, VP2GBR, VU2TG, HS4ACE, OD5BZ; (November) ET3USA, FP8AP, TJ1AW, 4X4WN, OHs in ZAland, W4VPD/KS4 with K5QHS/KS4, DU1ZAF; (December) YV7AV, VR6TC, ZA2RPS staff, 4S7DA, TJ1AZ, VP9BY, MP4BHH.

— 1971 —

(January) CT2AT, 9Y4s VU VV, WP4DKA, VK9VM, EA8FO; (February) HT4s CI IM, VP2DAJ, KL7GSG, EA8 group, 9Y4 gang, VR5LT; (March) LAØAD, 9K2AH, 8P6s CP AH, HR1MD, HKØBKX, LZ2EE, VK9BS; (April) OZ1LO, K2ALO/OHØ, DL7NS/OHØ, ET3UA, ST2SA, 5R8AB, VP2EE crew; (May) OD5BA, JD1ABO, HM1EJ, KC4USG, HB9NL, VU2s BEO OLK VAE TU2s CW DD, YBØAAH; (June) JD1ABO QTH, YL UA1JL, OA3s Y X, ZE1DC, CT2AK, SVØWP, CE7DW, TI9s J CF, 6Y5GB; (July) HV3SJ, VP5CC, W9IGW/CEØ, KP4 and KG4 groups, VP2ES, PJ7VL, EL2BA, YS1s JL JSL, UW1BF, VP7DL, 5B4ES; (August) VE3MR/4X, TI9CF QSL, ET3ZU/a, IS1DFO, 5VZWT; (September) HW6KAW, FL8HM, UA6XG, 9M2PT, OD5CS, 9G1WW, PJ7JC, VP2s group, VG7XT, VK4s NP YP with *La Balsa* crewmen; (October) VP2LY QTH, 7Z3AB, TN8BK, 9G1YA, ZB2A, JD1ABX, CP3BY, MP4TDM, KC6SJ; (November) KX6IY QTH, JY1 with JY1/B, 9K2s AL AM, 7Z3AB and ST2SA, 5H3LV, HBØD, OHØMA with OH2BHU/Ø, IMØKH, 9J2PM, SVØWOO; (December) KC6RM, AC5TY, CN8GG, VP2s LAW LK, ET3ZU/a ops, WA2WYR/CE2.

— 1972 —

(January) FPs 8AP ØBG, FB8XX staff, KA5JJ, ZS3KC, SVØWXX, HB9C'K with WA2HSU; (February) VP2s LAW and LK mobile, KP4CL, 9Q5BG, HR1WSG, XU1AA, FMØIX squad; (March) 4X4s BL QR, HS4ACN, mobile mariners LA7QM and JAØAIG, CT3AS, PZ1AC, ON4QX; (April) VU7US men, MP4TEA, VU2IN, 9G1DY, LG5LG, VQ9R, 9X5YG; (May) HA2RB, FOØGO, HC8GS, YO2s KBH KBO, VQ9N; (June) MP4TDM QTH, VP2s MAA MF, CO2FA, VQ9NEW, KM6DX; (July) WN8MLV's QSL, 9M2DQ, VP2MA, VQ9DM, WA6FSC/DX; (August) QTH of W9IGW/CEØ and K9KNW/CEØ, ZD7SD, G3DME of *QU4X*, VP9BDA, TY1ABE, PJ8DX; (September) 6WØ/WA2BAV, 5U7AV, EL2s AV DF, 9L1s EP GP, 5U7s AU AW, ZD3s D S, TUs 2AZ 4AB 4AC, TJ1BF, TY3ABF, OJØSUF team, PZ1DX, ET3s DS GK JH, YL SU1MI; (October) VK5MF's transceiver, JA6MWE, HL9TO, A51TY with VU2KV, 5H3LV, 4X4GV, 6D4s EB FFC J; (November) HL9WU, FM7s WN WW, EA8BK, OY9LV; (December) G2MI's backyard, YL HC1MM and friends, VK9JW, Costa Rica hamfest, SVØWUU.

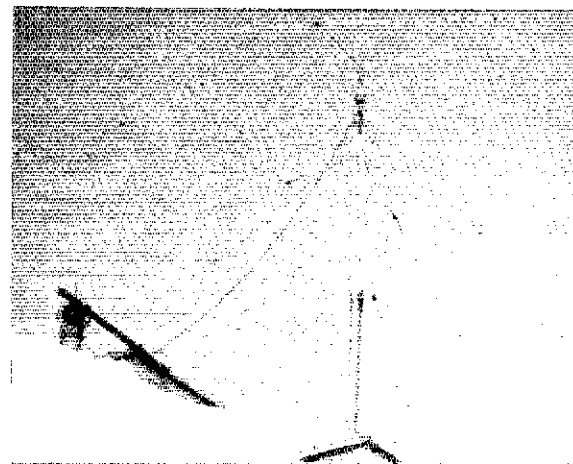
— 1973 —

(January) VR1s AC PA W, dead QSLs, VK4FJ of VK9JW, F8FD's ancient Saigon set-up, DU9FB & Co.; (February) UA9OH, SY1MA, SV1s DB GA GO with DL1CU, SVØs WII WJJ, CP1s EU FG, HL9TY; (March) SY1MA's QTH, EA9EJ, HL9TV, OD5GT, SV1CH, EA8CI, LZ2ZK; (April) ZF1SF, SU1IM, 9M2GV's QSL, ELØP/mm, HA3MB, EA8GK, VP2SG; (May) YO2BC, FG7XL, HH2JT, FM7WG, YVs 1ACO 5CIZ 5CKR, HI8s FED JD, 6Y5LA, FM7WN, VP2AC; (June) PY7ZAH/Ø, JH1WIX, OK1ATP, PY1DVG, G6JF, I2ZGA/HBØ with I1FGT/OHØ, KA6DO-KR6DO, TJ1BG, old AC4TF, JA1ATF.

Like the bulk of all *QST* material those pictures were unsolicitied contributions from fellow League members. WB2AQC with XYL WA2BAV top the field with 29 published submissions followed by K2THT with 14. Others with generous offerings: W3HNK 7, VE3GCO 6, W4BRB 4, VQ9N 4, W2MLO 3, W4BRB 3, WA3HUP 3, while two each came from Ws 4VPD 5 MVP 5 UNF/6, Ks 1DRN 2BYB 2BSY 6GLC, WAs 5YQV 6AUD, VE3s AGC EWY and DL1CU. Also contributing accepted singles:

Ws 1GL 1NU 1RLV 1YRC 2BBK 2CTO 2FJ 2NIN 3BWZ 3GE 3QT 4HJL 4SPX 5EL 5GTW

*c/o ARRL, 225 Main St., Newington, CT 06111.



VE8PI has a North West Territory QTH of the Month made to order for the August pleasure of sweltering readers farther South. And few among us aren't farther south than 64 degrees north, the latitude of Coral Harbour.

OY7JD remains one of our more available Faeroes friends. Nic's willing response in the dogfights keeps QSL manager W3HNK hopping.

5LZW 5QPX 6DDB 6DOR 6HJP 6HUQ 6ISI 6KNH 6KTE 6LS 7FCD 7PHO 7VFO 8RTN 9FN 9VNG 9ZRX, Ks 2KGB 2TNI 3AFO 3KWJ 3RPY 4ASI 4PRT 4UQ 4ZCP 5HWO 6LAE 8FSX 8PYD 8VBX 9KDI 9KNW, WAs 2FDG 2GZC 3KSQ 4EPM 4OWG 7EPG 9UES 9YNE, WBs 2WUQ 4CIN 4MKU 8ABN 9BUV 9CJS, VEs 1AIH 2IJ 3DPO 3MR 4AA 4SK 6MC 7AAR, KG4CS, KH6BZF, KP4RK, DLs 1FL 8DU, Fs 2MO 5QE, HB9s ANR FF P T, JA8BI, JH1EXV, LA1Q, Long Island DX Association, Northern Illinois DX Association, Newark News Radio Club, West Coast *DX Bulletin*, G. Allen and P. Kromayer.

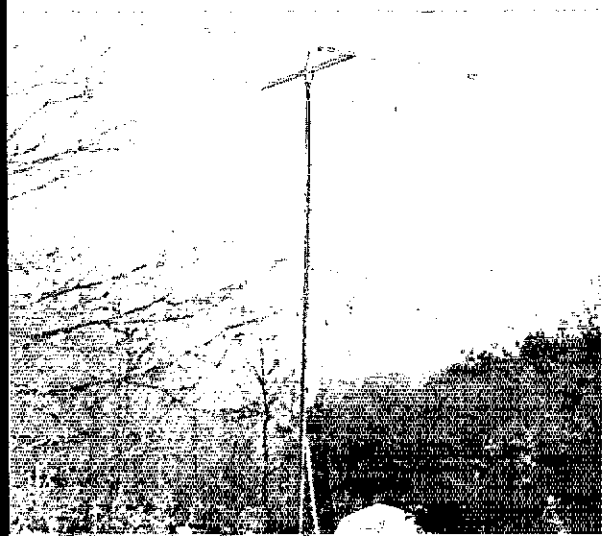
Hats off, too, to ARRL's hard-working Newington crew for taking time and trouble to forward DX shots encountered in their own busy Hq. correspondence channels. The accent, as usual, is on DX ops in their native habitat, the rarer the better. Anything fresh in your file to share with the gang?

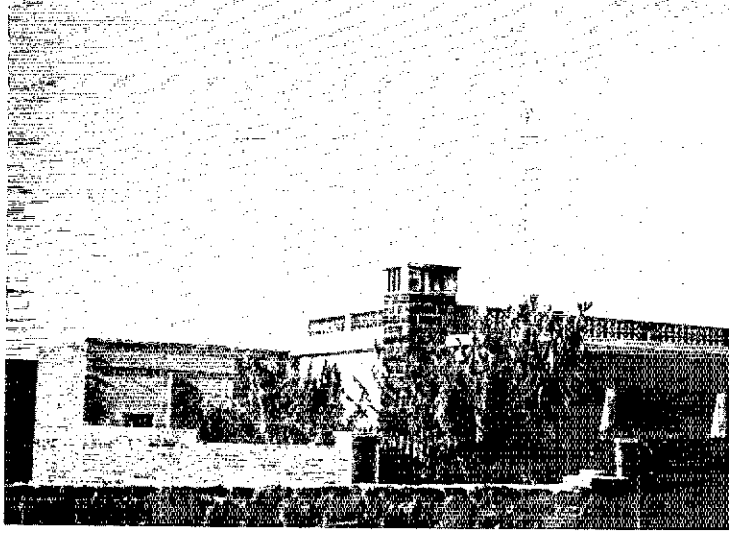
† † †

W h e r e :

NORTH AMERICA – "QSLers of the Month" saluted for quick QSLing in mail from Ws 1OPJ 2GEY 6AKM ØNDX, Ks 4WLS/KL7 6SE/2 8TRF, WA6GZG, WBs 4WHF 6YIY 8DSG, WNs 4ZVF 5HVY 6RXI, KH6FMO and E. Riggle: CF3HN, DK3EQ, EL2NS, ET3USE, FK8KAA, G3s DNF JVU, IT57ZGT, JAs 3ZP 7BJL 8FMB, JH1WIX, KG6AAY, KP4BBN, KX6BB, KZ5MS, LAs 3S 6XO, LUs 5HFI 9FAN, OH3OF, PJ9BB, PY8ZAB, TIs 2DX 2WX 3BVF, VK5s FM QI, VPs 2LAW 7BA, VR1W, WA5YSI/HK6, WH6HQK, WL7HHR, WP4s DPW DQP, XE1LA, YS2OB, ZL1ATW, ZM2s AEZ GH, ZS6AFC, 4Z4GH, 5T5CJ, 7X2HM, 9M8OEA and 9Y4VU as well as QSL tenders W3EVW, K7NHV, WA6AHF and G3AMR. Any worthies missing here? . . . Halp! These parenthesized colleagues seek the secret of coaxing QSLs from holdouts indicated: (W1BFK) JT1ZB; (W1OPJ) PZ9AB, YN1CX, 6W8FB, 8P6BU, also FAs 8CR 8ZZ and 9VE circa 1950; (K6SE/2) KR6TN '72; (K8TRF) CEØXI '71, FG7XF '71, LX1DM '69, ZD8AU '69; (WA9MOE) FG7XZ, FY7AI, JW5CI, SV1FD, WB9FAB/KC4, ZF1VD, 5T5CJ, 8P6AG, 8R1J; (WB4WHE) LU5HFI, OX3YY, VK4ZV; (WB6TYA) JAs 2EQ 6HKC, VK4MY, XE2UG worked in Novice days; (WBØCGJ) HC8FN, KH6EDY, YU3TYX, ZE8JN; (WN5HVY) CO2DL, G3s JXD MDI, LU6DJX, OA4AGR and SM6CEP. Any 'alp? . . . Although I've heard he has been on the air I have received no logs from HR2HHP for almost a year. I must assume he has lost interest in awards and QSLing, no answers to my mail inquiries. After four years and two thousand cards I can no longer consider myself HR2HHP's QSL manager. All valid requests for my own WA9RAT/HR2 confirmations have been answered or will be processed soon, about 1000 worth. (WA9RAT) . . . Seven QSLs from my nine holdouts would net me the magic 100. (WA9MOE) . . . I hold logs for KG4FI QSOs beginning March 12, 1973. (DK4TP) . . . Several of us AFIs have had our calls bootlegged, possibly by the same character in the direction of Europe. (ZF1SB) . . . No complaints on QSL receipts here. Since April of '72 I've confirmed 107 countries of 115 worked. (WBØCGJ) . . . I'm interested in the possibility of becoming QSL manager for some overworked DX op. (WN5HVY) . . . The XF2 prefix will be used in southern offshore Mexican waters, XF4 in northern reaches. (WCDXB) . . . DXpeditions are all very good but how about some "QSLpeditions" to

SV1DB/a, an international Mount Athos enterprise in April, tallied five thousand contacts with 106 countries in all continents. Among participants were SV1s DB ER GA GK, DLs 1CU 7FT 8ME, DJ6SI, DK5OS, HB9s AHL and HK. Here DL7FT, SV1s GA and DB make a stick-check while DL1CU and kibitzer do radiotelegraphic chores. *(Photos via DL1CU)*





ET3USF (K3ZNJ) likes 15 and 20 sideband and also wiggles the key at times. David fired up a year ago in beautiful Asmara, 7600 feet above the Red Sea and sixteen degrees off the equator with year-'round sunshine. ET3USF also serves as president of Kagnew Station Amateur Radio Club.

scoop up overdue cards in rare regions? (K8TRF) . . . Pitching in to help keep things rolling at ARRL's Sixland Bureau branch recently: W6s AFI BSY CUF DOD DPK ITD JZU KG KJG LQC NTQ OKK OL RGG UZX, K6s CCY DC ISI OSO RXZ TWT UJS YGS, WA6s AHF CXK IEB TOK, WB6s BGW and COX. (NCDXC)

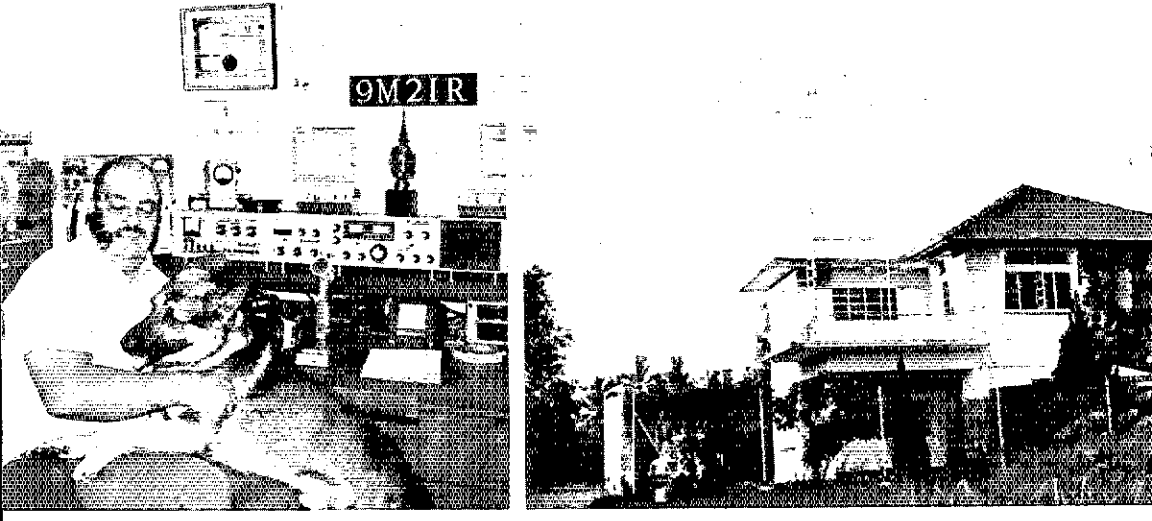
EUROPE — I've backed off from QSL managerial chores to permit some on-the-air time, retaining clients EA6s AR AS BG BH BJ, WX8s BP CN, YB1BM, ZA2RPS, 3As 3CN ØCU, 3V8BZ and SV1DB/a, the latter for sideband contacts only. QSL HBØLL and OY2A via DJ9ZB, KZ5EK via DL1HH, and TFs 3ST 5TP, TU2s AZ and BB via DL7MQ. (DL7FT via JDXRC) . . . Just a reminder that all my WA3SMN/TF QSOs can be confirmed through my father, W3KHL. (WA3SMN/6) . . . I1BNZ iterates that a bogus MI1 was active last fall. (W1OPJ) . . . Receipt of QSLs at my British address indicates misuse of my home call which has not been active for years. (G3SEA in KH6-land) . . . Three hundred cards sent to the U.S.S.R. in the past have brought back only forty responses. (W1BFK) . . . Regarding your mention of one SVØEAA, all SVØ calls are issued through our Athens embassy and the only block in use is WAA-WZZ, fifty-two in all (second and third suffix letters are always identical). S VØEAA was heard on 3.5 MHz, furthermore, an amateur band not authorized in Greece. (SVØ WTT)

AFRICA — Note that ZS6GE manages ZS1ANT's antarctic QSLing only for 1972 QSOs. He holds no logs for previous ZS1ANT operation. (DXNS) . . . TN8BK tells JA4BLY/3 that all cw action under his call is spurious. (JDXRC) . . . Regarding June's fast QSLers, did FR7AM/g really QSL somebody at long last? (W4UF, Ks 4BHG 6GA, WAs 3KSQ, 9UEK) . . . Whoops! Wrong category. We hereby declassify and reclassify Thom to his rightful "halp!" status. (W9BRD) . . . Note that I still serve as QSL manager for XT2s AG and AK, W/K/VE QSLs only. (W1AM) . . . 9Q5AE says his call was abused on 80 cw last November for about two dozen W/K QSOs. Scratch another. (W9UDK)

OCEANIA — I'm now back in England for a time so any operators who have not received my due QSLs direct or via manager JA2KLT can contact me at my G3WUW address. (ex-VQ9AP-VS5AP-9M6AB-9M8WUW) . . . FK8KAA's card arrives in an envelope covered with enough stamps to make a philatelist drool. (WØNDX) . . . As manager of 9M8SDA's QSLs please use my new address: 127 Leo del Mar Vallejo, California, 94590. (WB6BGQ) . . . VS5LH QSLs 100 percent, direct if International Reply Coupons are provided, otherwise via bureaus. (DXNS) . . . Brent of VK9ZB still labors over his Willis QSL backlog at Box 708F, Melbourne 3001. Self-addressed envelopes with IRCs plus the quoting of transmitted QSO numbers will help complete the detail. (WCDXB)

SOUTH AMERICA — My management of HK7BDA QSLs commenced May 18, 1973. Self-addressed stamped envelopes are expected from W/Ks, s.a.e. plus IRCs from others. (WA2GMD) . . . W3DJZ expected all ZVØWH cards to be in the mails by mid-June. (WCDXB) . . . It appears unlikely that those USAF operators who appropriated the CEØAE call on Easter several years ago even kept a log. They ran casual phone patches for the most part. (K2BUI-CEØAE/6) . . . We come to the monthly QTH catalog now but keep in mind that each item is necessarily neither accurate, complete nor "official":

A6XP, Box 1057, Sharjah, United Arab Emirates
CO8QS, Box 5, Santiago, Cuba
CP2BK, P.O. Box 157, Sucre, Bolivia
CR8s AG AL (via PY7YS)
DL1CU/4X, Box 585, D-7, Stuttgart 1, Germany
DU8BA, P.O. Box 244, Zamboanga City, P. I.
ex-EP2DX-EQ2DX-JY9DX-9C9DX (via W3HNK)
FG7AE, B. P. 387, Pointe-a-Pitre, Guadeloupe, F. W. I.
FM7AM, P. Rondof, Rue Schoelcher, St. Pierre, Martinique
FYØAV, P. O. Box 508, Cayenne, French Guiana
HP1CY, Box 5045, Panama 5, R. P.
IT57ARI, P. O. Box 420, Palermo, Sicily, Italy
IT57BWQ, Box 300, Palermo, Sicily, Italy
IT57RA, Box 35, Termini Sicily, Italy
K8YUW/VQ9, Chagos via BFPO 656, GPO, London, England
KG6SX/KC6/KX6 (via KH6IJ)
OA6NCT, Box 223, Tacna, Peru
PJ9BN, c/o Transworld Radio, Bonaire, N. A.
PY1DYN/9, P. O. Box 196, Campo Grande, M. T., Brazil
PYØs DVG ZAA (to PY1DVG)
TU2DN, J. Derviso, P.O. Box 1908, Abidjan, I.C.R.



9M2IR (VE7IR) as every DX man should know, is one of hamdom's leading good-will ambassadors. These classy quarters are at Johore Bahru. For previously published photos of John at YBØAAH and XU1AA consult this month's "How's" photo directory. Also don't miss "Van Lear and the Khmer Republic" in February '73 *QST*.

UA9VH/JT1 (via CRC, attn. UA9VB)
VP2s LGH LYL, P. O. Box 70, Castries, St. Lucia, W. I.
ex-VP2VB/mm, D. Weil, 719 Finale, San Antonio, TX 78216
VP2VBG, P. O. Box 84, Roadtown, Tortola, B. V. I.
VP2VS, P. O. Box 368, Roadtown, Tortola, B. V. I.
VS5LH, L. Hickingbotham, P. O. Box 91, Kuala Belait, Brunei
ex-VS9AWA, D. Beale, 20 Lavender Rd., Cambridge CB4-2, England
WA6AXE/KH6, J. Glockner, 329 Johnson Rd., U. S. Naval Hospital, FPO, San Francisco, CA 96630
WA8RGJ/VE8 (to WA8RGJ)
WA9CTS/KM6, P. O. Box 19, FPO, San Francisco, CA 96614
XT2s AG AK AM (see text)
YB9ABH/1, Box 2761, Djakarta, Indonesia
YJ8EE, Santo, New Hebrides
ZD7SS, P. O. Box 16, Jamestown, St. Helena
ZP5FN, Nolan, IAGS, APO, New York, NY 09881
5B4AC, P.O. Box 2335, Nicosia, Cyprus
9M2TV, S. Christie, 2 Pesiaran Carruthers, Lake Gdna, Luala Lumpur, Selangor, Malaysia

CT2AK (via W3HNK)
DA2DX (via W3HNK)
DF8SAR (via DL8FP)
ET2AI (via DJ9DK)
FCØAHY (to OK1AHV)
FY7YG (via F5GV)
FYØAOT (via F8YY)
HK7BDA (via WA2GMD)
HKØBYU (via WA6AHF)
HR2HHP (see text)
IT57SEZ (to IT1SEZ)
JTØAE (to OK1AIA)
JY6UAA (via IT9EDO)
K6JAN/HKØ (to K6JAN)
KG4FI (via DK4TP)
KH6HDB (via WA3HUP)
MP4BJP (to WB4WPP)
MP4BJS (via K2HVN)
ex-MP4TEE (to G8FOC)
OHØMAS (to OHØMA)
OKSØR (via OK1MP)
PZ5AA (via PAØWKZ)
SKØITU (via SSA)
SPØITU (via SP5BB)
SVØWY (to WAØVPK)
VK4VU (via WB5HGS)
VK9ZB (see text)
VP2MHB (via W4WWG)
VP2SN (via VE3BMV)
VP2SQ (via W2MIG)
VP7DS (via WA4UZI)
VP8NI (via SM3CXS)
VS5AP (see text)
VS6CD (via HKARTS)
ex-VS9ALV (to G3WMZ)
ex-VS9ASC (to 9M2TV)
ex-VS9ATH (to G3PRS)
YA1VKJ (via W3HNK)
YBØABB (via WA4MUM)
YUØITU (via SRJ)
YV9AJ (via YV4YC)
ZE8JN (via WB4VUP)
ZS1ANT (see text)
3D2JA (via W2OVC)
ex-5Z4KL (to GM3VLB)
6W8FB (via ARAS)
7W3ITU (via ARA)
9H3H (via DK6EA)
9M8SDA (see text)
9M8WUW (see text)
9Q5BG (via REF)

Your thanks for the preceding glossary are due Ws 1JUB 4WFL 8EFW 9NN ØNDX, Ks 1ZND 2YFE 3CL 4WLS 8TRF, WAs 2TRK 3RBN 3 RJS, WBs 2VYA 4WHE 5EBC ØCGJ, VO1KE, Arlington (Texas) Radio Club, Columbus Amateur Radio Association *CARAscope* (W8ZCQ), *DX News-Sheet* (G. Watts, 62 Bellmore Rd., Norwich, N. 72T, England), International Short-Wave League *Monitor* (E. Chilvers, 1 Grove Rd., Lydney, Glos., GL15 5JE, England), Japan DX Radio Club *Bulletin* (JA3GZN), Long Island DX Association *DX Bulletin* (K2KGB), Newark News Radio Club *Bulletin* (M. Witkowski, Rt. 5, Box 167, Stevens Point, WI 34481), North Texas *DX News* (W5SZ), Northern California DX Club *DXer* (Box 608, Menlo Park, CA 94025), Southern California DX Club *Bulletin* (W6EJJ), VERON's *DXpress* (PAØs INA TO), West Coast DX *Bulletin* (WA6AUD) and Western Washington DX Club *Totem Tabloid* (WA7JCB). Got grist for our mill?

† † †

Whence:

ASIA — I'll be operating from Bahrain Island for about two years. MP4s BJP BJS and BJT are also very active, particularly on 14,050, 14,204, 14,333 and 21,275-21,300 kHz, usually at 1900-0300 GMT. (MP4BJR-WB4OUD) . . . 9N1MM should be in the States next month through December and can be reached through Rev. Ed Mann, S. J., Patna Jesuit Mission Service, 3431 N. Ashland Av., Chicago, IL 60657. (WØPG) . . . UAØAJ is very eager to complete WAS from the 350-year-old city of Krasnayarsk. (WB5EAY) . . . UA9AAN's fat 20-sideband signal from Chelyabansk comes off a 7-element beam. Jerry attends a tech school and speaks excellent English. (W8EFW) . . . Ex-SVØWUU, now visiting Stateside, expects to be on from 4W1-land in a few months. (W3HNK) . . . It's surprising how many cw operators think they're working BY5XX when it's really 6Y5XX. (WA2EAH) . . . Right, John — one of several reasons why meaningful DX certifications aren't issued without QSL inspection. (W9BRD) . . . YA1DT will be on 160 this autumn with a new FT101, also on 80 through 10 meters code and phone. Don expects to be active in Afghanistan into February. (JH1AGH) . . . Real pleasure having a visit from JA3IG after several QSOs with Yuu. (W1YL) . . . JA2BET and XYL JH2BIU blast through consistently on 7-MHz sideband with their FLDS400, FL2000B and homebuilt EP2DX down for a three-year

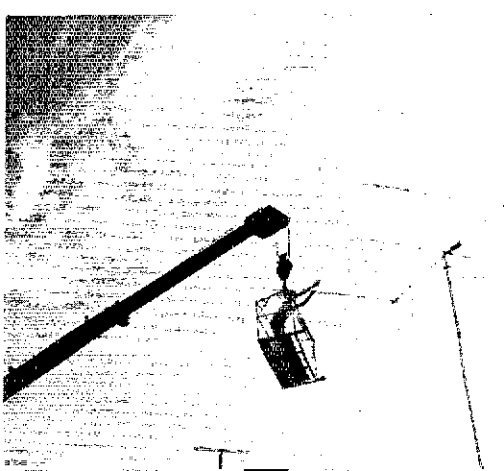
TR8MC (F2MC) is very big from Libreville with his ST700/SR700A machinery and simple folded dipole. Claude formerly signed TJ1AP and 3V8BL. *(Photo via W2YY)*

Germany sojourn. (DA2DX) . . . TA1MB, 14,028 kHz at 2230 GMT, enlarges the handful of Turks returning to the air. (CARA) . . . W4OUK tries to scrounge up radio literature for would-be XZ amateurs while stationed at our Rangoon embassy. JA1MCU, premier 5BDXCCer, devises DX-peditionary projects with an accent on 160 and 80 meters. Southeast Asis Net, 14,300 kHz at noon GMT, is a hangout for VS5LH, XU1AA, XV5AC and other juices. (WCDXB) . . . JD1ABX & Co. arranged more than eighteen kiloQSOs from Ogasawara in May with another massive eruption due this month. (DXNS) . . . After a fine DX year as HS4AGZ Gary gives Germany a go, and Formosa is the new assignment for WØCL with hamming status in doubt. (LIDXA) . . . Ex-C21TL-C29ED may try mainland China after summer VK-ZL leave. (VERON) . . . AP2s BY DY MR and NM lead Pakistan's DX crowd back to 15 and 20 after a two-year hiatus. 5BDXCC buffs may find AP2MR near 3795 kHz at 0100 GMT. (NTDXN)

OCEANIA — KH6ABH is finishing a somewhat lonely Coast Guard tour on Tern isle, French Frigate Shoals, with a few dozen humans and countless goonybirds. I've been keeping Gary in touch with home on 15 sideband with my indoor dipole. (WA1NSJ) . . . Really enjoyed my first ten days as a General working 20 countries with my 200-watter. Getting one's feet wet in DX convinces me that this world is full of wonderful people. (KH6HRG) . . . FK8KAA's cw is regularly available near 14,030 kHz at 0300 GMT. (WØNDX) . . . I operate cw almost exclusively with fifty watts and dipoles on five bands. In the past four years I've confirmed 239 of 252 countries worked. (VK4KX) . . . KG6AAY and ZL3JC still enjoy answering Novice CQs on 15 meters. (WNØHZZ) . . . VKØWW puts a good signal into the central U.S. from Macquarie around 1130 GMT near 14,210 kHz. (E. Riggle) . . . WH6HQK said I was his very first QSO. (WN6RXI) . . . May try reciprocity operation from my present Honolulu QTH. (G3SEA) . . . Sorry I didn't get more operation in from VS5AP but I understand that VS5BY will soon return to the air. VS5LH is due to radiate Brunei for a couple of years with a penchant for 15- and 20-meter DX nets. (G3WUW) . . . KH6HDB checks in from Kure isle with USCG's loran team, 14,203 or 14,332 kHz at 0430 GMT. KH6BVS (K5LTH) also is reported thereabouts. (LIDXA) . . . W8IB and ZL1DI, hams for sixty years, still bang away at each other on 20 cw. (CARA) . . . W6GQU, K6GUY, KH6HIF, KS6DY and SW1AU figure to follow Tongareva with Fanning and/or Palmyra this month or next. FO8DF, 14,038 kHz or 14,120 at 0630 GMT, will pour forth Pukapuka until '74. (DXNS)

EUROPE — In order of single-op multiband scoring UW3HV, UAs 4QX 3DA 9TS, UG6GAF, UP2PAP, LZ2VX, DJ7HZ, UC20AA and YU1PH are the top ten entries in RARF's 1972 Romania DX test. YOs 4SI 2GL 2BM 6ADM 3AC 2AVP 5BQ 2AAF 4HW and 8MH were single-op champs on the home front in that order. We hope W/K/VEs will participate in the 1973 version scheduled for the first week end of this month. (YO3JW) . . . Just closed down in Iceland in favor of California. Since April of last year I filled four logbooks. I'll be WA3SMN/6 while awaiting my new Navy assignment. (ex-WA3SMN/TF) . . . CT2AK listens above 3800 kHz while transmitting on 3780-3790 on Fridays and Saturdays at 0100-0300 GMT. (W3HNK) . . . I'll be operating SVØWY at Athens intermittently for the next two years. WA3IJR, WBØCWA and I are stationed at Rota, Spain, with no reciprocal-operating possibilities. (WAØVPK) . . . Nearing my third DXCC from Greece. Made the Club previously as W6GBG and KH6PY. (SVØWTT) . . . "The Word," best-selling novel by

9M8WUW believes in calling on the right tool for the job when he prunes his TH3. Allan also stirred pile-ups as VS5AP with the line-up at left. He's home at G3WUW now awaiting another delicious DX posting. You may have worked Allen as VP9AP and 9M6AB, too.



Irving Wallace, has an interesting section on Mt. Athos. (WB2IWH) . . . SV1BH journeyed Stateside to participate in my gala Connecticut antenna-raising party. (K1MAR)

AFRICA – ZE7JX is the first Africa station to grab the Satellite DX Achievement Award. Peter, formerly VQ2PL, earned SAA No. 97 by working, among others, F9FT, HG5s AIR KEB, VK6HK, VU2UV, ZEs 1DRR 2JV, ZSs 2DH 5CG and 4X4MH. (W1YL) . . . EA8GZ listens between 3804 and 3810 kHz while transmitting on 3780-3790 at 0100-0300 GMT Fridays and Saturdays. (W3HNK) . . . Worked more than a thousand Statesiders since last August plus DXCC on mike and key. May try RTTY before summer's end. (ET3USF-K3ZNJ) . . . VQ9N has his sights set on Farquhar whenever transportation jells. (K4BHG) . . . I was CR3AB's final QSO before Jorge knocked off for CT2BA May 21, 1973, and his equipment, on loan from me, was turned over to a future ham. CR3KD, only remaining Portuguese Guinea DXer, should be available until 1974. (CT2AZ) . . . Bouvet isle could become WB5BID's QTH this winter. (LIDXA) . . . 5X5NK, liking 3630 kHz Fridays and 7085 Saturdays at 1900-2000 GMT, should be back at it next month after European furlough. (WCDXB)

SOUTH AMERICA – Check with CE8AA for specs on Radio Club Magallanes's WAM (Worked All Magallanes) certification earned by collecting four QSLs from prescribed CE8-9 regions. (CE8AP) . . . HK4AJF tells me there are ten Colombian radiotelegraphers frequenting the lower end of forty meters. (WA2BIQ) . . . Fine ham hospitality at OA6s BW and BY during my visit to Ilo last winter. Chuck and Yvonne often can be found on 21,265 or 28,213 kHz around 1700 GMT. OA6s AK BF CL CS and CU are close neighbors while OA6s BH and CQ aren't far away. (K6SE/2) . . . I still envisage a return to Easter Island for more 5BDXCC excitement. My license is good into 1975. (K2BUI-CE0AE/6) . . . W4MEH/HC8, radioman aboard cruise ship *Yankee Trader*, radiates from a Pacific itenerary after Galapagos and Easter stops. (DXNS) QST

Amateur Satellite *(Continued from page 74)*

donation of rf semiconductor devices; Project Oscar: donation of funds for the purchase of components and hardware for Oscar 6. Donation of basic Oscar-6 structure; International Amateur Radio Union – Region 1: donation of funds for Oscar systems under development in Region 1.

Those individuals who worked on and developed the Oscar 6 subsystems and who share the ARRL Technical Merit Award for 1972 should be proud of their technical contribution to the history of amateur radio. Below is a list of the Oscar 6 subsystems and components and those who developed them.

- Two-to-Ten Meter Repeater : Dick Daniels, WA4DGU; Perry Klein, K3JTE; Karl Meinzer, DJ4ZC; Wally Mercer, W4RUD.
- 435.1 MHz beacon transmitter: Gary HendricksonW3DTN; Rich Potyka, W7DTL.
- Morse Code Telemetry Encoder: John Goode, W5CAY.
- Command Encoder/Decoder: Peter Hammer, VK3ZPI (WIA Project Australis).
- Codestore: John Goode, W5CAY.
- Experiment Control Logic: Jan King, W3GEY.
- Instrumentation Switching Regulator: Karl Meinzer, DJ4ZC.
- Antennas and Filters: Bill Scholtz, W3HXF.
- Battery: Sid Tiller.
- Structure: Bob Sprole, W2QJT; Joe Dezio.
- Thermal Design and Coatings: Ted Michalek.
- Electronic Potting and Encapsulation: Bucky Moore, W3ZKI.
- Wiring and Integration: Marie Marr and Dave Reiser, WN3TRS.
- Fabrication of PC Boards: Emil Zugby, WA3MIL; Fred Muccino, W3ITO. QST

Planning *(Continued from page 76)*

ments! If you don't agree with a Report and Order, submit a petition for reconsideration but explain why you think we are wrong! If you still do not agree with the forthcoming Memorandum Opinion and Order, you have the prerogative of taking the FCC to court. Your chances of winning are somewhat dependent on whether you availed yourself of all possible recourse under the Administrative Procedure Act.

– – – –

Call it a service, call it a hobby, or whatever, it is still the greatest and most intriguing avocation in human history. Its record of accomplishments is long and bright. It paved the way for modern high-frequency communication, which is now giving way to greater reliability of cables and satellite circuits. For Amateur Radio to remain vigorous we must look ahead to new goals, and while remaining proud of our past, let us look forward to our accomplishments of tomorrow. QST

Happenings *(Continued from page 93)*

spectrum involved . . . is allocated currently to the Radio Amateur Service, in addition to Government Radiolocation, the . . . remaining [frequencies] would seem adequate for current and likely future radio amateur operations. Radio amateurs could continue to use [these channels] provided they comply with the rules applicable to the new radio service. Although we are greatly reluctant to reduce any frequency allocations now devoted to amateur use, we feel the large public need for this new radio service justifies this action. In summary, there is a need for a disciplined radio service responsive to the needs of the general public. . . ." — *Clay T. Whitehead, Director, Office of Telecommunications Policy*

". . . In view of CRS history of undisciplined operations, uncontrolled sharing of the frequency resource under consideration is not feasible. It is imperative that existing caveats applicable to the 220-225 MHz band be retained for CRS operations. In addition, a . . . similar [restriction] must be imposed against CRS operations in Gulf and Franklin Counties, Florida and their contiguous water areas extending 30 miles into the Gulf of Mexico . . ." — *William R. Sell, Colonel USAF, Chairman, IFP*

The World Above 50 Mc.

CONDUCTED BY BILL SMITH,* W7JNK

FCC Seeks 224-225 MHz for CB

JUNE 6 FCC adopted combined rulemaking and inquiry notices (based in part on petitions RM-1633, 1656, 1747, 1761, 1793 and 1841) proposing that 224 to 225 MHz be assigned for the creation of a new Class E Citizens Radio Service. In its proposal, FCC said, "The new service would provide additional frequencies to meet the requirements of the general public for improved radio communication and relieve some of the heavy concentration of stations on channels available to the Class D Service." The Class D Service is the 27-MHz CB band.

The proposed use of a portion of the 220-MHz band for Class E services is not in accord with the international Table of Frequency Allocations and the Commission said objections from Canada and Mexico could require a prohibition against Class E operations in some border areas. Buffer zones of 10 to 25 miles around the borders may be required. Petitions from various individuals and organizations had requested assignment of a portion of the 220-MHz band for Citizens Radio use, although currently, the frequencies are internationally allocated in Region 2 to Amateur and Radiolocation services on a co-equal basis.

FCC says that nationally, Radiolocation is the primary use of 220-225 MHz, mainly by Government agencies. The Office of Telecommunication Policy, however, has told the Commission, "That sharing to accommodate additional operations of a *disciplined* (emphasis by W7JNK) Citizens Radio Service would be practicable, although such use would be subject to possible interference from radiolocation operations, particularly in coastal, North Central and the Northwestern areas of the United States."

The Commission proposes to divide 224 to 225 MHz into 40 channels, with 25-kHz spacing. Eligibility would be similar to that of the Class D service – any person 18 years of age or older who meets the basic criteria for licensing. The FCC said further that to avoid abuses of Class D rules and associated enforcement problems, it would establish enforcement procedures before the service is permitted to begin operation.

I personally am not pleased with the FCC's proposal to remove even one Megahertz from amateur authorization, even though it was on a shared basis. But we should point out that EIA, and others, had sought a bigger bite of the 220-225 MHz allocation. Obviously FCC is concerned whether they may be creating another 27-MHz playground.

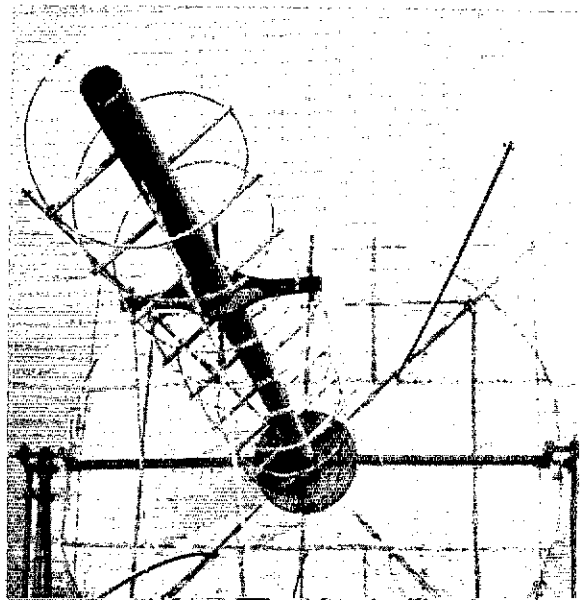
FCC invites comments by September 20, and replies by October 22, 1973. The action by the Commission on June 6 was approved by Chairman Burch, Commissioners Robert E. Lee, H. Rex Lee, Wiley and Hooks, with Commissioners Johnson and Reid concurring; the full text appears in "Happenings," this issue.

WAS Boxes

Allright guys, here are the boxes again this month. I pray they are more nearly correct than they apparently were in May. A portion of the problem was that they were held over a month; hence the more recent updates did not appear. To those of you who wrote, I enjoy receiving all kinds of mail, and if your listing still is not correct, write again.

The 10-6 Relationship

Back when anyone with a ham ticket could work both bands, 10 and 6 made a popular combination. Especially in the sporadic-*E* season, it was common practice among 6-meter operators to watch 10 closely for the first sign of "short skip,"



DJ7AA finds this combined 2-meter helix and 10-meter quad to be excellent for advanced Oscar 6 work.

*Send reports and correspondence to Bill Smith, W7JNK, ARRL, 225 Main St., Newington, CT 06111.

220- and 420-MHz STANDING

WA1MUG	15	5	450
K1PXE	13	6	700
W1HDQ	13	5	450
K1JIX	12	4	600
W1AZK	10	3	375
K1BFA	10	3	225
K2CBA	19	7	2650
W2DWJ	15	5	740
W2CRS	14	5	600
K2RTH	13	5	960
K2DNR	13	5	600
W2SEU	13	5	325
W3UJG	14	5	460
W3RUE	11	6	480
K3IUV	11	4	340
W4UCH	9	5	543
K4IXC	5	3	1115
K4GL	4	2	485
W5RCI	10	5	910
W5AJG	4	2	1050
W5LO	2	2	660
WB6NMT	9	5	2650
W6WSQ	6	4	1142
W7CNK	6	3	923
W7JRG	5	3	959
K7BBO	5	3	940
K7ICW	4	2	250
K7HSJ	3	2	400
W8PT	11	6	660
K8HWW	8	5	550
K9HMB	18	8	1086
WØEYE	11	5	950
WAØQLP	4	2	923
VE2YU	8	3	300
VE2HW	5	2	325
VE3AIB	7	4	450

420 MHz

K1PXE	18	7	1210
K1HTV	17	5	610
W1AJR	16	5	680
WA1MUG	15	5	740
K3EAV/1	14	6	700
K1BFA	13	5	710
K1JIX	13	5	620
W1SL	11	5	400
WA1JTK	11	4	715
W1HDQ	11	4	380
K2ACQ	24	8	925
W2AZL	21	7	1000
K2CBA	20	8	2670
W2CLL	20	6	790
K2UYH	19	7	2500
K2RIW	19	6	812
K2VDK	18	6	750
WA2EMB	18	6	720
WA2FGK	17	6	745
K2ARO	17	6	740
W2BLV	17	6	732
W2OMS	16	5	537
W2DWJ	16	4	570
K2OVS	15	5	734
K2YCO	14	6	675
W2CNS	14	6	525
WA2EUS	10	4	280
W3RUE	19	7	850
K3IUV	18	5	720
W3UJG	9	4	400
K4QIF	23	7	1065
W4FJ	22	7	995
K4EJQ	19	7	800
W4HJZ	15	5	560
K4SUM	15	5	462
W4VHH	15	4	750
K4GL	11	3	720
K4NTD	9	2	963
K4IXC	4	2	800
W4AWS	4	2	750
W5RCI	19	6	880
W5ORH	13	4	700
W5AJG	7	3	1010
W5UKQ	6	2	590
W5SXD	5	2	850
W5GVE	3	1	365
WA6HXW	6	4	7500
W6FZJ	4	2	7506
W6DQJ	4	2	360
K7ICW	4	2	225
W7JRG	2	2	420
K8DEO	24	8	775
W8YIO	22	7	650
K8REG	21	7	700
K8UQA	19	7	800
W8HVX	18	7	660
W8CVQ	13	7	625
W8MNT	13	7	600
W8RQI	10	6	425
WA8VHG	8	6	625
W8FWF	8	5	450
W9WCD	22	9	1725
K9HMB	21	8	836
WA9HUV	17	7	780
W9JIY	15	6	550
W9AAG	15	5	800
K9AAJ	12	5	425
WØDRL	23	8	1210
WØLER	15	5	1000
WØLCN	13	4	700
KØTLM	10	5	700
WØYZS	9	4	650
WØEYE	7	2	702
VE2HW	6	3	750
VE3DKW	19	7	940
VE3AIB	9	5	600
VE3EZC	7	5	510
VE4MA	2	1	420
VE7BBG	1	1	1125

The figures after each call refer to states, call areas, and mileage of best DX. Revised August, 1973.

on the assumption that an opening would show first on the lower frequency. Now licensing restrictions keep many 6-meter men from using lower frequencies, and most 6-meter transceivers make no provision for other bands. Watching 10 for signs of imminent 6-meter openings is almost a lost art.

Is this causing some 6-meter men to miss early minutes of some E_s openings? Probably, but the skip-length relationship between the two bands can be obscure at times. At the peak of a solar cycle the skip length on 10 can give a good indication of the likelihood of 6-meter F-layer DX. Occupancy of the lower band is almost sure to be high, and well-distributed geographically. The ionosphere will have nearly mirror-like qualities, and there will be many hours daily when skip length can be observed with fairly high accuracy on 28 MHz. When 10-meter F-layer skip pulls in to 1000 miles or less, it's time to make calls on 6, in the direction where the 10-meter skip is shortest.

The picture is less well-defined when sporadic-E propagation is involved. Especially in the low part of the solar cycle, as at present and in the near-future years, use of the 10-meter band falls off badly. This is unfortunate on many counts,[1] and especially so for the 6-meter operator looking for help in observing openings. Thus we encounter examples of DX being worked on 6 when no signals are being heard on 10. It's happened several times at W1HDQ, already, in the 1973 E_s season.

Then consider the differences in the reflecting media. Where the F-layer may present solid ionization of high density over rather large areas at any one time, sporadic-E ionization is, by nature, a patchy medium. Though 10-meter E skip under 500 miles is a good 50-MHz DX indicator, it may not be a sure-fire thing. The propagation geometry is far too uncertain.

Still, playing the 10-6 game can be very interesting. It may be a bit frustrating, too. Example: all through the evening of May 29 there was E skip on 10, mostly at distances beyond 1000 miles. Snatches of 6-meter DX were heard, but nothing was in long enough to offer much chance of completing even a short exchange. As a final indignity for the 6-meter addict, 6s and 7s were heard, with nice steady double-hop signals, around 10 P.M. EDST, just before the 10-meter band closed for the night.

Skip length relationships between 6 and 2 can be even more confusing. Normally we look for very short skip on 6, before expecting E propagation on 2 – but it doesn't always work that way. There is really no substitute for being on the right band at the right time – but checking other frequencies may still give you some good clues. It's fun to try to out-guess the ionosphere, in any case! – *W1HDQ*

OVS and Operating News

50-MHz DXers are engaged in their annual debate over whether the summer E season was "normal" or otherwise. One fact is certain: the season was late arriving, but the last two weeks of May found conditions rapidly improving and the first three weeks of June quite productive. Contest weekend was disappointing in most areas of the country until the waning hours, when six opened throughout the country. Around the US, here is what has been reported.

WA1DFL, Revere, Mass., says May didn't approach last year in amount of double hop, but the last half of the month was "not bad." Steve worked E_s on May 14, 23, 25, 27, 28 and 31. WA1HYN, Dayville, Conn., adds the 24th, 26th, and 29th to the above list of active days for E_s in May. W1HDQ, Canton, Conn., finds retirement to his liking, and is getting in more 6-meter DX chasing than in many years. Ed caught several multihop openings in May, including New Mexico on the 23rd, Colorado the 28th, and the West Coast the 29th.

[1] See "Tips on Ten," March, 1973, *QST*.

Bob Dreste, K7VOR, left, is the Trustee, and Howard Nutter, K7GHS, right, is the President of the Arizona Repeater Association, operators of WA7CEM, currently awaiting a new license. *(WA7NIY Photo)*

WB4UHI, Kings Mountain, N.C., says that he, WB4TSB, and WB4QAQ are looking for FAX contacts via 50-MHz *E*. Recent editions of this column should provide some leads. WA3SJT/4, Va., had a big day May 23, climaxed by California contacts in the evening. Also in Virginia, WB2LAI/4 had two hours of work with California, Arizona, New Mexico, and Nevada June 3. WB4ZKP, Tuscaloosa, Ala., worked South Dakota and Oregon June 5. WB4YAB, Olive Hill, Ky., used his central location to advantage in the June VHF Party,working 37 ARRL Sections in 87 QSOs. His bag of ARRL Sections on both coasts would make East and West Coast dwellers weep in envy! Jim worked or heard all 48 contiguous states on 6 between May 14 and June 12. He worked 8P6EN and KP4s May 29, and TG9SO June 5 (0133 GMT).

Any state other than Texas have a sporadic *E* QSO entirely within its borders? WA5QCP, El Paso, worked East Texas stations via E_s on May 16 and 22. He had an interesting session with Rhode Island, Connecticut, Massachusetts, Vermont and New Hampshire, and New York, between 2230 and 2315 GMT May 28. Notable in this period of double hop was the lack of single-hop propagation.

WA5UNK, Olton, Texas is working on a frequency synthesizer to cover 49 to 54 MHz. This will serve as a tunable i-f for higher bands. It would be interesting to hear more about this, Joe, when you have it working to your satisfaction.

WA5LZJ, also El Paso, is working hard to promote more cw activity on 6. Dave's objective is a 50-MHz cw WAS, and he's closing in on it. He (and probably every other cw-oriented vhf operator) would like a small portion of the low part of the band where all license classes could work together on cw, without QRM from voice signals. Are you listening, FCC? Isn't that what the 50.0 to 50.1 segment should be? WA6JRA is another 50-MHz DXer who is close to a cw WAS.

From San Antonio, K5ZMS/5, reports *E* for nearly 30 days running, beginning the middle of May. Among the more notable openings were those of June 5 and 6. On the 6th, W6s are said to have worked Hawaii, and the KH6EQI beacon was reported heard in New Mexico. Ray says May 26 was exciting for out-of-U.S. DX, with TG9SO, 8P6EN, CO2CI and KP4s workable from the south, midwest and southwest.

WA5VAJ, in Louisiana says that a-m still works, even with low power. He worked 4s, 8s, and 9s on June 5, with two watts.

W6YKS, Stockton, CA, has a word for 6-meter county hunters: the W6SF/6 Field Day, *1972*, operation was from Calaveras County. The 1973 FD workout was in Stanislaus County. Confirmations for either can be obtained from W6SF or W6YKS. John's E_s log so far this year (through June 3) shows skip worked on 6 on May 13, 15, 18, 20, 25, 26, June 2 and 3.

K6ITZ heard (but could not break) the KH6EQI beacon May 30. I understand, from second-hand reports, that some California stations have worked KH6s this season. Details, please?

K7HSJ, Bend, and K7ZCB, Boring, Ore., and K7GSE, Seattle, Wash., report E_s good in late May, and both observed auroral propagation on the 13th. K7GSJ says the best in May was a long opening through the night of the 25th and into the 26th, 2300 to 1300 GMT. K7ZCB like the 30th, working Florida, 8s, 9s, and Øs, 1700 to 2100 GMT. K7ICW, Las Vegas, Nev., says May was practically identical to previous years. Al worked stations almost daily after the 15th. He worked KP4AHQ on the 25th, and heard TG9SO working 4s at 0054 May 26, but his signal was too weak for a QSO.

W8UCI, Warren, Ohio, says the 6s were exceptionally strong for nearly two hours on the 30th. His heart skipped a few beats when one W6 was heard calling KH6, but only Mainland call areas (all of them) were heard. K8UNV, Patriot Ohio, found late May to his liking with multihop on the 24th to the west, May 26 to CO2CI, Cuba, for country number ten, and May 27 contacts with 8P6EN, KP4s AAB and AHQ and VP2VAI/KP4. The last station is also reported by WBØIWG, Northfield, Minn., on the 27th WB9ETQ, Indiana, worked 34 states on Sunday June 10 during the contest, including three in Delaware. VE3 and VE7 were also bagged. WB9KXX, a newcomer to six meters in Illinois, is finding *E* interesting. WBØENH, Iowa is in the same category, and says he now understands why confirmed six-meter operators are so enthused with the band.

WAØVJF, near Kansas City, is back with his informative reports, having worked 8P6EN May 18, plus the more-common stateside openings. He says KG4CB at Guantanamo Bay, Cuba has a kilowatt of sideband on six, but is too busy handling traffic on 20 meters to watch six. Too bad, as he would be a nice DX catch.

The closing hours of the June VHF Party were interesting for WBØIWG. Activity was bolstered by the Sunday-afternoon aurora, during which Jim worked stations as far east as New Jersey. The E_s that followed was his best this year. Between 0150 and 0445 GMT, June 11, Jim worked 59 stations, in all call areas except 1 and 2. W7VDZ, Wyoming and K7DVK, Oregon, brought WBØIWG to 48 states on 6, since he got on the band Dec. 1, 1972.

144-MHz news was made this month on several fronts. At first reading, we thought that the following was a 6-meter report: "On May 26 I worked HI8WPC, mobile in Santo Domingo, and HI8RO. On May 28 I worked HI8WPC again." Then the reporter, KP4AST, went on to say that he was using a TR-22. Two-meter fm was good for tropo, obviously, as this was a hop of over 200

2-METER STANDING

K1HTV	36	8	1310	W5HFV	38	10	1285
K1ABR	35	8	1478	K5BXG	36	10	1330
W1AZK	34	8	1412	W5AJG	33	9	1360
K1WHT	31	8	1300	W5UKQ	33	9	1290
K1UGQ	30	8	1370	K5PTK	29	9	1330
WA1FFO	29	9	2624	W5LO	29	7	1325
K1WHS	29	8	1300	W5SXD	25	6	1265
W1VTU	29	8	1296	W6GDO	18	5	1326
W1JSM	29	8	1100	W6WSQ	16	4	1390
K1BKK	28	7	1275	W6PO	15	7	8000
K1PXE	28	7	1250	K6HAA	13	4	1380
K1MTJ	26	7	1250	K6JYO	13	4	1240
W1HDQ	24	7	1040	K6HMS	11	4	1258
K1RJH	22	7	1450	W7JRG	27	6	1320
W1FZA	22	7	960	K7NII	25	5	1290
WA1JXN	18	7	990	K7ICW	18	4	1278
W1MX	18	6	850	K7VTM	10	6	950
K1JIX	18	6	800	W8KPY	42	10	1310
W2AZL	38	9	2500	K8AXU	38	8	1275
W2NLY	37	8	1300	W8IDU	36	8	1150
W2CXY	37	8	1360	W8YIO	36	8	1100
W2ORI	37	8	1320	W8IDT	36	8	1150
W2BLV	36	8	1150	K8DEO	35	8	1200
K2RTH	34	8	1215	W8NOH	31	8	1165
WA2EGK	33	8	1340	K8HWW	31	8	1125
W2CUX	33	8	1334	WA8LLY	28	8	820
WB2WIK	32	8	1080	W8TIU	24	8	1000
WA2CJK	31	8	1160	K8ZES	22	8	675
W2CRS	30	8	1270	K9SGD	42	9	1300
K2CEH	27	8	1200	WA9DOT	41	9	1303
W2CNS	27	8	1150	W9AAG	41	9	1200
K2DNR	25	7	1200	K9AAJ	41	9	1200
WB2SIH	25	6	1000	K9UIF	41	9	1150
WA2EMB	23	8	1335	W9YYF	41	9	1050
K2BWR	23	7	1350	W9BRN	36	9	1260
WA2PMW	23	6	1000	W9PBP	34	8	820
W2DWJ	23	6	860	K9HMB	33	10	1820
WA2UDT	22	7	1020	W9JGV	32	8	915
WB2YQU	22	6	850	WA9QZE	28	8	960
WB2FXB	21	6	915	W9JDJ	26	8	800
K2YCO	21	7	750	KØMQS	45	10	1605
W3RUE	36	8	1250	WØLER	44	9	1440
W3BHG	35	8	1260	WØDQY	41	9	1300
K3CFY	35	8	1200	WAØCHK	40	9	1120
W3GKP	32	8	1108	WØLFE	40	9	1100
W3BDP	29	8	1225	WØEYE	35	9	1380
WA3GPL	26	8	1100	WØENC	35	9	1360
W3LNA	26	8	970	WØRLI	35	8	1139
W3OMY	26	8	800	WØEMS	34	10	1320
K3CFA	25	8	1200	WØLCN	33	9	1100
W3TMZ	24	8	1000	WØRLI	31	9	1115
W3HB	23	8	1310	WØDRL	27	9	1295
W3TFA	21	8	1342	WØMJS	25	8	1107
K3OBU	21	7	930	VE1ZN	7	2	500
K3QCQ/3	20	7	900	VE2DFO	33	8	1385
W3ZD	20	7	850	VE2BZD	23	7	1309
K4GL	39	9	1270	VE2YU	28	8	1200
W4HJQ	39	9	1150	VE2BZD	23	7	1309
W4WNH	38	9	1350	VE2HW	18	6	800
W4HHK	38	9	1280	VE3ASO	37	8	1290
K4EJQ	37	8	1125	VE3BQN	37	8	1250
K4IXC	36	8	1403	VE3EZC	33	8	1283
W4VHH	36	8	1100	VE3AIB	29	8	1340
W4CKB	35	8	1440	VE3EVW	28	8	1100
K4QIF	35	8	1225	VE3DSS	27	8	1200
W4FJ	34	8	1150	VE3CWT	27	7	1072
W4AWS	29	8	1350	VE3EMS	24	8	1100
W4ISS	29	8	1000	VE7BQH	12	3	7920
W5UGO	43	10	1398	SM7BAE	1	1	11055
W5ORH	42	10	1507	VK3ATN	3	3	10417
W5RCI	42	9	1289	ZL1AZR	2	2	11055
K5WXZ	38	10	1450				
W5WAX	38	10	1310				

The figures after each call refer to states, call areas, and mileage of best DX. Revised August, 1973.

miles. But then Pedro began to hear repeaters, one on 146.73 and another on 146.91! On the morning of the 29th, he heard a repeater on 146.85, and by calling on .25 he got a reply from K4HD in Miami. KP4AST also worked several stations through the Miami repeater, 34-76. At first Pedro found it hard to get stations to come back to him, as mainland fm-ers thought they were being hoaxed! But KP4AST is "for real." He drives a kilowatt amplifier with his TR-22, and has a 20-element array 165 feet above ground, and that on a 3000-foot site with an open horizon out over the Atlantic and the Caribbean. Four 20-element arrays will soon be combined to make an 80-element array at KP4AST. Be sure to keep us informed of your results, Pedro. You should be able to do some fine DX work on 146-MHz fm!

WA1FFO, East Hartford, Conn., reports reception of W6PO again, on May 28. No QSO with W6PO since their first EME one of January. Steve now has an 8877 amplifier on 144, similar to the W6PO design. W6PO continues to do well via the lunar surface, enjoying recent contacts with KH6NS June 5th, KØMQS June 2, and WA2WOM. Bob says W2AZL has a mean signal with his new array, and WA2WOM is workable most anytime the moon is in proper position. Bob also "had another ho-hum contact with SM7BAE." Obviously, after one works the bugs from his moonbounce system, the results are repeatable without much difficulty. W6PO now has 15 states worked on two meters, seven of which via the moon. He has also worked Sweden, Australia, Canada and Germany, leaving Asia and Africa needed for a 144-MHz WAC.

We have several Oscar reports on hand, but with the exceptions below will not deal with these in detail here. They will be part of the total Oscar record eventually. It's worthy of note, however, that K7BBO had 47 states and 4060 QSOs via Oscar 6, as of the end of May.

WØLER says that intense *E* on May 24 filled the fm broadcast band with skip signals in Minneapolis. John worked WØRLI via *backscatter* on 144. The same thing happened May 28. I'm surprised to have received no reports of 2-meter *E*. Personal observation leads me to believe *E* was on 144 several times in early June, especially the evening of the 10th when 107.9-MHz fm broadcast stations from Washington were solid into W5KHT, near Oklahoma City, for more than one hour.

John, WØLER, commented also on the opinion some have expressed that Oscar 6 has caused an exodus of 2-meter DXers to the satellite mode. Says John, "I do not agree with these individuals entirely. Oscar was not intended to replace vhf DXing or to replace repeaters, but was intended to be another mode of communication. Oscar 6 has been the first long-life operational satellite for the amateur, providing reliable satellite communication over long distances, month after month. It was, and still is, exciting to hear one's signal returning from an active satellite. As time has passed since the October 15 launch, more and better functional uses are being found for the satellite. A few such things as propagation studies and warnings, scheduling and rag-chewing are included, but as the old saying goes, 'I would rather do it myself.' Nothing can replace the excitement of meteor scatter, long-haul tropo, moonbounce, or other DX modes. Those who have condemned the Oscar program should give thought to what Oscar 6 can do to advance our understanding of propagation mechanics. Oscar 6 has been a tremendous technical achievement for amateur radio; something all of us should take pride in -- end of sermon."

From Martinique, in the Caribbean, comes word from FM7AB he has 100 watts on cw and

would entertain some meteor scatter schedules. He should be contacted via: FM7AB, Observatoire, 97250 Fonds Street, Denis, Island of Martinique, FWI.

VE1AUC has written to say that in 1969 his call was changed to the present VE1ZN and that he is looking to begin again 2-meter DXing. And VE7ANP reports working W7JRG, Montana, on sideband meteor scatter May 5.

WB5BKY, Tulsa, Oklahoma, made his first m.s. contact May 13, working "the ole pro" K4IXC, Florida. WB5BKY would like further meteor schedules.

220-MHz tropo tests began June 1 between California and KH6BZF, Hawaii. Some 14 California stations were participating in the nightly schedules across the 2500-mile path. The schedules were due to run until mid-July, and then resume in mid-September through November. Similar tests are being run on 432. Stations interested in participating should contact WB6NMT or W6FZJ. As of this writing, June 20, no results had yet been reported.

In Canada, VE2YU has nearly completed a kilowatt amplifier, but is now active running 40 watts and a 13-element Yagi.

If you have not already done so, 220 operators are urged to read the lead of this month's column.

432-MHz tropo opened the evening of May 21 and morning of May 22, across the Gulf of Mexico between Florida and Texas. K4NTD, Oakland, and W4UWH, Auburndale, worked W5GVE, Waco; W5HN, Dallas; W5UND, near Dallas; and W5LDV, Houston with S3 to S9 signals. W5UND, running *100 milliwatts*, was 539 in Florida! Switching to 1296, K4NTD heard W5LDV, 539, over a 850-mile path and W5HN, 529, 952 miles. W5HN heard K4NTD's 2 watts briefly, but no contact was made. W5GVE, Waco, reports W4UWH was 59 on ssb. The contact gave Bill his fourth state on 432. A letter from W5HN (also W5AJG) reported the same opening. Leroy says if only K4NTD had a few more watts, they would have had a new 1296 tropo record.

Also in S-land, K5PJR has joined W5ORH on 432 in Oklahoma City. W5WAX is also active from Oklahoma and WA5UNL is on in Arkansas. K2LGJ, Buffalo, New York, is seeking long-haul tropo schedules for his 500 watts and array of four 13-element Yagis.

W6FZJ, San Jose, worked VK2AMW, Australia, via moonbounce May 5 over an "earthly" distance of 7506 miles. Joe is also scheduling VE7BBG, K2UYH, W9WCD, F8DO and G3LTF.

W4JFU, Virginia, says he and W3BSV, Maryland, are now both active on 1296. So far, W4JFU has worked W2OMS and WA2LTM, N.J., W3BSV and W3AED, Maryland, and K4QIF, Virginia. On May 19, W3CCX/3, operated by K1SFF, K1JDY, WA2LTM and WA3NGK was active from Delaware, handing out 11 contacts in five states. K3GIW of the Wilmington repeater group hosted the Pack-Rat Expedition.

The San Bernardino Microwave Society is building prototypes for a 2304-MHz beacon transmitter, hopefully for Oscar 7. K6HIJ, WA6ZKY, and WA6EXV are building them. WA6EXV reports 100 mW output from his, which uses a crystal oscillator on 115.2 MHz, a doubler to 230.4, and three stages of amplification to drive a step-recovery diode multiplier to 2304. Chuck also is at work on a 20-foot ribbed dish, which maintains a surface accuracy of plus-or-minus 1/32 inch, out to 19 feet. Experimentation with 2304-MHz mixers is also in progress at WA6EXV.

1215-MHz STANDING

K1PXE	7	4	500	W4VHH	2	1	350
K9AQP/1	7	3	300	W5LDV	1	1	290
WA2LTM	12	6	770	K5PUF	1	1	290
W2OMS	8	5	537	W5AJG	1	1	235
K2UYH	8	5	520	K5LLL	1	1	235
K2JNG	8	4	305	W5HPT	1	1	235
WA2VTR	6	4	330	W8YIO	5	4	551
K2YCO	3	2	350	W9JIY	4	3	300
K3IUV	7	4	320	W9WCD	3	3	770
K1SFF/3	7	4	260	WA9HUV	3	2	220
K4QIF	8	5	551	W9JTP	3	2	165
K4NTD	2	1	350	VE3HW	1	1	260

Listing revised August, 1973.

Ionospheric Physicist for Arecibo

Cornell University invites applications for a postion as scientist, to conduct ionospheric research at the Arecibo Observatory in Puerto Rico. The applicant should have a strong background in several of the following fields: ionospheric physics, plasma physics, radio wave propagation, radar techniques, signal processing and numerical data analysis. Applications with curriculum and employment vitae and references should be addressed to: The Director of Operations, Arecibo Observatory, PO Box 995, Arecibo PR 00612. QST

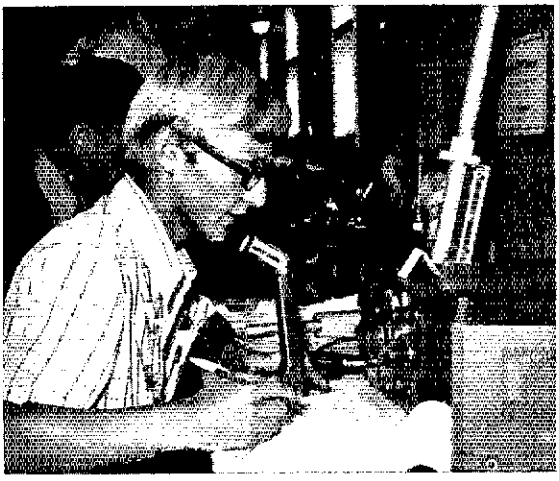
Astronomical Time

Previous to 1925, mean solar time was reckoned from noon in astronomical practice, instead of from midnight as in civil timekeeping. The mean solar day beginning at noon, 12 hours *after* the midnight at the beginning of the same civil date, was known as the *astronomical day*, and the time reckoned from noon was called *astronomical time* to distinguish it from civil time reckoned from midnight. By international agreement, the use of astronomical time was discontinued at the end of the year 1924.

In using astronomical tables and ephemerides for years preceding and immediately following the discontinuance, care is necessary to avoid error because of the confusion in terminology that resulted. Mean solar time reckoned from mean noon on the meridian of Greenwich was known as *Greenwich Mean Time*; reckoned from mean noon on a local meridian, local mean time. In the national ephemerides for 1925, Universal Time was introduced, but under a variety of names. In the British *Nautical Almanac* the same designation, *Greenwich Mean Time*, was still used for the new reckoning, whereas in the *American Ephemeris and Nautical Almanac* the designation *Greenwich Civil Time* was adopted. Eventually both designations were dropped, and replaced by Universal Time; however, the term *Greenwich Mean Time* is now used in the navigational publications of English-speaking countries, instead of Universal Time.

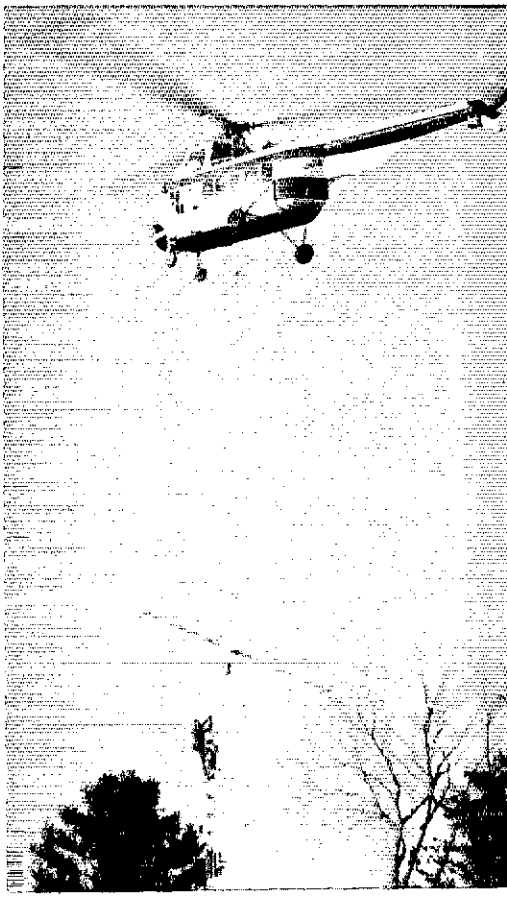
To distinguish the two different reckonings that have both been called *Greenwich Mean Time*, the designation *Greenwich Mean Astronomical Time* should be used in referring to dates before 1925 when the time then known as *Greenwich Mean Time* is intended; and for dates in and after 1925 the reckoning from midnight should be exclusively used. *(Tnx U.S. Bureau of Standards and K6HV.)*

Strays



VE6ANW is shown at the operating position of VA6NC, the special call issued to commemorate the Golden Jubilee of the Northern Alberta Radio Club. The station was set up during the Golden Jubilee Hamfest held last fall in Edmonton, and made hundreds of contacts during over 24 hours of continuous operation at the hamfest.

◀



When K1RES installed his new 7-element beam he decided to call on a little outside help — the local helicopter service! ▶

Except for one instance WA7RXA always convinced his neighbor that TVI was not the result of his amateur radio operation. In desperation the neighbor came over one day saying "your amateur radio gets into my TV set, the radio, stereo, telephone and everything else including my wife's sewing machine and mixer, but the next time a piece of toast pops up shouting "WA7RXA" I am coming over and stomp the very daylights out of you." The complaining neighbor now has a WN7 call! — *W7OCX*

◀

The chap in the Beefeaters uniform is Roy Reed, one of the Yeoman Warders of the Tower of London, and known on the ham bands as G3LEX. Yeoman Warders are ex-servicemen who have completed a minimum of 22 years in the British army or air force. Roy lives in the Tower with his wife and daughter and operates from their house, behind the outer wall of the Tower.

Operating News

GEORGE HART, W1NJM
Communications Manager
ELLEN WHITE, W1YL
Deputy Communications Mgr.

ASST. COMMS. MGRS.: *DXCC*, R. L. WHITE, W1CW; *Hq. Station*, C. R. BENDER, W1WPR; *Contests*, F. D. NISWANDER, WA1PID; *Public Service*, W. C. MANN, WA1FCM.

Code Practice Tapes. From time to time the headquarters gets requests for taped code practice. These requests vary from simple taped versions of the W1AW sessions to made-to-order tapes, from standard audio tapes to Wheatsone perforated tapes. The demand for code practice material, in whatever form, is very high. And as popular and as much used as the W1AW program is, there seems to be a demand for other forms of code practice as well, especially for the beginner in International Code.

So it would seem that an addition to the ARRL Training Aids program in the form of code tapes or records is in order. Fine. Sounds easy. All we have to do is make some tape recordings of W1AW and make them available to clubs for use in club training programs, just as we do films and tape lectures. Clubs can either use the tapes and return them, or make copies of them to keep for repeated use returning the master copy so it can be circulated again. Tapes will have to be erased and re-recorded every so often, because the material starts becoming memorized after a certain period of time. Once per month or so should be sufficient.

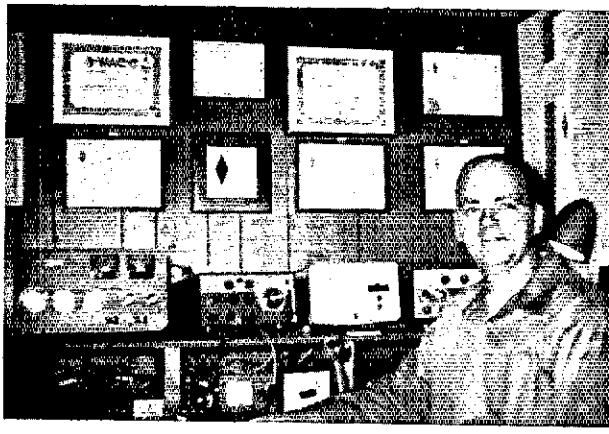
Yes, making tapes of W1AW code practice available here for affiliated club use, shouldn't be too difficult, and by the time you read this there will be a few such tapes on hand in our TA library. Affiliated clubs wanting to use them may do so on the same basis on which they use our films – a booking request, specific date, you pay return postage. We'll have both the "slow speed" version (5-7½-10-13) and the "high speed" version (35-30-25-20-15), recorded on 7" reel-to-reel tapes at 3-3/4 i.p.s., and perhaps also on C-60 cassettes.

In passing, we can't help but note that it would be a lot easier for all concerned if clubs interested in having tapes of W1AW code practice just set up some recording equipment and "roll their own." Clubs (individuals, too, for that matter) in the northeast in particular, with a little repetition in effort, should be able to get pretty clear recordings, even more valuable for practice purposes in that the various little on-air noises will also be present to give the practice that realistic touch. W1AW comes in loud and clear almost everywhere in the country, at one time or another, on one frequency or another. Bide your time, keep trying, sooner or later you'll be able to get a good, clear signal from the headquarters station. When you do, throw on your recorder. If the path is good one night (or day), chances are that it will repeat at the same time on following days, so make as many recordings as you can, to tide you over for periods when reception is not good. There are more than one way to skin a cat, and to get taped code practice too.

But of course the W1AW code practice may not meet your exact (or exacting) requirements. It is, after all, pretty standard and varies little in format from day to day. As the conductors of the program, we have received requests to run practice at speeds covering nearly every wpm from one through 25, and at nearly every 5-wpm increment from 25 through 70. It's simply amazing how unaware so many people are of anyone's needs or

Meet Your SCM

Here's Iowa SCM "Big Al" Culbert, KØYVU, a Plant Maintenance Superintendent for the White Farm Equipment Company in Charles City. Al attended Iowa State College, Stout State College (Menomonie, WI), Iowa State U. Graduate College and MIT. He has been licensed since 1960, and holds Extra Class and 2nd class radiotelephone and is an EC and Assistant Director for the Midwest Division. Al has been active in numerous contests, holds RCC, WAS and DXCC. He is a member and former secretary-treasurer for the North Iowa ARC. Favorite bands at KØYVU are 80/20 cw and 75/20 ssb. Other hobbies include flying (commercial, instrument, multiengine), fishing, golf and water sports.



New A-1 Operators

W2SUE WA2CLB WB2LZN W5KC K6NB W7CGF WA7JRL WA7KNW W9KT W9LNQ DJ3HJ DJ4KM EA8ID JA1AG TU2BX.

desires but their own. If we tried to meet all needs via the W1AW program, we would be sending code practice 24 hours a day at speeds varying from 1 through 70 wpm on all bands from at least half a dozen locations throughout the U.S. and Canada. So, forget it!

How about made-to-order tapes, then? Possible, but almost prohibitively expensive – at least in staff time. Some consideration is being given to expanding the Training Aids program so that some additional services may be possible, however, and it is not impossible that a greater number of different arrangements can be made available, not to mention a complete taped code course for beginners, starting from scratch. If all goes well we can look for something like this to become available this fall or winter. Taping facilities are available at HQ, but they aren't unlimited. And when it comes to making a variety of code practice tapes available, we have to consider such variables as code speeds, sequences, tape speeds, kind of tape, methods of booking, shipping, frequency of obsolescence, kind of text, and a few other things that will undoubtedly come up in the process. So you see, making code tapes available isn't quite so easy as it sounds.

DXAC Summary. A communication from DX Advisory Committee Vice Chairman W6RGG requests a rundown of DXAC recommendations and a reminder that the committee is standing by at all times for field input. Here is a listing of DXAC recommendations in the order in which submitted and the current status of each one:

1) Recommend that unadministered areas not be accepted for country status. Accepted, and now appears as a part of the criteria.

2) Recommend annulment of Maria Theresa in DXCC list. Accepted; facts showed that this "country" actually does not exist.

3) Recommend that cross-mode contacts be allowed for 5BDXCC credit. Returned to committee pending disposition of other matters felt to be related.

4) Recommend that DXAC be given the opportunity of advising HQ on additions to the "Countries" List. Accepted for cases in which standard criteria cannot be applied.

5) Recommend that plaque be made available to those on Honor Roll. Board of Directors concurrently ordered a pin for Honor Rollers; this was felt to cover the field.

6) Recommend establishment of a 160-meter DX Award. Returned to committee for further development.

7) Recommend deletion of presently-unadministered areas from "Countries" List. Rejected, primarily as to form, on advice of General Counsel.

8) Recommend consolidation of DXCC to single mixed-mode award. Accepted and scheduled for implementation in September, to allow those now working toward DXCC-Phone to have a chance to complete it.

9) Recommend that plaque be made available to those on Honor Roll that have DXCC credit for all countries on current "Countries" List. Consideration deferred pending many changes DXAC is discussing to DXCC Rules and "Countries" List

10) Recommend pins for "200" and "300" club, DXCC. Rejected by vote of Board of Directors.

Many other items have been discussed and voted on, but only the above were officially recommended to headquarters by vote of the majority of committee members.

The DX Advisory Committee actively seeks ideas, opinions, programs and advice from DXers. Your card or letter sent to: DXAC, ARRL HQ, 225 Main St., Newington, CT 06111, will be made available to the committee for its consideration. See list, p. 81 June *QST*, for a complete list of committee members. – *W1NJM*.

5-BAND AWARDS

(Updating the July 1973 listing.)

5BDXCC: (Starting with number 252), W2GUH DK1FW W5SBX W9LT WA4DRU PZ1CU SP3DOI WA2HSU OZ8KR W9WYB K1ZND WB2IEC W9CH.

5BWAS: (Starting with number 151), KH6GKD.

CLUB COUNCILS AND FEDERATIONS

Add to the June *QST* list (p. 115) the Northern Virginia Amateur Radio Council, sponsors of the Roanoke Division ARRL Convention, Sept. 14-16 at Reston, Va. Secretary is Leland W. Smith, Jr., W4YZC, 10820 Woodhaven Ct., Fairfax, Va. 22030. *Register your club council with* ARRL headquarters so it will make this semi annual listing.

SCM ELECTION NOTICE

To all ARRL members in the Sections listed below.

You are hereby notified that an election for Section Communications Manager is about to be held in your respective sections. This notice supersedes previous notices.

Nominating petitions are solicited. The signatures of five or more ARRL full members of the Section concerned are required on each petition. No member shall sign more than one petition.

Each candidate for Section Communications Manager must have been both the holder of amateur Conditional Class license or higher (Canadian Advanced Amateur Certificate) and an ARRL full member for at least two years immediately prior to *receipt of petition at headquarters. Petitions must be received* on or before 4:30 PM Eastern local time on the closing dates specified. In cases where no valid nominating petitions were received in response to previous notices, the closing dates are set ahead to the dates given herewith. The complete name, address, *Zip code of the candidate and signers should be included with* the petition. It is advisable that a few extra full-member signatures be obtained, to insure that it will be valid.

DX CENTURY CLUB AWARDS

Radiotelephone listings follow the general-type "New Member" and "Endorsement" listings – May 1-31, 1973

New Members

W9RER	302	UI8CD	144	UW3HQ	110	LU9FAN	104	WB2OFS	102	KH6HC	100
DK1FW	276	W9KM	143	KØCMF	109	UK5LAA	104	WB9ACR	102	LA1P	100
WA4PVD	226	JA4XH	140	W5EKF	109	WB6OFX	104	WBØFGV	102	SP9EEE	100
WB9GIT	210	KH6GCY	137	HB9PG	107	HB9SO	103	9M2IR	102	UK4WAC	100
PY4AKR	206	PY6HL	134	WA1LIR	107	JA3PPR	103	WA2OKN	101	UAØFD	100
JA1BNW	189	UA2AG	134	VE3BUX	107	UA3LAB	103	WA7SLC	101	UQ2MU	100
WØGGC	175	SM6EOV	125	WA6OPB	107	VE2QJ	103	WAØEHQ	101	WA6CPP	100
JW5NM	171	K1TZD	122	UB5ZBB	105	WA2DHG	103	HB9AQW	100	WA7KLK	100
K2AGJ	165	W7YOZ	122	WB4SEO	105	K6PWR	102	JA9BCU	100	WA9LEY	100
		WAØJDX	117	DJ4RK	104	UY5FF	102	K4RU	100		
DK1FW	276	WB2PGM	161	UA3AAX	124	DJ3KD	109	DL2SV	105	WB2FWS	101
W1JNV	269	JW5NM	159	WB9HAK	121	JA1UVQ	108	LA2IM	105	WA1PEL	100
WA4PVD	225	W5SZV	141	VE6PW	120	W2VMH	107	K2VUI	104	W5RKT	100
W6SUN	209	W4EH	132	LA8NC	118	WA6OPB	107	UAØDG	103	W6EOL	100
W6DQG	205	K9ZXG	130	W9KM	116	DK4SB	106	JA3PPR	102	WA6CPP	100
K2AGJ	197	K4FJC	124	JA3VRS	110	JA4XH	106	W2AXR	101	WB9ATB	100
OE3KTA	187									WBØGXU	100

Endorsements

In the endorsement listings shown, totals from 120 through the 240 level are given in increments of 20, from 250 through 300 in increments of 10 and above 300 in increments of 5. The totals shown do not necessarily represent the exact credits given but only that the participant has reached the endorsement group indicated.

HB9TL	335	K6GUY	280	K3SXQ	240	YU1SJ	220	W9FT	180	EA7OH	140
G2FYT	330	KØJPL	280	K4OD	240	DJ5AI	200	WA9MAG	180	W2USJ	140
K2TQC	330	OH3NY	280	K8CMO	240	DL7HT	200	DK3VV	160	WA2RAZ	140
ON4QJ	320	VE3EU	280	SM6EOC	240	EA3NA	200	DL7PW	160	W3JZJ/8	140
SM5AZU	320	W5QBM	280	WA2FCA	240	HA5DA	200	G2AYG	160	WA5TYB	140
W9LTR	320	K3OTY	270	W4GIW	240	JA3DWT	200	HB9ANR	160	G3DPX/W6	140
K4CFB	310	W1ESN	270	WB4UYD	240	K6ZXS	200	K5CSK	160	W6DZK	140
K4YFQ	310	W3LB	270	W7PFZ	240	VS6DO	200	K8HBN	160	W9KBZ	140
PAØVO	310	G3OZU	260	WA8GPX	240	W2HN	200	K9EHP	160	WB9EEF	140
K9AWK	305	K4FP	260	W9IT	240	W2TKG	200	UA6BV	160	WAØTKJ	140
W4REZ	305	KP4DLW	260	K1ZND	220	WØEXD/4	200	VP9GD	160	ET3USF	120
WA6GFE	305	W3AXW	260	HB9AMO	220	W5HIC	200	WA1EVX	160	K5DUT	120
W3CRE	300	WB8ABN	260	K1AGB	220	W9GKJ	200	WA2MBP	160	K6UGS	120
W5DRW	300	DL9TI	250	K6IR	220	YU2AKL	200	WB2FBF	160	WA1KKT	120
W8ZCK	300	HB9AIJ	250	OE3HOW	220	DJ4WG	180	WB4SJG	160	K4CEY	120
PY5ATL	290	JA1DQT	250	PY4ALC	220	DJ8QP	180	W6EOL	160	K4JIK	120
WB2PGM	290	JA3KWJ	250	SP9AI	220	EA8BK	180	W6KYA	160	W4RMB	120
W5LJT	290	WA5ZWC	250	WB4PUD	220	JA2AHR	180	W6OKX	160	WB4TDH	120
W8CFG	290	WA8TDY	250	WA5YMW	220	K4KA	180	W9MLG	160	W9MYG	120
ZL3AAD	290	W9NN	250	WØVUU	220	WA5EEM	180	W9OYZ	160	WB9AAQ	120
DL1OT	280			WAØTLT	220			CE3YO	140	WB9EEF	120
HB9TL	335	W4ELB	290	W1COA	260	OH3NY	220	WA4NIB	180	W9MLG	160
SM5AZU	315	ZL3AAD	290	W2RAD	260	WA2FCA	220	W8PCA	180	CT1PQ	140
I1WT	310	EA1IY	280	W6USG	260	W3IF	220	DL7PW	160	K3BCG	140
K3GKU	310	F8CW	280	W9LAA	260	W7JWE	220	I2TPL	160	K3NEZ	140
W3EVW	310	K6GUY	280	W9KB	250	DL9XN	200	JA1DQT	160	K4BKF/6	140
W6GRV	310	W1DO	280	K4QPR	240	K2UFM	200	K2GBC	160	W5HFA	140
YV5EC	310	W3CRE	280	K9VQK	240	K6ZXS	200	K9EHP	160	W6KYA	140
WB2WOU	310	W4REZ	280	OE1PC	240	K6ZXS	200	WA2EJS	160	ET3USF	120
K6VB	305	K3OTY	270	W4GIW	240	W2MPK	200	WB2FBF	160	W1WXZ	120
W6CCB	305	K4YFQ	270	K3JLI	220	W6EHA	200	WA4RQD	160	W2YRK	120
W9LTR	305	W6AOI	270	K3SXQ	220	W7AUS	200	W5LJT	160	WB4NKO	120
ZS5PG	300	W6HUR	270	K6IR	220	KØTOV	180	W6BWM	160		

Elections will take place as soon after the closing dates specified as full information on the candidates can be obtained. Candidates' names will be listed on the ballot in alphabetical order

The following nominating form is suggested. (Signers should be sure to give city, street address and Zip code.)

Communications Manager, ARRL (Place and date)
225 Main St., Newington, Conn. 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.

You are urged to take the initiative and file nominating petitions immediately.

George Hart, W1NJM, Communications Manager

Section	*Closing Date*	*Current SCM*	*Present Term Ends*
Idaho	9/10/73	D.A. Crisp, W7ZNN	12/10/72
N.Dak.	9/10/73	H.L. Sheets, WØDM	3/8/73

W1AW SPRING-SUMMER SCHEDULE

(April 29—October 28)

(The specific frequencies shown below are approximate and indicate general operating periods)

The ARRL Maxim Memorial Station welcomes visitors. Operating-visiting hours are Monday through Friday 1 P.M.-1 A.M. EDST, Saturday 7 P.M.-1:00 A.M. EDST and Sunday 3 P.M.-11:00 P.M. EDST. The station address is 225 Main Street, Newington, Conn., about 7 miles south of Hartford. A map showing local street detail will be sent upon request. If you wish to operate, you must have your original operator's license with you. The station will be closed May 28, July 4, and September 3.

Times/Days GMT	*Sunday*	*Monday*	*Tuesday*	*Wednesday*	*Thursday*	*Friday*	*Saturday*
0000	.....	←	—	— CW BULLETIN[1]	—	—	→
0020-0100[4]	.....	.....	3.7 Nov.[5]	14.080	14.080	7.15 Nov.[5]	14.080
0100	OSCAR[10]	←	—	— PHONE BULLETIN[2]	—	—	→
0105-0130[4]	.....	.....	3.990	50.190	145.588	1.820	21.390
0130	← CODE PRACTICE[1] (35-15 wpm TThSat. 5-25 wpm MWFSn) DETAILS BELOW →						
0230-0300[4]	.....	.....	3.580	.....	1.805	.....	3.580
0300	RTTY BULL.[3]	.....	←	—	RTTY BULLETIN[3]	—	→
0330	PHONE BULL.[3]	.....	←	—	PHONE BULLETIN[2]	—	→
0335-0400[4]	.....	.....	7.290	3.990	7.290	3.990	7.290
0400	CW BULL.[1]	.....	←	—	CW BULLETIN[1]	—	→
0420-0500[4]	.....	.....	3.7 Nov.[5]	7.080	3.990	7.15 Nov.[5]	3.580
1240	.....	←	—	— OSCAR[9]	—	—	→
1300	.....	CODE PRACTICE[1] (5-25 wpm MWF, 35-15 wpm TTh) DETAILS BELOW					.....
1700-1800	.....	21/28cw[7]	21/28ssb[8]	21/28cw[7]	21/28ssb[8]	21/28cw[7]	.....
1800	.....	←	—	— OSCAR[9]	—	—	→
1900-2000	.....	7.080	7.290	14.095 RTTY	7.290	7.080	.....
2000-2030	OSCAR[11]	21/28ssb[8]	21/28cw[7] CW BULL.[1]	21/28ssb[8]	21/28cw[7] CW BULL.[1]	21/28ssb[8]	....
2030	.....	.....	.....	.....	.....	.....	.....
2100-2130	.....	7.15 Nov.[5]	21.1 Nov.[5] RTTY BULL.[3]	7.15 Nov.[5]	21.1 Nov.[5] RTTY BULL.[3]	7.15 Nov.[5]	....
2130	.....	.....	.....	.....	.....	.....	.....
2200	.....	CPN[6]	7.095[4] RTTY CN[6]	3.625 RTTY RTTY BULL.[3]	14.095[4] RTTY CN[6]	CPN[6]	....
2300	.....	.....	.....	.....	.....	.....	.....
2330	← CODE PRACTICE (10-13-15 wpm) DETAILS BELOW →						

[1] CW Bulletins (18 wpm) and code practice on 1.805, 3.580, 7.080, 14.080, 21.080, 28.080, 50.080 and 145.588 MHz.
[2] Phone Bulletins on 1.820, 3.990, 7.290, 14.290, 21.390, 28.590, 50.190 and 145.588 MHz.
[3] RTTY Bulletins, on 3.625, 7.095, 14.095, 21.095, and 28.095 MHz. Bulletins repeated when time permits.
[4] *Starting time approximate, following conclusion of bulletin or code practice.*
[5] W1AW will tune the indicated bands for Novice calls, returning the call on the frequency on which called.
[6] Participation in section traffic nets.
[7] Operation will be on one of the following frequencies: 21.02, 21.08, 21.1, 28.02, 28.08, 28.1 MHz.
[8] Operation will be on one of the following frequencies: 21.260, 21.390, 28.590 MHz.
[9] When an OSCAR satellite is in orbit, daily updated orbital data is sent at 18 WPM on cw frequencies.
[10] OSCAR orbital data for the coming week, on RTTY frequencies.
[11] OSCAR orbital data for the coming week, on cw frequencies.

W1AW CODE PRACTICE

W1AW transmits code practice according to the following schedule. Approximate frequencies are 1.805 3.58 7.08 14.08 21.08 28.08 50.08 and 145.588 MHz. For practice purposes the order of words in each line may be reversed during the 5-13 wpm transmissions. Each tape carries checking references.

Speeds	*Local Times/Days*	*GMT*
10-13-15	7:30 PM EDST dy 4:30 PM PDST	2330 dy
5-7½-10-13-20-25	9:30 PM EDST SnTThS 6:30 PM PDST	0130 MWFSn
5-7½-10-13-20-25	9:00 AM EDST MWF 6:00 AM PDST	1300 MWF
35-30-25-20-15	9:30 PM EDST MWF 6:30 PM PDST	0130 TThS
35-30-25-20-15	9:00 AM EDST TTh 6:00 AM PDST	1300 TTh

The 0130 GMT practice is omitted four times a year on designated *nights when* Frequency Measuring Tests are sent in this period. To improve your fist by sending in step with W1AW (but not over the air!), and to allow checking the accuracy of your copy on certain tapes, note the GMT dates and *QST* practice text (from the issue 2 months previous) to be sent in the 0130 GMT practice on the following dates:

Aug. 6:	It Seems to Us
Aug. 16:	Correspondence
Aug. 22:	League Lines
Aug. 28:	ARPS
Sep. 5:	World Above
Sep. 7:	YL News

IN A COMMUNICATIONS EMERGENCY, MONITOR W1AW FOR SPECIAL BULLETINS AS FOLLOWS (times in GMT).

Phone: On the hour.
RTTY: At 15 minutes past the hour.
CW: On the half hour.

Maine	9/10/73	P. Sterling, K1TEV	6/9/73
Tenn.	9/10/73	O.D. Keaton, WA4GLS	7/1/73
Manitoba	9/10/73	S. Fink, VE4FQ	10/10/73
Del.	9/10/73	R.E. Cole, W3DKX	10/10/73
Va.	9/10/73	R.J. Slagle, K4GR	10/11/73
R.I.	9/10/73	J.F. Johnson, K1AAV	10/12/73
S.Dak.	9/10/73	E.C. Gray, WAØCPX	11/1/73
E.Bay	9/10/73	P.J. Parker, WB6DHH	11/10/73
E.Pa.	9/10/73	G.S. Van Dyke, Jr., W3HK	11/10/73
Ore.	9/10/73	D.T. Justice, K7WWR	11/10/73
Hawaii	9/10/73	L.R. Wical, KH6BZF	11/11/73

(Continued on page 118)

Operating Events ..... *de W1YL*

AUGUST

1 *W6OWP Qualifying Run* (W6ZRJ, alternate) 10-35 wpm at 0400 GMT on 3590/7090 kHz. This is 2100 PDST the night of July 31. Please note that dates are always shown at least two months in advance and times are the same local "clock time," i.e. 9 PM local Pacific time. Underline one minute of the highest speed copied, certify copy made without aid and send to ARRL for grading.

4-5 *Illinois QSO Party*, p. 118 July.

11-12 *CQ-WE Contest (vhf/RTTY), Space Cadet QSO Party*, p. 118 July.

14 *W1AW Qualifying Run* (10-35 wpm at 0130 GMT) on 1.805 3.580 7.080 14.080 21.080 28.080 50.080 and 145.588 MHz. This is 2130 EDST (9:30 PM EDST) the night of August 13. Underline one minute of top speed copied, state no aids used (typewriters OK), sign and mail to ARRL with your full name, call (if any), and complete mailing address.

18-19 *NJ QSO Party, World-Wide RTTY Contest, Trinidad and Tobago Independence Anniversary QSO Party*, p. 118 July.

18-20 *QRP QSO Party*, p. 119 July.

19 *American Contest*, p. 119 July.

25-26 *All-Asian CW Contest*, p. 119 July.

SEPTEMBER

6 *W6OWP Qualifying Run.*

8-9 *VHF QSO Party*, this issue.

8-21 *Malta Special Activity Period*, contacts in any mode (or mixed). Send in separate list of Malta stations worked for each band showing date/time(Z), stations, RS(T), serials starting with 001. A certified copy of the applicant's log signed by an official of his club/society or by any other two amateurs together with 10 IRCs or $2 (U.S.) must be forwarded. Name, call and QTH must appear on each sheet of paper. Special certificates. Award free of charge to physically handicapped amateurs and SWLs. Applications go to the Awards Mgr., Lawrence Smith, 9H1BB, 'Doreen', Francis Buhagiar St., Birkirkara, Malta.

9 *Frequency Measuring Test*, open to all, begins with a callup at 0130 and 0430 GMT September 9. (Remember, this is the evening before, local time!). The periods for measurement start at 0137 (80 meters), 0145 (40 meters) and 0153 (20 meters); for the late run, 0437, 0445 and 0453, respectively. Each measuring period lasts five minutes. Submit your averages for each 5-minute period which will be compared with the umpire's averages during the same period. (The umpire is a professional measuring laboratory.) Tell how many readings you took to form your averages. Approximate frequencies for the early run are 3559, 7067 and 14,096 kHz. Late-run frequencies are 3547, 7035 and 14,112 kHz. Your entry must be RECEIVED by September 20 to qualify for the *QST* report of the competition. W1AW will start transmitting the official readings September 21.

12 *W1AW Qualifying Run.*

15-16 *VHF Space Net Contest* commemorating the Apollo 10 mission, from 6 PM to 6PM your local time. Single or multioperator, power classes 1-25, 25-100, 100 watts to 1 kW input. Trophies, certificates, etc. Each complete QSO counts 2 points, each different zip code worked is a new multiplier. Each contact on a different band counts 2 points (zip codes count just once). All modes except repeaters. All stations submitting logs will receive a participation certificate. Logs must be postmarked no later than September 30. Send to Tony Slapkowski, WB2MTU, Box 909, Sicklerville, NJ 08081. *Scandinavian Activity Contest* (SAC) cw, from 1500 Sept. 15 to 1800 GMT Sept. 16- 80-10 meters. Try to work as many Scandinavian stations as possible. The same station may be worked once on each band during the contest. No cross mode. The prefixes: LA/LJ/LG (Norway), JW (Svalbard), JX (Jan Mayen), OH (Finland), OHØ (Aland Islands), OJØ (Market Reef), OX (Greenland), OY (Faroe Islands), OZ (Denmark) and SM/SK/SL (Sweden). Operating classes are single operator, multioperator single transmitter, multioperator multitransmitter. Club stations are classed as multiop. even if operated by one operator during the contest. Multi-multi stations must use a separate set of serials for each band. The serial consists of RS(T), plus number starting with 001. One point for each complete QSO. Max. of 10 multipliers per band. Final score equals complete QSOs times the sum of multipliers. Certificates. Logs must show date, GMT, stations, exchanges, bands, note of new multiplier. The summary sheet must indicate the QSO/multiplier breakdown by band. Usual declaration. Logs must be mailed no later than Oct. 15, send to the Contest Mgr., Alf Almedal, LA5QK, N-4052, Royneberg, Norway.

15-17 *Washington State QSO Party*, sponsored by the Boeing Employees' Amateur Radio Society (BEARS), during the final weekend of Washington State AR Week. Starts 2000Z Sept. 15 and end 0200Z Sept. 17, all amateurs invited to participate. Wash. stations score 1 point for each QSO (including contacts with other Wash. amateurs), all others score 2 points per Wash. QSO. Wash. stations multiply total contact points by the total of states, VE provinces and countries worked. Others use Washington counties as mult. (total of 39 possible). Wash. stations send QSO no., RS(T) and county. Others use state/province/country in lieu of county. Appropriate certificates. Suggested freqs.: cw 3560 7060 14060 21060 28060, phone 3935 7260 14280 21380, novice 3735 7125 21150 28160. Logs must show date/time in GMT, stations, exchanges, bands, modes and claimed score. Include check sheet for entries with more than 50 QSOs. Usual declaration, no logs can be returned. Results will be mailed to all. S.a s.e. is not required. Logs must be postmarked no later than Oct. 15. Send to BEARS, c/o Contest Committee, Willis D. Propst, K7RSB, 18415 38th Ave. South, Seattle, Washington 98188.

19-21 *YL Howdy Days*, p. 119 July.

22-23 *SAC phone* (see Sept. 15-16 listing). *VE/W Contest*, this issue.

25 *W1AW Morning Qualifying Run.*

29-Oct. 1 *Delta QSO Party*, sponsored by the Delta Division of ARRL, from 2000Z Sept. 29 to 0200Z Oct. 1, no time or power restrictions. Amateurs outside the Delta Div. (Ark., La., Miss., Tenn.) will attempt to work amateurs within the division. Delta amateurs work both inside and outside the division. Exchange QSO no., RS(T), QTH (ARRL section for non-Delta amateurs county/state for Delta. Div. hams). Logs must include date/time, stations, exchanges, bands, emission, multipliers. Stations may be worked on each band/mode. Portables and mobiles may be reworked if they change counties. Suggested freqs.: cw 3550 7050 14050 21050 28050, ssb 3990 7290 14290 21390 28590, novice 3725 7125 21125 28125. To score: Delta Div. no. QSOs times no. of ARRL sections, outside amateurs multiply the no. of QSOs by the no. of Delta counties worked (max. 316). DX stations may be worked but do not count as multipliers. Appropriate awards. Any station disrupting a working Delta Div. traffic net or whose log exhibits obvious irregularities will be disqualified from award consideration. Logs must be postmarked by Nov. 5 and send to Malcolm P. Keown W5RUB, 213 Moonmist, Vicksburg, Miss 39180. Logs will be returned, if requested.

OCTOBER

3 *W6OWP Qualifying Run.*

6-7 *New Mexico QSO Party, CQ-WE bf* (p. 118 July).

11 *W1AW Qualifying Run.*

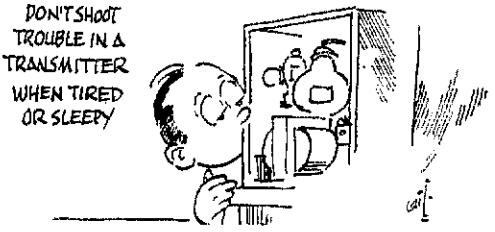
13-14 *CD Party phone, CARTG RTTY SS, RSGB 21/28 MHz phone.*

17-18 *YLRL YL/AP cw.*

20-21 *CD Party cw, N.C. QSO Party, Scouts Jamboree-on-the-Air, RSGB 7 MHz cw.*

29 *W1AW Special Evening Qualifying Run.*

Nov. 1-2, YL/AP phone.
Nov. 10, FMT.
Nov. 10-11, SS phone.
Nov. 17-18, SS cw.
Dec. 8-9, 160-Meter Contest.



Silent Keys

IT IS with deep regret that we record the passing of these amateurs:

WA1AGR, Eleanor M. Fiero, Assonet, MA
K1BXD, Ralph B. Dodge, Peabody, MA
W1EIJ, Edwin S. Parker, Sebec Village, ME
W1FYN, Irving S. Simpson, Chatham, MA
W1IP, John M. Bristow, Seekonk, MA
W1MBT, Eugene F. Camerlin, Chicopee, MA
W1NCE, Albert G. Hutchins, Jr., Foxboro, MA
W1OFY, Gordon W. Gilbert, Beverly, MA
WA2BCI, Richard K. Carpenter, Newfield, NY
K2CR, Richard D. Zucker, Water Mill, NY
WB2DDL, Cyril C. Hartill, Valley Stream, NY
W2FEN, Charles R. Wagner, Albany, NY
W2JJH, George H. Johnson, N. Troy, NY
WB2PKJ, Harry L. Chamberlain, Baldwinsville, NY
W3AYK, William D. Kelly, Catonsville, MD
W3BAO, James S. Whelan, Pittsburgh, PA
W3GTZ, Bayard G. Taylor, Claymont, DE
W3IEI, Carl E. Miller, Baltimore, MD
K3JYB, Walter F. Andrewjeski, Middletown, PA
K3WEZ, Harry V. Hume, Rosemont, PA
W3WMP, John H. Fisher, East Stroudsburg, PA
K4AN, Cline M. Cole, Knoxville, TN
WA4BET, Ernest J. Gaines, Calhoun, GA
W4DEW, William D. Montgomery, Huntsville, AL
WA4GOL, James B. Hay, Cleveland, TN
W4GQB, Volney J. Cissna, Signal Mountain, TN
W4KZR, Hans H. Hilcken, St. Petersburg, FL
W4VZU, Gerald M. Golightly, Memphis, TN
W4YU, Harold E. Hotaling, St. Petersburg, FL
W4YZ, Max H. Edwards, Sarasota, FL
W4ZAB, George F. Fischer, Pompano Beach, FL
WA5JXO, Sammy L. Fields, Mesquite, TX
K5RKT, Omar B. Milligan, Oklahoma City, OK
W5WJ, Thomas O. McKinstry, Albuquerque, NM
W6CZE, Fabian R. Fletcher, San Diego, CA
W6FWZ, Louis J. Riboni, Carmichael, CA
K6GKV/W6DLA, Willard C. Hatfield, Sr., Capistrano Beach, CA
WB6HTN, Anthony G. Kelly, Santa Monica, CA
W6ULC, John C. Machin, Anderson, CA
K6WI, John N. Hurtt, Palm Desert, CA
WA7KQX, Lewis Chastain, Jr., Tucson, AZ
WA7MDW, Karl E. Swenson, Humboldt, AZ
W7VZ, Charles H. Burson, Portland, OR
WB8EKH, Clyde J. Hull, Big Rapids, MI
WA8EKJ, Kenneth D. Maynard, Kearsarge, MI
WA8FGD, William A. Hyde, Pontiac, MI
W8HKT, Fabian T. McAllister, St. Joseph, MI
W8IZ, William G. Bruening, Saginaw, MI
Ex-8JZ, Paul D. Tennant, Shinnston, WV
W8PYP, Edward J. Zick, St. Joseph, MI
W8QZF, George A. Leininger, Cleveland, OH
K9ACL, Robert E. Orr, Sullivan, IN
W9AJ, Charles E. Nichols, Muncie, IN
W9ANA, Louis A. Wollaeger, Wauwatosa, WI
K9BCD, Henry F. Gamble, Jr., Warrens, WI
K9EEC, Laurence L. Finnan, Chicago, IL
WA9FDI, Louis O. Sloggett, Chicago, IL
WB9GIX, LeAnn S. Demaree, Noblesville, IN
WB9GTB, Warren L. Angrick, Indianapolis, IN
WA9LAF, Harland A. Craft, Menomonee Falls, WI
W9LRT, Julia L. Morgan, Mishawaka, IN
W9TFD, Edgar W. Bailey, Deerfield, IL
W9VD, Clarence N. Crapo, Milwaukee, WI
W9VVT, Earl F. Lemme, Carmel, IN
WAØFHF, Hubert E. Curtis, Muscatine, IA
WNØJWU, Julian J. Schmidt, Anoka, MN
WAØMPB, Hugh C. Elmore, Kansas City, MO
WØODQ, Everett A. Phelps, Cedar Falls, IA
WØVBQ, Oscar H. Baker, Ozawkie, KS
WAØWGR, Woodrow W. Andersen, Emmons, MN
WØWNJ, Gerald O. White, Littleton, CO
WAØZCQ, Olin W. Munger, Kansas City, MO
VE2BZ, Paul E. Plante, Longueuil, PQ
VE3AYS, Del R. Spaetzel Beamsville, ON
VE3BAT, W. Bruce Adams, Don Mills, ON
VE3DBB, W. A. Duffield, Ottawa, ON
VE3EU, S. I. Comach, Ottawa, ON
VE4CA, Albert G. Cobb, Winnipeg, MB
VE7KX, J. T. Hepburn, Sardis, BC
VE7TC, G. Fred Barron, Vancouver, BC
DL3LL, Karl H. Schoenherr, Ludwigsburg, Germany
GI6TK, Frank A. Robb, Holywood, Co Down, N. Ireland
ON8UK, Harry M. Flora, Casteau, HT, Belgium

Operating News *(Continued from page 116)*

S.Fla.	9/10/73	*J.F. Porter, W4KGJ	11/28/73
Wis.	9/10/73	J.A. Taylor, W9OMT	12/10/73
Okla.	9/10/73	C.C. Cash, W5PML	12/11/73
Ill.	9/10/73	E.A. Metzger, W9PRN	12/15/73
N.Fla.	9/10/73	F.M. Butler, Jr., W4RKH	12/15/73

*Acting SCM
SCM

SCM ELECTION RESULTS

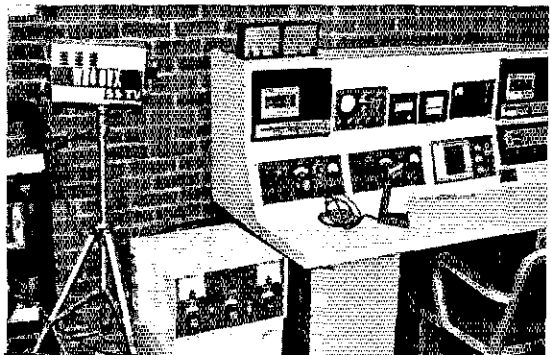
Valid petitions nominating a single candidate were filed by members in the following sections completing their election in accordance with applicable rules, each term of office starting on the date given.

W.Mass.	P.C. Noble, W1BVR	8/11/73
Kansas	R.M. Summers, KØBXF	8/18/73

In the New Mexico Section, Mr. Edward Hart, Jr., W5RE and Mr. John A. Meissner, K5CXN were nominated. Mr. Hart received 157 votes and Mr. Meissner received 58 votes. *Mr. Hart's term of office began July 2, 1973.*

In the Washington Section, Mr. Donald W. E. Calbick, W7GYF, Mrs. Mary E. Lewis, W7QGP, Mr. Gerald N. Seligman, W7BUN and Mr. William R. Watson, W7BQ were nominated. Mrs. Lewis received 420 votes, Mr. Seligman received 338 votes, Mr. Watson received 314 votes and Mr. Calbick received 103 votes. Mrs. Lewis' term of office began July 2, 1973.

Strays



WB4OVX was first to qualify for the WAS award -- all via slow-scan TV. Shown right is the neat set up which did the trick.

All operating amateurs are invited to report to the SCM on the first of each month, covering station activities for the preceding month. Radio Club news is also desired by SCMs for inclusion in these columns. The addresses of all SCMs will be found on page 6.

ATLANTIC DIVISION

DELAWARE – SCM/SEC, Roger E. Cole, W3DKX – RM: W3EEB. PAM: WA3GSM. 16 licensed hams and a total of 47 individuals gathered at Tuckahoe Acres near Dagsboro for the Delaware Ham Campout June 2,3. Those present are already talking about next year and hope to double the number present for this pre-Field Day activity. It is a beautiful location with activities for the entire family. Present were W3ZNF, K3YHR, K3GUW, WA3SQS, WA3KZX, WA3QLS, K3NCL, K3IMH, WB4KAN, WB4HBC, WA3RER, WA3TBN, WA3TBM, WA3RUF, WA3SSI and W3DKX. Visitors included WA3SKX, K3CEW, WA3GSM and WA3NHW. Mobiles with 40 watts output worked through the WA3KXH 2-meter repeater in Wilmington 90 air miles away. K3KAJ has a new Drake "C" line in use and WA3QLS is on 2- and 6-meter ssb. DTN QNI 205, QTC 45. DEPN QNI 54, QTC 16. PSHR: WA3DUM 56, K3KAJ 50. Traffic: (May)WA3DUM 74, WA3GSM 58, K3KAJ 29, W3DKX 26, W3EEB 16. (Mar.) W3EEB 23.

EASTERN PENNSYLVANIA – SCM, George S. Van Dyke, Jr., W3HK – SEC: W3FBF. RMs: W3EML, WA3AFI, K3MVO, K3PIE, W3CDB. PAMs: K3BHU, WA3PLP. OBS reports received from W3CL, WA3QOZ, WA3LWR. OO reports from K3RDT, W3KCM, W3KEK, W3CL. OVS reports from WA3BJQ, W3CL. BPLs: W3CUL, W3VR, K3PIE. PSHR: WA3ATQ, K3MVO, WA3PLC, WA3RKH, W3ABT, K3DCB, K3OIO, WA3QOZ. What happened to the net reports this month? Only one net reported in time. EPA CW 3610 kHz 7 and 10 P.M. daily QNI 362, QTC 412, RM K3PIE. If reports get any later we won't have anything to write! Mark your calendar for the end of the month. W3CUL and W3VR are back in town, welcome! W3EML gaining on his illness. Many report the VHF QSO party a real good time this year. Many picnics reported, sure hope they all had FB WX. K3MNT now has his big "A" ticket. Congrats! Several OOs have reported they are having a hard time to really find much to report on. W3GMK worked the military stations on RTTY. W3EU reports one grandson now operating and second one studying for Novice! WA3QFN home from school and wants to get RTTY activity going; anyone interested contact him. W3ABT will probably be QRT until the fall semester. All ops. are home for the summer. FD again was a real wing-ding. How some of those stations get all the wire and pipe up in the air and make it work is always a mystery to me! Hope we are able to do the same thing if and when a real emergency does occur. Very little reported this month so a short report. Again mark that calendar, fix those antennas for next winter and have a safe vacation. See you on 2-meter fm. Traffic: (May) W3CUL 2188, W3VR 752, K3PIE 573, WA3QOZ 384, W3EML 364, K3DZB 157, WA3ATQ 141, K3DCB 134, WA3PZO 122, K3MVO 100, W3ABT 71, WA3QLG 68, K3OIO 67, WA3IYC 64, WA3PLC 57, W3HK 41, WA3LWR 26, WA3RKH 23, W3ADE 21, W3WRE 17, W3CL 11, W3VA 11, W3VAP 10, W3LC 7, W3OY 7, W3CBH 6, K3KTH 6, K3MNT 4, WA3BJQ 2, W3EU 1, W3GMK 1, K3HXS 1, W3KCM 1, W3KEK 1, WA3QFN 1. (Apr.) WA3PZO 101, WA3LWR 68, W3KEK 1.

MARYLAND-DISTRICT OF COLUMBIA – SCM, Karl R. Medrow, W3FA – RM: W3QU. PAM: K3TNM. NCM: W3LDD. W3QU cites the May MDD top brass as WA3QIA, WA3SQQ and WA3IYS. The MEPN has WA3IIV as topper along with W3ADQ, W3DKX, W3HWZ and W3JQN. WA3RDU made a quick trip to England. K3STU reports 10 meters is not dead – among other things too many 2nd harmonics, and too infrequent ID his most prevalent observation. The High Point HS lost WA3QPM, WA3QGA and WA3QDH through graduation. WA3QDH is making a big splash in many activities including WAS with school behind him. WA3LFU home from CASE has the rig back in shape and soon the Quad. W3FCI is having a ball on 2-meter fm. W3QU nailed GW3FSP on 2 meters via Oscar 6; congrats. WN3UUR and WN3UUH are neighbors of WA3RJS. WA3FYZ has WN3URR for the same. W3ABC is off to SRA8-Land until Sept. W3CDQ says 20 meters is too QSB. WA3SCR has learned the BPL trick. W3EOV is prospecting in the Yuma desert, Mex. and Ariz. all part of his retirement plan. W3BHE claims filling as many log books in 2 years on ssb as the previous 40 years on am and cw. W3OKN still zeroing in on skeds versus daylight saving time. W3ZNW opines a very busy time of it without traffic yet! W3FA hosted the MEPN directors K3TNM, W3FCS, WA3RDU and K3ZPU along with W3LDD and K3LJB. WA3RCI has another net in the making on the novice band. Those feet of W3FCS get attention on the fone nets. K3FPE and W3EKI activated MEPTN for an hour May 31 during a tornado watch in the area. WA3SWS is sticking to the higher bands for his work. WA3MSW finds Baltimore traffic hard to come by. WA3SQQ is doing a nice NCS job on MDD. W3LBC and WA3PJG are both named Joe and sound alike on cw. WA3TTM is a new reportee from Baltimore. WA3EOP make QRN for the Antietam Radio Assn. paper that is. W3FZV, WA3AFQ, WA3IYS, W3IN were all in there pitching for the PVRC reunion. MDD in 60 sessions had QTC of 377 and QNI average of 10. MEPN in 22 sessions had a QTC of 78, IF/84 and a QNI average of 25.9. The MDCTN had 18 sessions, QTC of 41 and QNI average of 15.4. Traffic: (May) WA3IYS 604, WA3SCR 274, WA3QIA 236, WA3RCI 230, W3QU 147, WA3SWS 129, WA3AFQ 101, WA3SQQ 83, W3FA 50, W3OKN 45, WA3IIV 29, WA3QDH 29, K3TNM 27, W3FCS 26, WA3FYZ 24, W3ADQ 14, W3FZV 13, WA3TTM 10, W3BHE 8, W3LBC 8, WA3LFU 6, W3FCI 4, WA3MSW 4, WA3RDU 3. (Apr.) WA3QDH 6.

SOUTHERN NEW JERSEY – SCM, Charles E. Travers, W2YPZ – Acting SEC: W2YPZ. PAMs: WB2FJE, WA2FVH, WA2TRK.

Net	*Freq.*	*Time(PM)*	*Sess.*	*QNI*	*Tfc.*	*Mgr.*
NJSN	3730	8:15 ea nite	24	50	14	WA2TRK
NJPN	3950	6:00 M-S	31	585	343	WA2FVH
NJPON	3930	6:00 Su	3	54	17	WB2FJE

WB2VEJ, WA2TRK and WB2FNK head the list of "operators of the month". Commendations are in order and hopes for an ever increasing group. WA2TRK working hard to build up NJSN. Tony will be happy to welcome you into the net. W2ORS reports one station with bad chirp this month. WA2TRK needs two more states to qualify for WAS. New ARRL affiliate W2MBC, Cherry Hill H.S. RC will be off the air for the summer months, will resume in the fall. WN2GQS recently acquired a triband beam. WB2ELK passed the Extra Class exam. WN2GRB won a two meter station at the May SJRA meeting. K2BG of the Burlington Co. RC reports the club roster was prepared and distributed. A fine job done by WN2JZZ with his XYL assisting. K2DAP gave a very interesting talk on the various requirements pilots must meet to travel the skyways. The DVRA held a very successful Flea Market and Auction at the VAW club grounds in Ewing Township. A fine job was done by all those who assisted in the program. Traffic: WB2VEJ 311, WA2TRK 227, WB2FNK 168, WB2FJE 38, W2YPZ 14, W2IU 13, W2MBC 12, WB2SFX 10, WA2FGS 8, W2CDZ 6, W2JI 6, K2PWK 4, W2ORS 3, W2ZI 2.

WESTERN NEW YORK – SCM, Richard M. Pitzeruse, K2KTK – Asst. SCM: Rudy M. Ehrhardt, W2PVI. SEC: W2CFP. The new EC for the Niagara Frontier AREC, WB2YEM reports activity underway with assistants WA2KTI, K2HYQ and K2DWI working hard. They would appreciate the support of the Niagara Frontier gang. New officers for the Auburn Amateur Radio Assn. are WA2VCM, pres.; K2RTG, veep; WA2FSJ, secy.; WA2EIX, treas. WA2FSJ edits their real FB club newsletter. NYS handled 380 messages with 705 check-ins for May. Manager W2MTA's ssb is on the fritz – condolences. The RARA Hamfest was its usual roaring success with over 2500 in attendance. W4BW of FCC gave a most sobering talk at the dinner. Next year's RARA bash is May 11. A flock of Rochester hams provided communications for the annual Hike for Hope held in that city. OVS K2LGJ is holdindg some interesting and successful skeds on 432. K2AOU reports that he, WA2IWZ and K2RQB are successfully exchanging TV pictures with good sigs on 432. Please consider FCC's request for comments re the RACES. Not familiar? Check recent issues of QST. Sorry to report the passing of W2SSK to Silent Keys. WN2JRX is eagerly trying to figure out how a Novice can make PSHR. Mitch handles more traffic than most higher class licensees do. WA2AIV and W2FEY have been

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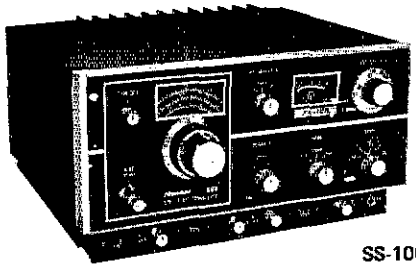

SS-100

SWAN SS-200 (200 Watts P.E.P.) . . **$779.00**
SWAN SS-100 (100 Watts P.E.P.) . . **$699.00**
SWAN SS-15 (15 Watts P.E.P.) . . . **$579.00**

If you must operate from a 115 volt AC source, order one of these power supply units:

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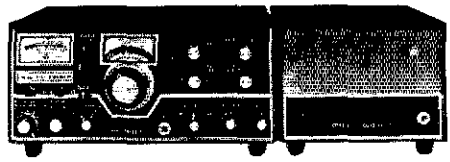
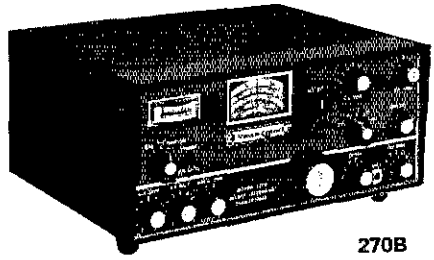


500CX 117XC

SWAN 500-CX — 500 Watts P.E.P., SSB/CW/AM Transceiver. Covers all amateur bands 80 thru 10 Meters **$529.95**
With SS-16B Super Selective Filter included **$589.95**
SWAN 117-XC — 117 volt AC Power Supply **$109.95**
SWAN 230-XC — 117 to 230 volt AC Power Supply **$115.95**

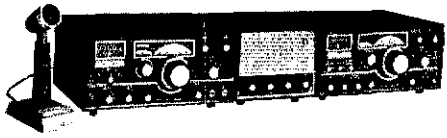


270B

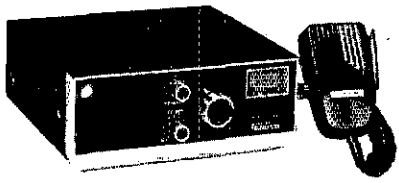
SWAN 270B — 260 watts P.E.P. SSB Transceiver. Built-in speaker/AC power supply. 3.5 to 29.7 mHz. . **$469.95**
With SS-16B **$529.95**

ACCESSORIES:

SWAN WM-1500 In-line Wattmeter 5, 50, 500 & 1500 Watt scales. . . **$49.95**
SWAN 600S — Speaker **$21.95**
SWAN 600SP — Deluxe speaker with phone patch **$64.50**
SWAN 600R — CW Filter **$29.50**
SWAN 600R — AM Filter **$39.95**
SWAN 14-117 — DC Power Supply **$139.95**
SWAN 510X — VFO **$53.95**
SWAN 508 — VFO **$159.95**
SWAN 210 — VFO **$109.95**
SWAN 160 — VFO **$119.00**
SWAN VX-2 — VOX **$35.95**
SWAN FP-1 — Phone Patch **$48.95**
SWAN NS-1 — Noise Blanker **$39.95**
SWAN 444 — Desk Mike **$28.50**
SWAN 404 — Hand Mike **$21.95**



SWAN 600T — 600 watts P.E.P. 10 to 80 Meter Transmitter **$589.95**
SWAN 600R — Companion Receiver for 600T. **$439.95**
Custom 600R **$545.95**
Custom with SS-16B **$599.95**



SWAN FM-2X — Operates directly from 12 volts DC. Up to 12 channel operation on 2 meters. Crystals for channels 1, 2 and 3 are included. Provides 10 watts of RF output. Furnished with dynamic microphone **$259.00**
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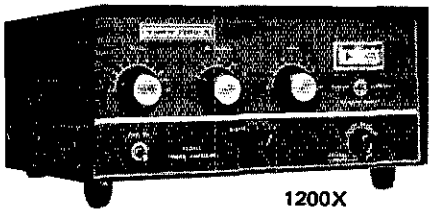
LINEAR AMPLIFIERS



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SWAN FM1210-A — 144 channel combinations are provided through independent switching of 12 transmit and 12 receive frequencies with eight crystals installed. Dynamic microphone included. Covers 144 to 148 MHz. **$319.00**
SWAN FM1210-A — Pedestal type AC Power Supply. **$49.95**
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appointed co-ECs for Orleans, Genesee and Wyoming Counties. WA2LUF's XYL is now WN2RIE and on the air with a DX-60 and HR-10. The Chautaqua County VHF Repeater Club provided communications for the 20 Mile Walkathon for the March of Dimes in that area. K2TXG and WB2BIS are working on an eight bay moonbounce antenna. WA2FVI has a new seven-element 2-meter beam. Another Silent Key is WA2BCI of Newfield, will be missed by the NYPON gang. K2LBB convalescing from illness now filling his log with his strong mobile signal. ESS handled 103 messages in May with 391 check-ins. No BPLs this month. Traffic with * indicating PSHR: (May) W2OE 311, W2RUF* 268, WA2AYC* 242, WB2ADW 211, W2MTA 86, WB2EEX* 68, WN2JRX 59, WB2VND 55, WA2PUU 45, W2ROF 43, K2UIR 38, W2HYM 37, WA2LUF 32, K2KTK 23, WA2ABL 21, K2OFV 20, W2PVI 19, WB2LKK 15, W2EAF 14, W2PNW 14, K2RTQ 12, K2IMI 10, W2RUT 8, WA2SMQ 8, WA2AIV 3. (Apr.) WN2JRX 59, WA2AIV 8.

WESTERN PENNSYLVANIA – SCM, Robert E. Gawryla, W3NEM – SEC: W3KPJ. PAM: K3ZNP. RMs: W3KUN, W3LOS, WA3PXA. WPA CW Net meets daily on 3585 kHz at 7:00 P.M. KSSN meets daily on 3585 kHz at 6:30 P.M. Both local time. WPPN, the West Pennsylvania Phone Net is now defunct. KSSN, The Keystone Slow Speed Net is beginning to come along nicely. QNI as often as possible. Watch for the Penna. QSO Party to be held Sept. 15 and 16. More details next month. The Indiana County ARC again sponsored the station WT3REE at the annual Christmas Tree Festival in May and made over 600 contacts despite very bad weather and noise levels at least 10 over S/9 at times. The Penn State University ARC announces the following new officers for the coming year: WA3JIH, pres.; WA2JHT, vice-pres.; WN3UBJ, secy.; WN3UBK, treas.; WA3IHK, station dir. The Nittany ARC reports W3ZUH is the new pres. of the Central Pennsylvania Chapter of IEEE for the next year. The summer months have produced very few newsletters and activity reports for this column. Check your license expiration date. If it is renewal time, upgrade at the same time. PSHR activity for May: WA3PXA 64, W3LOS 39, W3NEM 39, W3YA 34. KSSN had 13 sessions, 49 QNI and handled 23 messages WPA had 31 sessions, 385 QNI and handled 265 messages in May. WA3PXA made BPL with 52 originations plus 64 deliveries. Congrats. Traffic: WA3PXA 357, WA3SWF 205, W3YA 182, W3NEM 121, K3CR 118, W3LOS 70, W3KUN 48, WA3IYA 38, K3VQV 24, WA3EJO 19, WA3MDY 14, W3SN 14, K3HCT 11, K3SJN 9, WA3NAZ 8, W3IDO 4, K3LVO 1.

CENTRAL DIVISION

ILLINOIS – SCM, Edmond A. Metzger, W9PRN – Asst. SCM: Harry J. Studer, W9RYU. SEC: W9AES. PAMs: WA9CCP and W9PDI (vhf). RM: W9MUC. Cook County EC: W9HPG.

Net	*Freq.*	*GMT/Days*	*Tfc.*
ILNN	3720	0000 Dy	282
ILN	3690	0300 Dy	168
		2330 Dy	
NCPN	3915	1300 M-S	80
		1800 M-S	52
Ill PON	3915	1430	no report
Ill PON	145.5	0200 MWF	no report
Ill PON	50.28	0200 M	no report
IEN	3940	1400 Su	10

Our congratulations to pres. W9REC and the entire Chicago Radio Traffic Assn. upon their Fiftieth anniversary of their club founding. W9YH, at the Univ. of Ill. has a new QTH complete with a pair of 150-ft. towers. K9ZTV is now mobile. The League's Executive Committee has approved the application of the Moraine Valley Community College Amateur Radio Club (Palos Park) and declared it a duly affiliated society. W9UHD reports the Douglas County RACES license has been renewed and that the assistant communications officers are K9FTJ, WA9BFJ and WA9BZH. The Tri Town Radio Amateur Club held their annual Dinner Dance and an FB time was had by all. The York Radio Club visited the Moody Bible Institute and their club station W9LLW at their May meeting. The annual Six Meter Club's Hamfest will be held Sun. Aug. 5 at their usual picnic grounds near Frankfort, Ill. This column's sympathy to the family and friends of K9EEC and WA9FDI who recently joined the ranks of Silent Keys. The Chicago Amateur Radio Club will hold its 4th annual Hamfest and Mini-Auction on Sept. 30 at the St. Victor's Parking Lot at N. Kedvale and Addison, Chicago, Ill. A new Novice is WN9MQS, XYL of WB9EBZ. Reports received this month were heavy with plans for FD with a promise of a great day. Traffic: (May) K9MWA 366, W9NXG 189, W9KRR 169, W9JXV 148, WB9JPS 141, W9AES 127, WB9HEG 104, WA9LDC 80, W9MUC 72, W9OYL 50, WB9GSS 42, WB9DWG 34, WB9EYV 34, W9HOT 17, WB9FVG 13, W9KR 10, W9PRN 10, WB9ELP 8, WA9OBP 8, K9ZTV 8, WB9HAD 4, W9YH 3. (Apr.) K9ZTV 7.

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2 Meters
Features new high conductivity copper and nickel coated 17-7 PH stainless steel whip. Shunt fed coil encased in waterproof PVC jacket. All fittings chrome plated brass. Easy snap-in mounting.

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1¼ Meters
(220 MHz)
High performance ⅝ wavelength design for the new 220 MHz activity! Directly fed with low loss coil in new low-profile design. Spring and whip easily removable leaving only 1 3/16" high base for car wash clearance.

HM-175
¾ Meters
Collinear design with truly hot performance! Base fittings have silver plated contacts. Can handle 100 watts. Whip and phasing coil assembly is a one piece molded design to resist vibration and moisture.

HM-4
2 Meters
Tough, virtually indestructible antenna for hand-helds. Completely insulated. Base fitting matches Motorola HT, E. F. Johnson, and Standard portables.

HM-5
Same as above but for Drake and other packset portables with SO-239 fittings.

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INDIANA – SCM, William C. Johnson, W9BUQ – SEC: WA9YXA. PAMs: WB9FOT, vhf W9HWR, W9PMT. RMs: WB9LHI, *W9HRY*, WB9KVN.

Nets	*Freq.*	*Time(Z)/Days*	*Tfc.*	*Mgr.*
ITfeN	3910	1330-2300 Dy 2120 M-S	387	WB9FOT
QIN	3656	0100-0400 Dy	308	WB9LHI
IPON	3910	1300-2130 Su 2000 S	11	WB9AHJ
IPON VHF	50.7	0100 MWTh	16	WA9ULH
IPON CW	3712	*0000 Dy*	49	WB9KVN
IPON SSB	50.2	0200 Dy	42	W9MHZ
Hoosier VHF			11	W9PMT

With deep regret I report the passing of W9VVT. WB9GAT reports Grant County ARC provided communications for Grant Co. March-of-Dimes Walk-A-Thon May 5. W9BSZ, W9CUC, WB9FDC, WB9GAT, WB9KVI, K9MHU, W9MXV, WØPHT/9 all participated. IN and KY PON's are planning a joint meeting at Lagrange, Ky. *Aug. 26. Marion Co. director is available at the local amateur supply* house. WB9JLH had an antenna raising party. WB9NFX and WB9IFX are back on the air. DJ6GRD/9 is doing a lot of work with Oscar 6. Indianapolis Radio Club is putting on a Ham Demo. at the Senior Citizen Hobby Show. W9BUQ was at the Delaware Amateur *Radio Assn. Hamfest June 3. Talked about tornadoes and what to* do if you are in one. W9UEM is back on the air. At the May 25 IRC meeting W9FU explained about SB-220 Linear. W9FWH had the chance to use his generator after loss of power, the emergency power plant worked OK. QIN Honor Roll: WA9EED, W9EI, K9HDP, K9HYV, WB9KVN, WB9LHI. QIN operator for Apr. WB9KVN; May W9HWV. BPLs: WA9EED, K9HDP, WN9HWV. Traffic: WA9EED 520, K9HDP 247, WN9HWV 233, WB9KVN 195, WB9LHI 189, K9FZX 171, W9FWH 131, W9EI 92, K9HYV 92, W9JBQ 88, WB9CAC 85, K9KT 76, W9QLW 76, WB9AHJ 75, WB9FUT 64, WA9OHX 64, W9BUQ 46, K9RPZ 38, K9CBY 33, WA9OAD 29, W9DZC 28, K9RWQ 27, K9EQT 22, WA9TIS 20, *K9ILK 18, K9DIY* 16, *WA9ULH* 15, K9JQY 14, *WA9WJA* 12, W9RTH 11, WA9AXF 10, WA9OKK 7, WB9BAP 7, WA9BEE 5, W9KWB 5, W9UEM 5, WB9BAP 2, WA9BUV 2, W9FC 2.

WISCONSIN – SCM, Joseph A. Taylor, W9OMT – SEC: *W9NGT. PAMs: K9FHI, WA9OAY, WA9QKP.* RMs: *W9UCR*, K9KSA, K9LGU.

Net	*kHz*	*Time(Z)/Days*	*QNI*	*QTC*	*Mgr*
WSBN	3985	2330 Dy	1072	116	K9FHI
WIN(E)	3662	0000 Dy	250	77	W9UCR
WIN(L)	*3662*	*0400 Dy*	*138*	*82*	*K9LGU*
BEN	3985	1700 Dy	127	45	WA9QKP
BWN	3985	1145 M-S	504	303	WA9OAY
WSSN	*3662*	*2330 MWF*	*50*	*16*	*K9KSA*
WI-PON	3925	1701 M-F			WA9NIX
WI-PON	3697	2330 W			W9EMC

Congratulations to WA9MCC for putting the section on the map and winning the recent 160-Meter Contest. W9MFG reports the new Novice *Net now meeting at 5:30 P.M. local time. New WSBN net* certificates went out to WB9JXU, WB9JSW, WB9JMP. Also congrats to K9LGU who is new RM assuming duties as mgr of the late session of WIN. K9JQE has new mobile, standard 826 plus an RP synthesizer. W9QYH reports both fishing and DX great from his /9 location on Spectecal Lake. W9HSY is looking for a baker who doesn't include cherries in his pies. The Green Bay Mike and Key Club was the recipient of a 2 kw Gasoline Generator from the XYL of *K9DOL*. During this year's Field Day activities there were plenty of clubs challenging other clubs, hope yours was a winner! Traffic: W9CXY 338, W9DND 86, W9MFG 80, W9AYK 74, K9FHI 58, K9KSA 42, W9UCR 42, WA9OAY 35, W9KRO 22, WA9BZW 21, WB9EWQ 12, W9CTI 7.

DAKOTA DIVISION

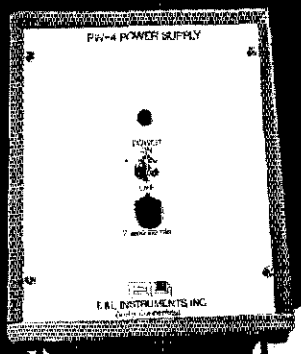
NORTH DAKOTA – SCM, Harold L. Sheets, WØDM – SEC: WAØAYL. OBS: KØPVG. RM: WAØMLE. OO: WØBF. WAØOVT reports two Novice Class licensees from the CAP class at UND – *WNØKFQ and WNØKFR. Congrats. Those that Prof. had at Valley* Jr. High have not received theirs as yet. WØKZU is on after a long absence with an SB101. WAØOVT used a TEN Tech receiver for transmitter hunt at the Peace Garden. WØGFE recently joined the tanks of granpa's! The Grafton Club held a picnic for area hams at the Grafton Park. WAØMLE again made BPL and PSHR. Keep the corn feed in mind down on KØPYZ's farm in Aug. If you fellows want news, you will have to get it to me!

Net	*kHz*	*CDT/Days*	*Sess.*	*QNI*	*QTC*	*Mgr.*
Goose River	1990	0900 S	4	59	0	WØCDC

BRING YOUR RIG IN AT NIGHT!

Now . . . a universal AC power supply for your FM transceiver *and* your amplifier!

At last, you can get the power you want at the price you want, with the new PW-4 from E&L. Plug it into any 110-120 volt AC source and you get a rated output of 13 volts DC @ *12 amps*, I.C. regulated to ±3%! The PW-4 features a circuit breaker reset, modern cabinet design, and heavy duty components for reliability. Use it with most 12-13 volt DC transceivers, together with your 50-60 watt amplifier. The PW-4 sells for $84.95, direct from the factory, or your local distributor.



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attn: Dick Vuillequez — W1FBS

PON	3996.5	0900 S 1830 S-S	12	252	14	WAØSJB
RACES	3996.5	1830 M-F	23	467	40	WBØATJ WAØSUF

Traffic: WAØMLE 299, WAØSUF 35, WBØBMG 24, WBØBCZ 22, WØDM 10, WØCDO 2, WØMXF 2.

SOUTH DAKOTA – SCM, Ed Gray, WAØCPX – Amateurs in the Clear Lake area have been meeting regularly with the Civil Defense Director. At the last meeting the film "Flams Wide World" was shown. Active members are KØTXW, KØTWT, KØTAM, KØTXU, WAØYIN, WAØFPR, WBØAXB, WBØAMK from Clear Lake or nearby. WØIG, WAØDEM, KØVDP and KØZUN have recently gotten on two meters. WBØDGA is on the air with a Swan 500. Net reports: NJQ Net – 553 check-ins and 20 formals; Early Evening Net – 457 check-ins and 11 formals; Late Evening Net – 1264 check-ins and 22 formals, SDN CW – 115 check-ins and 121 formals. Traffic: WAØROK 238, WAØTNM 121, WBØDGA 3.

DELTA DIVISION

LOUISIANA – Acting SCM, Louis A. Muhleisen, Jr., WB5AFH – SEC: K5SVD, RM: W5GHP, PAM: WA5NYY. VHF PAM: WA5KND. The LAN and LTN traffic nets are doing well. All wishing to check in are welcome. W4BPD was guest speaker at the July meeting of the DDXA in New Orleans. New officers of the DDXA are WA5WEY, pres.; W5KKZ, vice-pres.; W5JFB, treas.; WA5YFQ, secy.; W5NOP, ssb coord.; W5HIC, cw coord. GNOARC and NOVHF Club recently assisted the local Multiple Sclerosis Chapter in collecting money from their area leaders. Two Meter FM was used to coordinate the activity. WN5HXD reports the new Shreveport Amateur Club's name is Amateur Radio Club of Shreveport, ARCOS. The club has adopted a constitution and by-laws, and is now working on incorporation, Field Day, and ARRL affiliation. ARCOS has graduated five new hams from their novice class. Congrats to WB5HRP on his new General ticket. W5WE graduated three novices from his Science Class at Rock Mount Jr HS. W5ZBC's antenna setup is now back in use after a recent wind sheared the bolts in the bottom section of his tower and laid the antenna through his neighbor's roof. Maybe we could all benefit from this experience, especially with hurricane season upon us. SEC K5SVD still is looking for help in establishing an emergency communications plan in La. If you can be of any assistance please drop a note or send a message via one of our traffic nets. Don't forget the Alexandria Hamfest. Traffic: W5GHP 313, W5MI 125, WA5OVN 28, WA5WBZ 21, WB5IDV 12, WA5NYY 9.

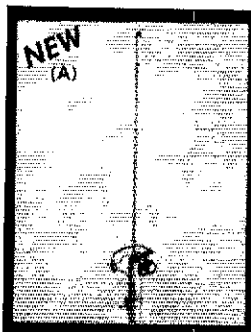
MISSISSIPPI – SCM, Walker J. Coffey, W5NCB – Asst. SCM: Gene McGahey, WA5JWD. SEC: WA5FII. PAMs: W5JHS, WA5KEY. RMs: WA5YZW, WB5EIN. We are pleased to have hard working WB5EIN as mgr. of MNN. PSHR: WB5EIN, WB5DLW, K5YTA, WB5FML. BPL: WB5EIN. Congrats to WB5CON now General and WB5HVX Advanced. WA5WUX graduated MSU and moving to La. NE Miss. ARC applying for 2-meter fm repeater license. QTH Blue Mtn., freq. 28-88. WN5HYR had perfect QNI on MNN in May. WN5HVY has WAS and WAC. W5RUB hopes to be back home in Sept. Let's all get in the Delta QSO party last week end in Sept. Glad to hear K5LUW back home for a visit. Another FB ECHO repeater bulletin by editor WA5FII. Nice letter from WB2KZM/KA6. Please help the SCM by getting your reports in by the 5th of the month.

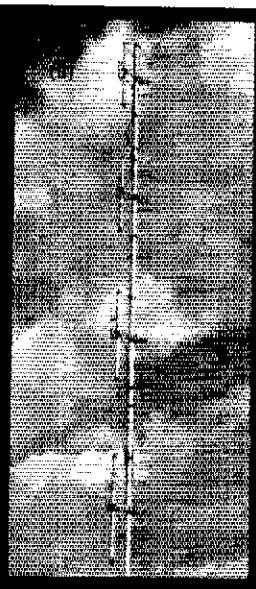
Net	*Freq.*	*Time(Z)/Days*	*QNI*	*QTC*	*Mgr.*
MTN	3665	2345 Dy	128	94	WA5YZW
MNN	3733	2400 MWF	87	75	WB5EIN
GCSBN	3925	2330 Dy	–	–	W5JHS
CGCHN	3935	0100 Dy	1452	145	WA5VVV
MSPON	3970	2345 MS	301	37	WAØGVO/5
MSBN	3987.5	0015 Dy	966	150	WB5BUE

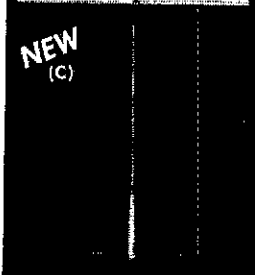
Traffic: WB5EIN 208, WB5DLW 156, WA5YZW 99, W5NCB 90, W5SBM 90, WA5THM/5 87, WB5FML 68, WN5HYR 67, W5EDT 54, K5YTA 47, WAØGVO/5 28, WB5AHY 19, WB5BKM 14, WB5DCY 10, WN5HNZ 9, WA5NWZ 8, WA5FII 6, W5BW 4.

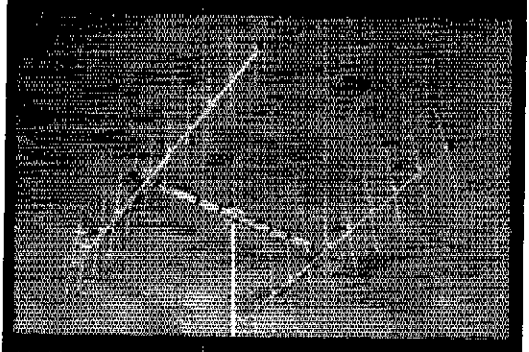
TENNESSEE – SCM, O.D. Keaton, WA4GLS – SEC: WB4DYJ. PAMs: W4PFP, K4MQI, WA4EWW, WA4NEC. RM: W4ZJY.

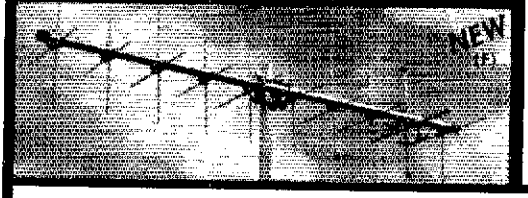
Net	*Freq.*	*Time(Z)/Days*	*Sess.*	*QNI*	*QTC*	*Mgr.*
TPN	3980	1145 M-F 1300 SSUH	31	1638	30	W4PFP
TSSBN	3980	2330 M-S	25	999	47	K4MQI
ETPN	3980	1040 M-F	21	631	19	WA4EWW
TCN	3980	0100 Th				W4CYL
TPON	3980	2330 Sa	5	163	9	WB4BHZ
TN	3635	2300 Dy	31	210	106	WB4YCV











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AR-2	100 watts	135-175 MHz	$12.50
AR-25	500 watts	135-175 MHz	17.50
AR-220	100 watts	220-225 MHz	12.50
AR-450	100 watts	420-470 MHz	12.50
AR-6	100 watts	50-54 MHz	18.50

(B) 4 POLE: A four dipole gain array with mounting booms and coax harness 52 ohm feed, 360° or 180° pattern.

AFM-4D	1000 watts	146-148 MHz	$42.50
AFM-24D	1000 watts	220-225 MHz	40.50
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(C) FM MOBILE: IMPROVED Fiberglass ⅝ wave mobile antenna with new molded base and quick grip trunk mount. Superior strength, power handling and performance.

AM-147	146-175 MHz mobile	$26.95

(D) POWER PACK: A 22 element, high performance, vertically polarized FM array, complete with all hardware, mounting boom, harness and 2 antennas.

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(E) 4-6-11 ELEMENT YAGIS: The standard of comparison in VHF/UHF communications, now cut for 2 meter FM and vertical polarization. 4 & 6 Element models can be tower side mounted.

A147-4	1000 watts	146-148 MHz	$ 9.95
A147-11	1000 watts	146-148 MHz	17.95
A220-11	1000 watts	220-225 MHz	15.95
A449-6	1000 watts	440-450 MHz	10.95
A449-11	1000 watts	440-450 MHz	13.95

(F) FM TWIST: A Cush Craft exclusive — it's two antennas in one. Horizontal elements cut at 144.5 MHz, vertical elements cut at 147 MHz, two feed lines.

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Kit SB-102, 24 lbs. $385.00*
Kit HP-23B, AC supply, 19 lbs. $51.95*
Kit HP-13B, DC supply, 8 lbs. $69.95*

Heathkit SB-220
2 kW Linear Amplifier...369.95*

The linear that gives you the most for your money, the SB-220 has two Eimac 3-500Zs in a grounded grid circuit that offers up to 2000 watts PEP SSB input or a full 1 kW on both CW and RTTY, yet requires only 100 watts of drive. Heathkit-quality features include a broad-band pretuned pi input delivering extremely high efficiency with minimum distortion; built-in solid-state power supply that can be wired for either 120 or 240 VAC operation, and changed to the other in minutes should your power requirements change; circuit breaker protection to eliminate fussing with fuses; zener diode regulated operating bias for reducing idling current to a bare minimum, resulting in longer tube life and cooler running; ALC to prevent overdriving; metered grid current, high voltage, and relative power; large quiet fan. Trim, compact table-top cabinet design uses extensive shielding for maximum TVI protection. At this low kit price, it's hard to find a comparison.

Kit SB-220, 69 lbs. 369.95*

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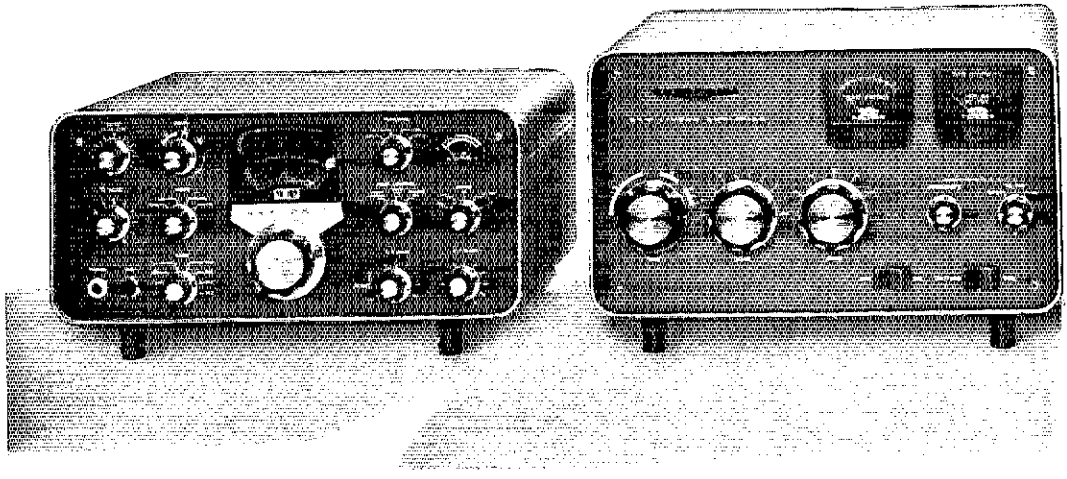

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Kit SB-650, 10 lbs. 179.95*

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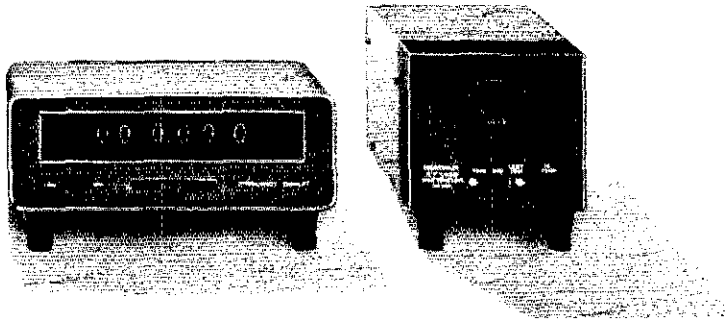
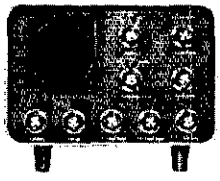
An accurate, reliable instrument for measuring RF output, the HM-2103 has a 50 ohm non-inductive load resistor and features less than 1.2:1 SWR for measuring frequencies from 1.8 to 30 HMz; built-in wattmeter with 0-200 and 0-1000 range, accuracy within ±10% of full scale; power rating of 175 W continuous, 1000 W maximum. High temperature indicator lamp warns of upper temperature limits, and a lamp test circuit is also provided.

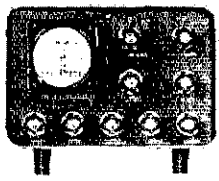
Kit HM-2103, 6 lbs. 59.95*

...you'll always find accessories to match

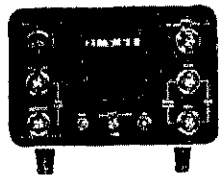




Heathkit Signal Monitor
kit SB-610, 14 lbs....89.95*



Heathkit Spectrum Analyzer
kit SB-620, 15 lbs....129.95*



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Heathkit External Speaker
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TNN	7135	2300 Dy	26	110	20	WB4NIR
ETVHFN	50.4	2300 MWF	13	130	0	W4SGI
ETVHFN	145.2	2300 TTh	8	28	0	WB4DZG
ETTMN	28.7	0100 W&F				WB4NFI
MTTMN	28.8	0100 T&Th	12	50	0	W4EAY
KVHFN	50.7	0000 T	4	18	0	WB4MPJ
ACARECN	146.28 146.88	0000 M	5	79	0	WA4BXK

Humboldt hamfest a success! The XYL of WA4LAX won a prize; WA6PAQ was the first prize winner and K4KLX came in second. The state of Maine was represented by WA1OKL and the oldest ham present was W4UU. The Knoxville hamfest was also successful. First prize winner was K4JBN and second was won by WA4BCQ. Everyone was glad John Huntoon attended and welcomed him back. The two ARRL forums drew good crowds and lots of comments. Everyone plan to attend the Cedars of Lebanon Hamfest on the 26th. Traffic: K4CNY 194, W4OGG 105, WB4DJU 66, WB4NIR 50, *W4ZJY 47, W4WBK 46, K4VVE 33, WA4GLS 29*, WB4ANX 16, WB4MPJ 15, WB4DYJ 12, WB4UZD 8, WB4BZC 6, K4SJV 6, W4SGI 4, K4UMW 3, WB4WHE/4 3, W4YAC 3.

GREAT LAKES DIVISION

KENTUCKY – SCM, Ted Huddle, W4CID – SEC: WA4GHQ. Appointed WB4EOR as PAM. Endorsed: WB4EOR, WA4MXD, K4YZU and K4YCB as OPSs; WA4VLH as OVS. BPL: WB4ZMK.

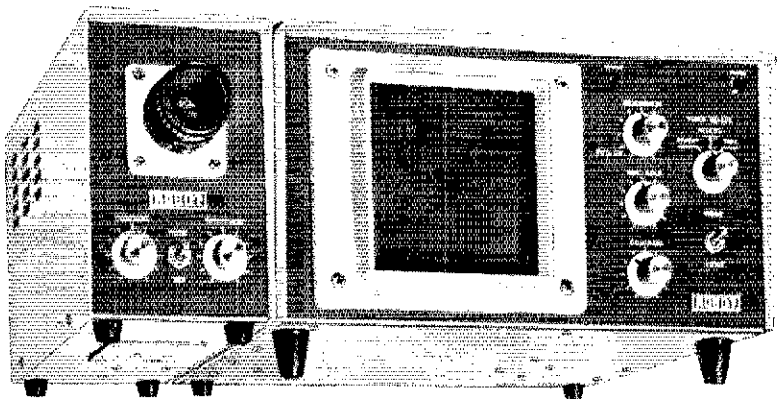
Net	*QNI*	*QTC*	*Net*	*QNI*	*QTC*
KRN	314	34	KYN	288	239
KTN	1029	172	KNTN	120	79

The summer blahs are with us! Traffic and QNI are down everywhere. Too much grass to mow. HL WA4BZS has been conducting Novice classes in Danville and has "graduated" his first YL, WN4EUE. WN4YQS has passed his General. W4IHR has a new 2-meter rig. Traffic: WA4JQS 287, W4BAZ 220, K4UNW 170, WB4ZMK 157, WB4EOR 100, K4TXJ 95, WB4ZSA 79, W4CID 66, *WB4WCM 66, WB4FOT 63, WN4YQS 63, WB4NHO 50*, WA4VZZ 41, WB4ZML 38, WB4HUS 34, W4CDA 18, W4IQZ 17, K4AVX 16, K4LOL 15, K4QHZ 15, WB4EWG 7, WA6KTN/4 6, WB4TNZ 6, WA4UMR 6, WB4GCV 1.

MICHIGAN – SCM, Ivory J. Olinghouse, W8ZBT – SEC: W8MPD. RMs: W8IYA, W8WVL, W8RTN, K8KMQ, W8GLC. *PAMs: W8GVS, WA8KHB, WB8HQS.* VHF *PAMs: K8AEM*, WA8WVV.

Net	*Freq.*	*Time/Days*	*QNI*	*QTC*	*Sess.*	*Mgr.*
QMN	3663	2200 Dy	779	340	62	W8JYA
WSBN	3935	2300 Dy	655	97	30	W8GVS
BR/MEN	3930	2130 S-F	754	72	26	WA8KHB
UPEN	3920	2130 Dy	582	35	31	WB8HQS
GLETN	3932	0130 Dy	847	124	31	WB8AXI
PON	3955	1500 Dy	917	302	31	K8LNE
PON/CW	3645	2300 M-S	160	26	26	VE3DPO
Mi.6M	50.7	2300 M-S	166	9	17	WA8VXE
Mi.NN	3720	2130 Dy	171	84	31	WB8JAD

SW Mi. VHF nets – WX 6M Net had 5 drills with 23 QNI. The 2M Net in 10 sessions had 110 QNI. K8GOG, K8THC, K8VAN and WA8FIF have joined Silent Keys. The Wolverine VHF SSB net reports May QNI 22 and 3 sessions. A net for beginners is operating on 3730 kHz at 2100Z on Tue. and Thur. and is designated BCN. WN8NCD is mgr. May net totals are QNI 22, QTC 3, sessions 10. WA8GVK is organizing a net for the bad weather season in the Muskegon area. Genesee Co. hams participating in the March of Dimes were WA8OZP as NC, WB8IYW, WB8IEK, WB8GUL, W8RTN, K8KMQ, W8JVV and WA8WQU. They did a very effective job and received high praise from the March of Dimes officials. WB8APN operates mobile on his pontoon boat, 5 watts ssb. WA8WMT has a new Advanced Class ticket and is the new trustee of the SRARS station license. WN8ONW and WN8ONX are new at Kalamazoo. WN8PRN is new at Indian River. QCWA – K8IGQ, pres.; W8CTC, vice-pres.; W8IAC, secy.; W8CAM, treas. 46 present at the Banquet in Cadillac May 5. FARL officers for 1973 are WB8HNJ, pres.: WB8IMI, vice-pres.; WB8CHE, treas.; W8NQ, secy. New officers for Hazel Park ARC are K8PNZ, pres.; WB8JYO, vice-pres.; WB8BUY, treas.; WB8IIC, secy.; WB8JYX and WA8WVE, dir. Latest information on AREC from W8MPD shows 694 members in Mich. section. Traffic: (May) K8KMQ 212, WB8JAD 200, *WA8ENW 155, W8GLC 135, K8LNE 118, WA8WZF 111, W8VFS* 106, K8DYI 103, WB8IMI 91, WB8FBG 87, W8JYA 87, W8ZBT 86, W8NOH 81, K3SJL/8 71, W8IBX 61, WRTZZ 52, W8OW 50, WB8DKQ 44, WB8HPZ 42, WN8NCD 39, WB8RHQS 38, K8JED 38, WA8KHB 33, W8IVC 30, W8MO 30, WB8HIB 29, WB8DJS 27, WA8EXR 27, WB8KWI 27, K8WRJ 25, WA8OJI 22, W8EU 21, K8SDA(GR) 17, WA8RXI 15, W8VXM 15, K8GOU 14, K8JHA 13, WA8LXY 12, WB8BYB 11, WB8IJI 11, W8VIZ 11, WA8WVV 11,



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e new Model 80A Camera offers four ditional features:

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CN-50 (14-18) 29
CN-50 (30.5-34.5) 29
CN-144 (7-11) 29
PV-144 Preamp 9
VX-62 VHF xmtr. 79

B T I
RF-2000/PS-2000 table model Lin. $475
LK-2000 (floor mod) 475

CENTRAL ELECT.
20A Exciter (table)$ 89
QT-1 Anti-trip 6
RC-458 VFO/10m 39
100V Transmitter 325

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66'er 6m Xcvr 125
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417 AC sup./mod. 65
418 DC sup./mod. 35
Zeus VHF Xmtr 275
Interceptor Receiver 225
Allbander HF Tuner 75
22'er FM series 25 229
22'er Mk II 2m AM 229
FM-27A 2m FM 295

COLLINS
75A-1 Receiver $139
75A-4 (ser.#5131 325
75A-4 (ser.#765) 325
75A-4 (ser.#1713) 349
75A-4 (ser.#3535) 395
75-A4 (ser.#4125) 425
75S-1 Receiver 325
R-388 Receiver 275
R-390A Receiver 795
R-390 Receiver 695
KWM-1 Xcvr 339
351D-1 Mount 35
516F-1 AC supply 75
516E-1 DC supply 75
CC-2 Carrying case 60

CONDEL
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2C Receiver 189
2CQ Spkr/Q-mult. 29
2NT Xmtr 109
R-4A Receiver 299
R-4B Receiver 339
MS-3 Speaker 12
MS-4 Speaker 15
SPR-4 Receiver 395
SC-6 6m conv. 59
TR-3 Xcvr 349
AC-3 AC supply 65
DC-3 DC supply 85
TR-4 with NB 489
TR-4 Xcvr 429
DC-4 DC supply 95
T-4X Xmtr 299
TR-6 with NB 549
TR-22 2m FM Xcvr 159
L-4B Linear 595
NB noise blanker 49

DYNAMIC COMM.
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752 DC supply 49
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Galaxy V Xcvr 239
Galaxy V Mk II 249
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RV-1 Remote VFO 49
VX-35 VOX 9
CAL-35 Calibrator 12
SC-35 Speaker 12
F-3 300 cy. filter 24
2000 Linear/sup. 225
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Duo-Power 300 69
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RV-550 Remote VFO 59
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GT-550A Xcvr 389
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AC sup. for rejector 4

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SX-62 Receiver $129
SX-101 Mk III Rec. 149
SX-101A Receiver 189
SX-110 Receiver 99
SX-117 Receiver 189
SX-130 Receiver 139
R-46 Speaker 9
R-46B Speaker 12
HT-32 Transmitter 209
HT-32A Transmitter 225
HT-37 Transmitter 189
HT-44 Transmitter 175
HT-46 Transmitter 219
PS-150-120 AC sup. 75
PS-150-12 DC sup. 75
SR-400 Xcvr. 625
SR-400A Cyclone 3 675
P-500AC AC sup. 89
PS-500A AC supply 89
PS-500DC DC sup. 95
SR-2000 Xcvr 995
SR-34 (AC/DC) 175
SR-46 6m Xcvr 79
SR-46A 6m Xcvr 99
HA-1 Keyer 59

HAMMARLUND
HQ-110 Receiver $109
HQ-110C Receiver 119
HQ-110A Receiver 149
HQ-110AC Receiver 159
HQ-170 Receiver 149
HQ-170C Receiver 159
HQ-170A Receiver 194
HQ-170AC Receiver 199
HQ-170A/VHF 259
HQ-215 Receiver 219

HEATHKIT
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GR-64 Receiver 39
HR-20 Receiver 69
RX-1 Receiver 139
HW-10 6m Xcvr 129
SB-300 Receiver 209
SB-310 Receiver 229
XC-2 2m converter 25
XC-6 6m converter 25
SBA-300-3 6m conv. 19
SBA-400-4 2m conv. 19
SB-600 Speaker 15
HD-11 elect. keyer 19
DX-20 Transmitter 29
DX-35 Transmitter 35
DX-60 Transmitter 59
HX-10 Transmitter 189
AK-7 mob. speaker 5
HX-20 Transmitter 119
HX-30 6m Xmtr 149
HW-12 75m Xcvr 75
HW-32 20m Xcvr 75
HW-32A 20m Xcvr 85
HW-16 Xcvr 99
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SB-401 Transmitter 249
SB-610 Signal mon. 69
SB-620 Scanalyzer 119
HW-16 Transceiver 99
HW-29 (Six'er) 34
HW-30 (Twe'er) 39
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HP-23A AC supply 54
HRA-10-1 calibrator 19
HO-13 Hamscan 69
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IB-101 freq. counter 149
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PS-511 AC supply 79
VFO-5 79

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X-10 calibrator 9
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T-150A Transmitter 69
T-175 6-10m Linear 59
V-44 VFO 19
TR-106 6m Xcvr 59
V-107 VHF VFO 19
TR-108 2m Xcvr 79

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KT-320 Receiver $ 59
HA-225 Receiver 79
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HA-800 Receiver 89

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NC-270 Receiver 125
NC-300 Receiver 129
NC-300-C2 2m conv. 29
NC-300-C6 6m conv. 29
HRO-50T1 Receiver 125
HRP-60 Receiver 199
XCU-50 Xtal calib. 9
XCU-27 calibrator 15
NCX-5 Mk II Xcvr 369
NCXA AC supply 75
NCXD DC supply 75
NCX-B AC supply 75
200 Transceiver 239
AC-200 AC supply 69
NCX-500 Xcvr 269
NCL-2000 Linear 375

P & H
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117C AC supply 75
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500C Transceiver 369
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500CX SS-16 449
117XC AC supply 85
230XC AC supply 95
14-117 DC supply 95
TV-2 2m Xverter 189
TV-2B 50MHz I.F. 225
510X MARS osc. 39
350 6m Xcvr 229
210 VFO 79
500kc calibrator 9
Mark II Linear 449
1200X Linear 199
FM-2X 189
VHF-150 219

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Tempo One Xcvr $249
Tempo AC One sup. 75
FMH 2m FM Xcvr 139
AC sup. for FMH 19

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KR-5 Keyer 24
PM-2A Transceiver 39

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361 Cedax Auto 49

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FRDX-400SD Rec. 319

6/1/73

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Due to the low prices and limited quantities of the merchandise listed below all prices are for "Payment in Full With Order — No Trade"

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Golden Eagle MK II AM CB Base Station (Rec. & Xmtr.)	$495	$395
CLEGG		
22'er FM series 25	$384	$269
22'er Mk II AM	389	269
COLLINS		
75S-3B Rec.-New display	$1101	$880
32S-3 Xmtr-New display	1330	1064
351D-2 mob.mt.-New display	337	137
R. L. DRAKE		
L-4B Linear-New Display	$825	$649
TC-6 6m xmt. converter	278	248
CC-1 Converter console	49	49
CPS-1 Power supply	20	19
SCC-1 VHF calibrator	27	26
C-4 Console - New display	395	325
ETO		
PA-70V Linear w/160m	$1875	$1375
EICO		
751 AC supply - kit	$ 79	$ 49
751 AC supply - wired	109	79
752 DC supply - kit	79	49
752 DC supply - wired	109	69
ELECTRA		
BCU UHF Scanner	$149	$ 89
GALAXY		
AC-210 AC supply/booster	$ 49	$ 25
GT-550A New Display	595	450
GONSET		
GSB-301 Mk IV Linear	$660	$360
HY-GAIN		
HB2S2 stacked 2m Halos	$ 26	$ 9
SD-150B 159-174Mc J-pole	125	29
HB-2S4 4 stacked 2m Halos	64	19
400 Rotor - New Display	229	189

	reg.	NOW
LINEAR SYSTEMS (ADCOM)		
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REGENCY		
HR-2A 2m FM Xcvr.	$229	$179
TMR-4H 4 ch. Scanner	179	79
REGENCY C B		
Imperial 23 ch, 110& 12v	$299	$199
RAYTRACK		
CB-AL3 CB Auto Level (same as Ham model)	$ 69	$ 19
S B E		
SB-36 Xcvr.-New Display	$969	$769
SB-SV Scanvision Monitor and Camera - New Display	999	780
SB-144 2m FM - New Display	359	229
SB-2MIC Mike (dynamic)	16	12
STANDARD		
SR-C826MA - New Display	$398	$279
SR-C140 - New Display	595	476
SWAN		
410C VFO for 500C	$120	$ 80
500CX/SS16B - New Display	589	519
600T Xmtr - New Display	589	489
1200w Linear (110v)	295	195
1200w Linear (230v)	295	195
VARITRONICS		
FM-20BM Base Amp/ supply	$235	$ 75*
PA-50A 2m FM Amp. 12v	129	85*
FDFM-2S (mod. for MARS)	310	160*

* with 90-day A E S warranty

	reg.	NOW
WATERS		
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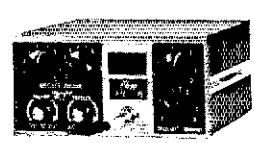
* AC Supply for FM-27B $ 79.00
* Hy-Gain or Cushcraft VHF Antennas

* Or any other merchandise of your choice –write for our "Condensed listing of Amateur Radio Equipment".



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AA-22 Rec./Xmtr. Amplifier	149.95
MMK-22 Mobile Mount	9.95
AA-10 10 watt 2 meter Amplifier	49.95
AC-10 supply for TR-22/AA-10 TR-72	39.95
Extra crystals for TR-22, TR-72 each	5.00
DSR-1 Digitally synthesized Receiver	2195.00
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2C Receiver	$295.00
2AC Califrator for 2C	18.75
2CS Speaker for 2C	22.00
2CQ Speaker/Q-multiplier for 2C	49.00
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R-4C Receiver	499.95
4NB Noise Blanker	65.00
Filters: 250, 500 cycle; 1.5, 6.0 kHz	50.00
MS-4 Speaker for TR-4C, R-4C, SW-4A	22.00
TR-4C Transceiver for 80-10 Meters	599.95
34PNB Noise Blanker	100.00
RV-4C Remote VFO for TR-4C	110.00
FF-1 Crystal cont. adapt. for TR-4C	46.95
AC-4 AC supply for TR-4C, T-4X	99.95
DC-4 12vdc Supply for TR-4C	125.00
MMK-3 Mobile Mounting kit for TR-4C	6.95
MC-4 Mobile Console for TR-4C	69.00
2NT CW Transmitter	175.00
T-4XC SSB Transmitter	530.00
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MN-4 Antenna Match Network	99.00
MN-2000 Antenna Match Network	195.00
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TV-300HP High-pass Filter	6.95
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Crystals for 2C, R-4C, SW-4A, T-4XC	5.00
Fixed-Frequency Crystals	7.50
729SRD Microphone with plug	19.95
SPR-4 Programable Receiver	579.00
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5NB Noise Blanker	$ 65.00
DC-PC DC Power Cord	5.00
TA-4 Transceive adaptor for SPR-4	25.00
SCC-4 Crystal Calibrator	20.00
RY-4 Teletype adaptor	10.00
DIAL Crystal Selector - plain	2.35
CRYSTAL KITS FOR SPR-4	
Aeronautical Overseas – 7 crystals	$ 32.00
Amateur Bands – 6 crystals	27.00
Citizens Band – one crystal	5.00
Marine Bands – 11 crystals	49.00
MARS – 5 crystals	22.00
Teletype Commercial – 4 crystals	18.00
Time & Freq. Std, WWV – 5 crystals	22.00

TR-72

TR-22

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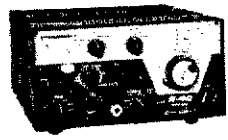
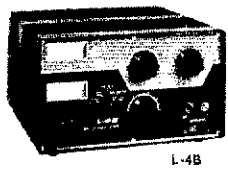


R-4C



L-4B

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TR-22 2m FM	$10 Bonus	SPR-4 Receiver	$40 Bonus
TR-72 2m FM	$20 Bonus	TR-4C Xcvr	$50 Bonus
R-4C Receiver	$40 Bonus	C-4 Console	$40 Bonus
T-4XC Xmtr	$40 Bonus	L-4B Linear	$100 Bonus

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2. C.O.D. (20% DEPOSIT)
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W8HKL 10, W8WVL 10, K8PYN 9, W8QBE 9, WB8MJI 8, WB8APN 7, W8ACW 6, WB8BJY 6, WB8IFD 6, W8OKW 6, K8TIY 6, K8ACO 5, WB8DRT 4, K8AEM 3, WB8DTJ 3, WB8EUN 3, W8TBP 3, W8FZL 2, WA8PDN 2, W8VOQ 2, W8CUP 1. (Apr.) K8KMQ 156, W8JYA 66, WB8KWI 27, WA8LXY 22, W8ACW 8, K8AEM 4, WB8EUN 3, W8VOQ 2.

OHIO – SCM, William E. Clausen, W8IMI – Asst. SCM: Kenneth L. Simpson, WA8ETX. SEC: WA8COA. RM: WA8WAK. PAM: K8UBK. VHF PAM: WA8ADU. I report with deep sorrow the passing of K8LFI, long-time EC and TVI chmn. for Northwest Ohio. Bill's leadership and many contributions to ham radio will long be remembered.

Net	QNI	QTC	Sess.	Freq.	Time(Z)	Mgr.
OSSBTN	2988	917	108	3972.5	1430/2000/2245	K8UBK
BN	541	316	62	3577	2300/0200	WA8WAK
O6MtrN	483	68	30	50.16	0100	WA8ADU
OSN	216	89	30	3577	2225	WA8WAK
BN RTTY	152	51	31	3605	2200	K8NCV
BN NOVICE				3730	2300	WN8OBK

New appointee: WA8RXM, OO. The Ohio Novice Net, meeting at 2230Z on 3740, had 90 check-ins and handled 65 messages. Is your club an ARRL affiliate? Send me a card or radiogram for details on the benefits of League affiliation. W8VYU reports the Massillon ARC again provided communications for a whole week end of canoe racing. OOs W8ZCQ, WA8MCR, W8VWX, K8RMK and W8DPW were active during May. W8VWX notes that the number of Novice harmonics has fallen drastically with the use of VFOs. EC WA8MGI reports that Stark County AREC/RACES nets were activated three times during severe weather warnings. New officers of the Univ. of Akron ARC are WB8LUW, stn. mgr.; WA8VKF, chief op.; WB8AZP, tech. supervisor; W8KWH, faculty adv. The sixth annual Ohio Traffic Nets Picnic is scheduled for Aug. 12 in the Massillon area. Contact WA8WAK for details and a map. EC WA8KPN reports great progress in building up the AREC program in Belmont, Guernsey, Monroe and Noble counties. EC WB8AYM is also hard at work building up AREC and reports that Mt. Vernon now has a .19/.79 repeater. The Apricot Net provided mobile communications for the Cleveland Memorial Day Parade and South Euclid High School's Bik-a-Thon. W8KC, WA8FQC, WA8QFK and K8ONA were interviewed on WELW-FM. W8KC was honored at the Cleveland VA Hospital and at the Dayton Hamvention for outstanding volunteer service. Stark County CD and the Tri-County Radio Assn. provided communications for a charity walk. W8GSR, WA8MHO and others assisted the Medina County Sheriff with communications at a rock festival. I visited the Marion ARC and joined SEC WA8COA for a visit to the Treaty City ARC at Greenville. Thanks to both clubs for their fine hospitality. Many Ohio hams provided emergency communications service during severe weather and tornados in May. Be sure to read Public Service Diary for details. Look for the ham radio display station at the Ohio State Fair in late Aug., again sponsored by Central Ohio AREC and the Ohio Council of ARCs. Traffic: WA8MCR 569, W8PMJ 335, W8CUT 230, WA8YLW 206, W8QCU 202, WA8WAK 165, WA8ETX 159, WN8MZZ 136 WA2ASM/8 124, WA8HGH 122, W8SUS 112, W8JD 103, K8UBK 102, WB8KKI 101, K8BPX 88, WB8KZD 86, W8MGA 83, WB8NRC 81, WB8ALU 68, WB8JGW 62, K8MLO 60, W8ENI 57, WA8DWL 53, W8DDG 50, WB8EEZ 42, WA8ETW 40, W8GVX 39, W8MOK 39, WA8SED 37, W8FGD 35, WA8YIB 35, WA8FSX 34, WB8KXV 33, W8QZK 33, WA8VWH 32, W8PBS 29, WA8UPI 28, WA8ADU 27, WB8AYC 26, WA8KPN 26, WA8MIH 26, WB8HWE 24, WB8IBZ 23, W8BHL 21, W8ARW 20, WB8KEO 20, WB8CSH 20, W8LZE 20, W8VYU 20, WA8ZNC 20, W8WEG 18, WA8MAZ 17, WB8FCT 15, W8GOE 15, W8NAL 13, K8BYR 11, WA8BCX 10, WA8SSI 10, WB8FWF 9, W8UX 9, K8CKY 8, K8EHU 6, WB8CLF 5, W8ETU 5, W8GRT 4, K8QYR 4, WB8MXU 2, WN8MYA 2, WA8JSW 1.

HUDSON DIVISION

EASTERN NEW YORK – SCM, Graham G. Berry, K2SJN – Asst. SCM/PAM: Kenneth Kroth, WB2VJB. SEC: W2URP. RMs: WA2FBI and WB2IXW. RTTY RM: K2DN. Nets: NYS daily at 0001Z and 0300Z on 3,675 MHz; ESS daily at 2300Z on 3.590 MHz (10 wpm); Novice Training Tue. at 0045Z on 3.677 MHz; Westchester County Novice Net open to all on Tue. and Sun. at 2330Z on 3.725 MHz. NYRTTY daily at 2330Z on 3.613 MHz. Division PR Net 2nd and 4th Sun. at 2200Z on 3.925 MHz. NYSPT&EN daily at 2300Z on 3.925 MHz. Note: all times are one hour earlier, local, during DST. Attention Dutchess County stations: Welcome to new County EC WB2LPQ who is in the process of organizing for county coverage. List your availability with him at

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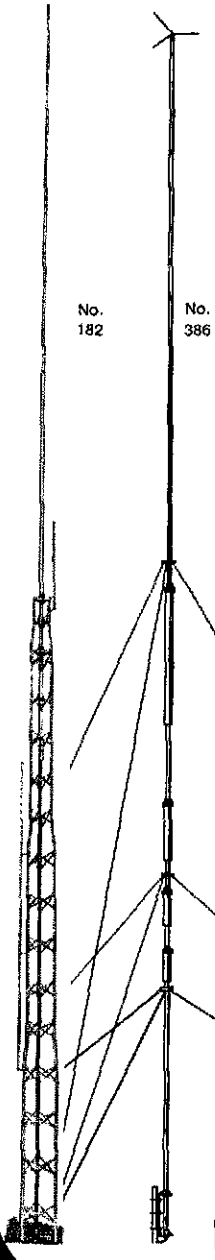

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No. 385 No. 193 No. 384

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Wappingers Falls QTH. Now if Putnam Co. will only come through, W2URP will have a county EC working in every county in the section! Among the clubs: Schenectady ARA heard Dr. Robert Yunick on "Art Science and Fun of Avifaunal Studies" and Annual Ladies Night Meeting in June. (Whoever thought that hams would have to be told about the birds and bees?) OMARC Club net active 2nd Fri. at 9:00 P.M. local on 28.650 MHz and welcomes visitors. Westchester Co. ARA heard G6JQ, originally G2BIT 30 plus years ago, and had slate of nominees presented for 1974 season; elections were in June. Albany ARA held annual dinner with W1UED as guest speaker, and auctioned off equipment of Silent Key W2FEN in May. Communications Club of New Rochelle held business meeting re City Parade assignments and FD'73 planning. Individual station activities: Section Net Certificates on way to all qualified ENY members of NYSPT&EN – 10 total new holders. WB2CFE graduated from Hudson Valley CC with Associate Degree in Electronics and celebrated by putting up a low band long wire for 80 and 40. W2OOJ looking for "hot" PR items in Albany district. WA2PJL and KYL WB2EMU soon on 2-meter ssb and chasing Oscar. K2DN now on fm with TR-72. Welcome to newcomer WN2QHL in Congers. All clubs please be sure SCM is on your mailing list for activities reports, club papers, etc., as new season starts. Thanks for the help. Traffic: (May) WA2CNE 356, W2GPH 109, WA2LIK 66, W2URP 49, WA2PJL 28, WA2RSP 16, K2SJN 15, WA2EAH 6, WA2HGB 3. (Apr.) K2DN 48.

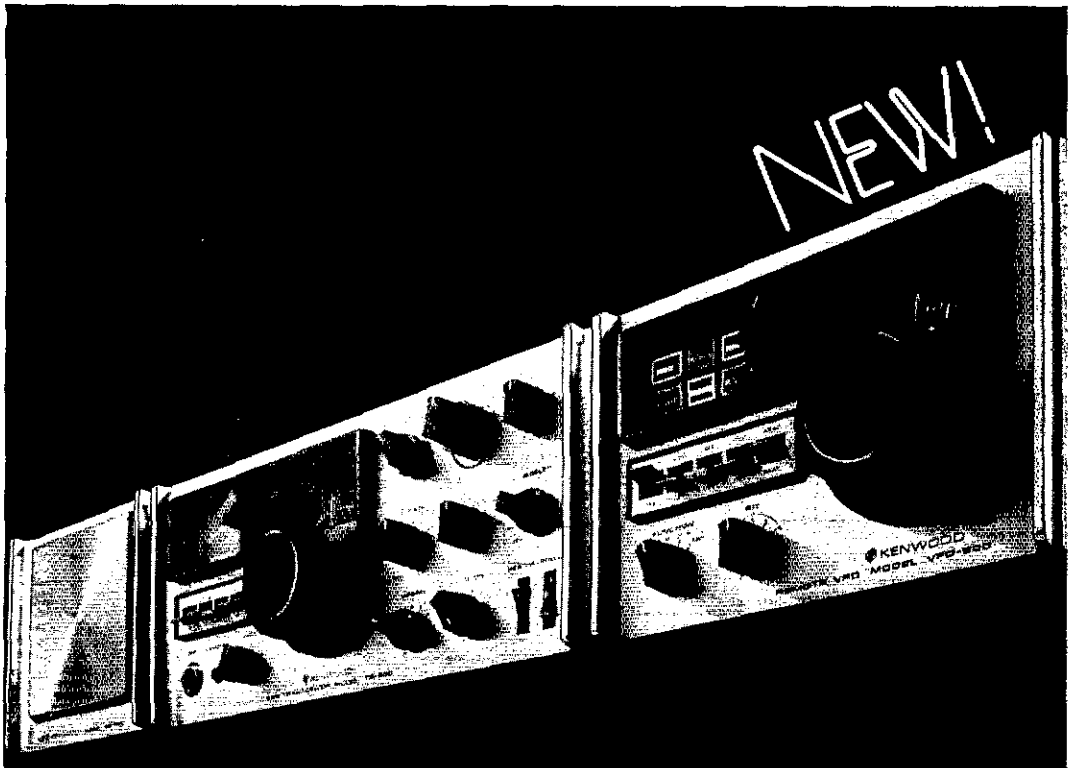
NEW YORK CITY AND LONG ISLAND – SCM, Fred J. Brunjes, K2DGI – Asst. SCM: John H. Smale, WB2CHY. SEC: K2HTX. RM: WB2LZN. PAM: WA2UWA. VHF PAM: WB2RQF.

NLI*	3630 kHz	1900/2200 Dy	WB2LZN Mgr.
NLS*	3730 kHz	1830 Dy	WA2CLB Mgr.
VHF*	145.8 MHz	1930 MTWThF	WB2RQF Mgr.
NLI Phone*	3928 kHz	1730 Dy	WA2CXY Mgr.
Clear House	3925 kHz	1900 Dy	WA2VYT Mgr.
All Svc.	3925 kHz	1300 Dy	W2OE Mgr.
Mic Farad	3925 kHz	1100 Dy	W2OE Mgr.
NYSTPEN	3925 kHz	1800 Dy	WB2QAP Mgr.

*Denotes section nets; all times, local! Congratulations to WB2FIG on his appointment as ORS! WB2LZN and WB2JEC have a new outlook on things after completing their telescope projects. The East Suffolk Radio Club had a nice turnout at their "Old Timers Night." W2DBQ gave a most interesting talk on the world of crystal making at a recent LIMARC meeting. WB2DAR announces the opening of a "FAX" Net (Fascimile) on 145.8 MHz at 8 P.M., Tue. and Thur. All stations, with or without Fax equipment, are welcome to check in. The NLI Section Net picnic will be held on Aug. 26. Contact WA2CXY for details. The Suffolk County Radio Club held their "all electronic" flea market on July 28 at the SUNY campus, Stony Brook. Congratulations to WB2GCE, who recently upgraded from Novice! W2KPQ headed up a first time electronic flea market for the LIMARC group which proved highly successful. W2TD is reported to have his RTTY operational and ready to copy. Members of the 10-meter AREC Net and LIMARC members, were active during a freak thunderstorm on June 9 with twister like conditions existing in sections of Western Nassau County. WA2PLI's summer job will hopefully gain him a HW101 about this time. New officers for the following clubs: Wantagh RC – WB2SEL, pres.; WB2DIN, vice-pres.; WB2PVH, secy. Tu-Boro RC – WA2BDB, pres.; W2JMU, vice-pres.; WB2KHO, secy. W2ELK and K2DGI set up a display in Hempstead Town Hall commemorating Amateur Radio Week during FD week. W2TUK, K2DGI, WB2CHY, WA2TSB, WB2BAU, WB2CRY and WA2CXG participated in a radio program over a number of local L.I. stations presenting various aspects of amateur radio including Field Day activities of the Suffolk County RC. How is your club publicity doing? Have you sent in items to the Division Publicity chmn. WB2FBF as yet? WA2KGB has been appointed Asst. Dir. for DX activities of the Hudson Division. K2HOI (4Z4HW) recently paid a visit to the old home grounds and attended the annual LIMARC dinner. WB2WFJ recently moved near WB2UFG; which should do something for the QRM problem? W2PF arranged a visit to League Hdqtrs. for area hams licensed for 50 or more years. Don't forget to express your thoughts and ideas on the various of the latest FCC proposals, to your Dir. K2SJO. Traffic: WB2LZN 278, WB2WFJ 260, WB2OYV 138, W2EC 104, WB2LGA 85, WB2CHY 82, WA2NCY 58, WB2DAR 35, WA2PLI 32, WA2HMM 25, K2VGD 14, WA2VXN 13, WB2BYY 11, K2JFE 10, W2PF 8, WB2RQF 8, WB2FIG 7. W2AML 3, W2DBQ 3, W2EW 3.

NORTHERN NEW JERSEY – SCM, John M. Crovelli, WA2UOO – SEC: K2KDQ. RM: W2ZEP. PAMs: K2KDQ and WA2FVH.

Net	*kHz Time (PM) Days*	*Sess.*	*QNI*	*Tfc.*	*Mgr.*
NJN	3695 7:00 Dy	31	489	237	W2ZEP



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existing in sections of western Nassau County. WA2LFI's summer

NJN	3695	10:00 Dy	31	266	92	W2ZFP
NJSN	3730	8:15 Dy	24	50	14	WA2TRK
NJPN	3950	6:00 M-S	31	585	277	WA2FVH
NJPON	3930	6:00 Su	3	54	17	WB2FTE

New appointments: WB2FWW as ORS and OPS; WB2UCS as OBS and OVS. Endorsements: WB2NOM as OPS; K2PBP and WB2OHV as OVSs. The Split Rock ARS, Don Bosco HS ARC and Mt. Carmel RC have all gained League affiliation. Congratulations. WN2QGT is a new Novice in Elmwood Park. The Bergenfield ARC provided communications for the Memorial Day Parade. W2IXD is active on 439 MHz ATV. WB2NOM finally worked KL7 for state number fifty. OO reports from WB2IEC and WB2TFH. WB2AYE active on 2-meter fm. *WA2EGP has purchased a TR-4.* K2EQP *now using a* GPR-90 receiver. Kearny Radio Club Net is on 145.5 Tue. at 9 P.M. WB2FWW is manager and WA2OPY his assistant. WA2YTX is moving to W4-Land. The NJDXA repeater has reversed it's in-out frequencies to eliminate interference. K2NP spoke to GSARA covering the topic of spark gap equipment. WA2UDT graduated from Newark State College and is making contacts through Oscar. K2EFB has received the Oscar award. K2AGJ has made DXCC 197 on phone. WA2SRQ busy building a quad and RF clipper WA2UOO using a new 40-meter wire beam. The operators at St. Peters station K2OOJ busy working DX. EC reports for Apr. were submitted by WA2EXX, WA2OKX, WA2CCF, WA2RYD and WA2DNU. A new contest club named The Wireless Institute of the Northeast has been formed with WB2RIJ elected pres.; W2FVS, vice-pres.; WB2CST, secy.; WB2HJV, treas For further information contact WB2CST. WN2OVE working European DX on 10 meters. WB2NOM has been appointed AEC for Fairlawn and vicinity. TCRA had a Field Day photo contest. W2IXD is the new RACES Radio Officer for Kearny and WA2SLR the new asst. RO. WA2DWB has a new Hallicrafters station. WA2SHT now performing liaison functions for NJPN and NJN. All New Jersey amateurs are reminded that the New Jersey QSO Party will be held the week end of Aug. 18-19. WA2UOO spoke at meetings of GSARA and East Brunswick ARC during May. The Kearny ARC is holding 2-meter transmitter hunts. Appointees are reminded to submit their monthly activity reports before the 5th of each month. Traffic: WB2NOM 170, W2ZEP 166, WB2RKK 139, WB2AEH 107, K2BDX 105, WA2SHT 97, WB2RIJ 86, WA2EUO 44, WA2UOO 40, K2ZFI 30, WA2DWB 25, WA2CAK 17, WA2QJU 12, WA2EXX 10, WN2OVE 6, WB2JSH 5, W2ABL 3, WN2CSX 3, WB2FWW 3, W2OPE 3, K2OQJ 3, W2WOJ 3.

MIDWEST DIVISION

IOWA – SCM, Al Culbert, KØYVU – SEC: KØCLI. The hot gossip has it that the Marshalltown gang is laying plans for installation of a 2-meter repeater. I am very pleased at the recent announcement by the Lincoln Nebr. Amateur Radio Club of their sponsorship of a 1973 Midwest Division ARRL Convention in their city the 5th, 6th and 7th of Oct. I truly hope that as many from this section as is possible give this group our support by our attendance. Speaking of attendance, do you all have Sun. Aug. 26 marked down on the family calendar for attending the Iowa 75-Meter Picnic at Marshalltown in Riverside Park? Our congratulations to the Richardson Court ARC of Iowa State Univ. and the Sioux City East High Ham Club on their becoming ARRL affiliated clubs. I think it goes without saying, that at least every club in the section should make some response to the FCC proposal on the 220 MHz carve-out for a CB band.

Net	*Freq.*	*QNI*	*QTC*
Iowa 75 meter(noon)	3.970	1413	114
Iowa 75 meter(eve)	3.970	867	49
Tailcorn(cw)	3.560	115	62

Traffic: KØDDA 289, WAØAUX 196, KØAZJ 106, WAØTAQ 104, WØWSV 63, WAØVZH 55, WØMOQ 47, KØYVU 17, WBØEEW 13, WBØBPH 6, WØBW 6, KØJGI 6, KØLKH 4.

KANSAS – SCM, Robert M. Summers, KØBXF – SEC: KØIMF RM: KØMRI. PAMs: WØGCJ, WBØBCL. VHF PAM: WAØTRO Another fine hamfest in Salina. The QKS group was represented by many fine fellows. Letters have been asking for information on AREC and who a certain EC is. Zone 1, EC WAØSRR – Marshall Nemaha, Brown, Doniphan, Jackson and Atchinson Co. (2) EC KØTCS – Dickinson, Geary, Morris, Marion, Chase. (3) EC WAØUX – Riley, Pottawatomee, Wabunsee, Lyons. (4) EC WAØTZW - Shawnee, Jefferson, Osage, Douglas. (5) EC WØMCH - Leavenworth, Wyandotte. (6A) EC open – Johnson Co. (6B) EC open – Franklin, Miami, Coffee, Anderson, Linn. (7) EC KØGUR - Greenwood, Woodson, Allen, Bourbon, Elk, Wilson, Neosho Crawford, Chatauqua, Montgomery, Labette, Cherokee. (8) EC

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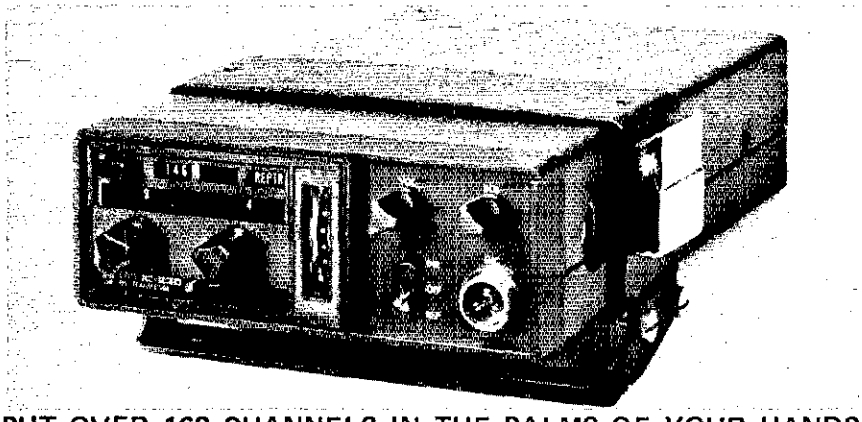

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WAØUMZ – Harvey, Butler, Cowley. (9) EC WAØUTT – Sedgwick, Harper, Sumner. (10A) EC WAØLBB – Rush, Barton, Rice, Pawnee, Stafford, Reno. (10B) EC WBØHBM – Edwards, Kiowa, Pratt, Commanche, Barber, Kingman. (11) EC KØJDD – Ness, Hodgeman, Ford, Clark, Meade, Gray, Lane, Haskell, Seward, Stevens. (12) EC open – Greeley, Hamilton, Stanton, Morton, Wichita, Kearney, Grant, Scott, Finney. (13) EC WAØKDP – Jewell, Mitchell, Republic, Cloud, Washington, Clay. (14) EC WAØYXK – Lincoln, Ellsworth, Ottawa, Salene, McPherson. (15A) EC WØWOB – Cheyenne, Rawlens, Decatur, Sheridan, Thomas, Sherman, Wallace, Logan, Gove. (15B) EC WØKPJ – Norton, Graham, Trego, Ellis, Rooks, Phillips, Smith, Osborne, Russell. If your co. has an open instead of an EC listed, why not volunteer yourself as the candidate. I will be more than happy to assist you in your efforts. Traffic: WNØHTR 515, WNØGQL 235, WBØHBM 166, WØNEE 159, WNØGVR 154, WØHI 148, KØMRI 148, WØFIR 122, WNØFSL 110, WØCHJ 82, WNØHTH 58, WBØCUY 57, WAØLBB 51, WØPR 49, WAØSXR 39, WBØBIY 35, WAØSWC 34, WBØCZR 30, KØBXF 22, WØRBO 22, KØYTA 20, WAØZTW 18, WØFCL 15, WØNYG 12, WAØSEV 7, WAØOWH 6, WAØNXD 2.

MISSOURI – SCM, Larry S. Phillips, KØVVH – Asst. SCM: Clifford Chamney, KØBIX. SEC: KØHNE. New appointments: KØBIX, WØRTW, WAØVBG as ORSs; WAØEMX OBS; KØQNU OO. Appointments renewed: WAØFLL as OPS, ORS, OO, OVS; KØHMN OVS; WAØKUH OBS, PAM; KØONK, KØRPH OBSs; WØTDR as OBS, OO; WAØYCN as OPS, OBS.

Net	*Freq.*	*Time(Z)/Days*	*Sess.*	*QNI*	*QTC*	*Mgr.*
MOSSB	3963	2300 M-S	22	1038	48	KØPCK
MOPON	3963	2200 M-S	27	558	49	WAØTAA
MEN	3963	2230 MWF	13	236	14	WØNUT
MON	3585	0000 Dy	31	175	138	WØBV
PHD	50.45	0130 T	4	87	11	WAØKUH
MON2	3585	0245 Dy	31	92	30	WØBV
JCAREC	146.28/	0330 T	4	30	0	W88
WEN	28.6	0130 M	4	29	5	WA5KBH/Ø
MSN	3703	0030 M-S	14	25	10	WØOVJ
		2100 Su				
(Apr)						
MOPON	3963	2200 M-S	23	646	50	WAØTAA

Congratulations to KØPCK as new Net Mgr. of MOSSB. Glad to report that 60 amateurs and families had a good time at the MOSSB Picnic. All interested may contact WAØEMX regarding a new cw training net in the K.C. area on 28.15 MHz. I would like to thank the many amateurs who participated in the Joplin emergency and commend the operators of this section on an excellent job of handling communications into and out of the disaster area. Thanks to WØGJP and WØGLZ for helping WØOUD erect antennas after the tornado. See you all in Washington at the Hamfest. Traffic: KØONK 1245, WØBV 134, WAØFMD 95, WAØVBG 65, KØBIX 62, WØOUD 56, WØOVJ 56, KØVVH 55, WØEPI 35, WØRTW 29, WBØFQM 19, KØPCK 18, WAØKUH 16, WAØETV 14, WØRTO 10, WAØEMX 4, WØGBJ 4.

NEBRASKA – SCM, V.A. Cashon, KØOAL – Asst. SCM: Velma Sayer, WAØGHZ. SEC: KØODF. Appointment WBØDQM as OVS. Endorsement: WØFQB as OPS. May reports:

Net	*Freq.*	*GMT/Days*	*QNI*	*QTC*	*Mgr.*
NEB I	3700	0000 Dy	73	12	WAØGHZ
NSN I	3982	0030 Dy	794	20	WAØLOY
NEB II	3700	0245 Dy	71	21	WAØGHZ
NMN	3982	1230 Dy	1323	49	WAØJUF
WNN	3950	1300 M-S	541	17	WØNIK
AREC	3982	1330 Su	188	1	WØIRZ
CHN	3980	1730 Dy	930	36	WAØGHZ
SHN	3950	1830 Dy	106	2	WØDJO
DEN	3980	2000 M-F	257	8	WAØAUX
NSN II	3982	2330 Dy	1030	13	WAØLOY

There is need for an additional NCS on the NEB Net. Contact WAØGHZ if interested. Saunders Co. RS held picnic at Wahoo City Park May 20. Lincoln RC participation in March of Dimes "March-a-Thon" added to its success. Pine Ridge RC picnic at Camp Norwesca had 42 amateurs with total attendance of 88. 21 members of Loyal Order of Smoke Signal Senders (SSS) attended the event. PAM WAØAUX reports net will meet intreqently until after Labo Day. WØDMQ recovering from broken leg. WØLRK returned from sunny south. WAØGAT and WØMW spent time checking S. Platte River levels for Lincoln Co. CD Dir with WØLOD relaying information. WØWRY operating new FPM-300. Niobrara Valley RC exhibited radio equipment at Ainswurth Hobby Show. WAØDOU and KØRRL operate 2 meters on motorcycles. ARRL Midwest Division Convention in Lincoln Oct. 5, 6, 7, 1973. Traffic: WAØQEX 73, WØLOD 69, WBØCAU 43, WAØCBJ 32, WØSGA 31, WØHOP 28, WAØPCC 24, WAØGHZ 12, WØDMY 11, WØMW 11.

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WØFQB 10, WØNIK 9, WØDJO 7, WAØYGZ 7, WØHTA 6, WAØJIH 6, WØLWS 6, KØODF 6, WØRJA 6, WAØDXY 5, WAØLOY 4, WBØGAK 3, WAØJWQ 3, KØUDW 3, WAØEEI 2, WAØJKN 2, KØMUF 2, KØPTK 2, KØSDG 2, WØVYX 2, WAØHQO 1, WØIRZ 1.

NEW ENGLAND DIVISION

CONNECTICUT – SCM, John McNassor, W1GVT – SEC: W1HHR. RM: K1EIR. PAM: K1YGS. VHF PAM: K1SXF.

Net	*Freq.*	*Time/Days*	*Sess.*	*QNI*	*QTC*
CN	3640	1900 Dy 2200	62	572	388
CPN	3965	1800 M-S 1000 Su	31	546	223
VHF 2	145.98	2200 M-S	23	56	39
VHF 6	50.6	2100 M-S	23	96	7

High QNI: CN – W1CTI, WA1GFH, W1KV and W1MPW. CPN – W1MPW, WA1NLD, WA1QZH and K1SXF. W1HHR appreciates comments from ECs – let him know if you have repeater contact equipment. Director W1QV quite busy with 2nd ARRL Directors Meeting – contact him for direct report. CN Bulletin de K1EIR has *excellent traffic operating information. Candlewood* ARC includes Swap Shop list in Bulletin. Tri City held Installation Dinner Meeting Murphy Marauder Message indicates high FD activity. Shoreline ARC, Westbrook, Dinner Meeting for new officers: K1QWB, pres.; WA1EFY, vice-pres.; WN1PUB, jr. vice-pres.; WA1LOT, secy.; WA1PRJ, treas.; WA1EFY, trustee. Ins. City RC 28/88 Flea Market a big success. N.E. Chapter QCWA would like more Conn. members. MARS area coordinator W1NBP sent Picnic invitations to all members – this fine group offers considerable training to all active members. ARRL Bulletin No. 429 covers FCC *proposed Class E CB 224/225 MHz band take over. File your* comments now! Congratulations to: W1MPW for high QNI CN/CPN May; W1DQJ new member of OT Club; Wright Tech. School ARC on ARRL affiliation; and to Mr. & Mrs. W1FBY for new YL jr. op! Continued activity on all amateur bands is required to justify our continued use of them – please do your part! Traffic: W1EJI 257, WA1FCM 181, W1EFW 167, WA1NLD 154, WA1GFH 127, W1CTI 119, WA1KVI 108, WA1QZH 104, K1SXF 102, WA1PHJ 100, W1MPW 77, WA1NES 63, WA1RZC 55, K1YGS 52, WA1HYN 43, W1GVT 38, W1KV 38, W1AW 30, K1EPW 29, WA1QMI 28, WA1KID 27, WA1PHF 24, WA1OPB 16, W1QV 13, W1CUH 6, W1FUF 6, WA1JZC 6, WA1PPD 4, W1HHR 3, W1BDI 2, W1RML 1.

EASTERN MASSACHUSETTS – SCM, Frank L. Baker, W1ALP – New ARRL affiliates are the Harvard Wireless Club, W1AF; WA3GQJ, pres., and Phillips Academy RC, W1SW, WA1QPD, secy. W1OFY is a Silent Key. W9IGD living in Braintree. WA1FWQ is RM on the USS Holder and looking for phone patches. New officers of Quannapowitt RA: WA1KLG, pres.; W6JQE/1, vice-pres; WN1QOV, secy.; K1ZTA, treas.; W1s FJ, OKB, EED, BHD, PLJ, NFW, PL, dir W1MGP moved to Maine. K4HBD, ex-W1CKW wishes to be remembered to all. T9 Club met at W1MNK's. WA1PLN has *his 'General.* W1MPP, K4RO back in New England. W1KX is ex-W1IYU. SEC W1AOG received reports from W1s BAB, UJF; K1s NFW, ZUP; WA1s DXI, QEK. WA1IFE worked K4TUI on 6. K1AMP moving to Fla. WA1IGL is RO for Sector 3B. WA1DJC moving to PA. K1WKS retired. W1MX making contacts through Oscar 6 and back on RTTY. WA1QEK working with hospitals in his area forming an emergency plan for their coordination. WA1DFL worked his first Colo. WØNRI on 6. K1IFV on 6,75 and 80 RTTY, he and WA1NNW working on 6-meter RTTY. Middlesex ARC had a speaker from Newton CD. K1UAQ new EC Wilmington. K1CCW new EC Lynnfield. K1WKS new OO. WA1OLV new OPS. Endorsements: K1UMP, K1HHN, WA1QEK as ECs; W1MNK, W1FJJ, W1DAL, WA1NRT ORSs; K1OKE as PAM for 6. Chelmsford ARA held their Ladies Night at Greenridge Turkey Farm in Nashua. WA1OMU active on 2 and 6. K1TIH is pro. chmn. Waltham Repeater group had banquet after the auction. K1UIW has a 70-ft. pole in his yard. W1ECK has new rig. Capeway RC met at K1HGT's. WA1OWQ has RTTY on 2 and 6. WA1RJX has Advanced ticket. WA1PFA on 6 DX SSB. W1PL high scorer in SPDX, H22 and WAE contests and 1st in 160-meter contest in this section. W1DAL working on his 80-ft. tower. WA1AGR a Silent Key. K1TZC has tower up. The K1UHU repeater in Walpole very busy. WA1HHK *back on our 2-meter net,* also W1AF, WA1IJL, W1RQL. Army MARS held a meeting in Natick.

Net	*Freq.*	*Time/Days*	*QNI*	*QTC*	*Mgr.*
EM2MN	145.8	2000 M-F	139	131	WA1OWQ
NEEPN	3945	0830 Su	86	7	K1EPL

6MCBN(Apr)	50.85	1930 M-F	28		K1OKE
EMPN(Apr)	3898	1800 M-F	122	46	WA1MYA
EMN	3660	1900/2200 Dy	329	187	WA1MSK
6MCBN	50.85	1930 M-F	21	6	K1OKE

South Shore ARC held its Ladies Night at the Viking Club. WA1RWK, WA1RZT are new YLs. W1HTJ moved to Calif. W1BVL worked W8AQ for their 50th anniversary QSO and on 160 cw he worked LU5HFI. W1BMH won a Clegg FM 27B. New officers of Minuteman Repeater Assn.: W1WSN, pres.; K1JDF, vice-pres.; WA1OQK, secy.; WA1RGC, treas.; K1s RAK, JUM, CCK, WA1NPN, W1PRI, dir. K1CCW's Galaxy 210 on loan to gang on top of Mt. Washington. WA1MSK, WA1MYK made PSHR. WA1MSK received BPL medallion. Traffic: (May) W1PEX 1215, WA1MSK 370, WA1OWQ 182, W1CE 140, WA1DJC 40, WA1IGL 40, W1EMG 39, WA1MYK 39, W1UX 32, WA1OAM 30, WA1NKE 22, W1DOM 21, WA1IFE 17, K1EPL 12, WA1EYY 11, K1LCQ 9, K1WKS 6, WA1QPD 6, W1PL 5, WA1HGG 2, K1OKE 2, W1SW 2, WA1FNM 1. (Apr.) WA1MXV 49, WA1OTF 46, W1UX 35, WA1DJC 34, WA1OLV 20, W1MX 3.

NEW HAMPSHIRE – SCM, Robert C. Mitchell, W1SWX – SEC: K1RSC. RM: W1UBG. The Port City Radio Club will commemorate the 350th anniversary of Portsmouth the 1st of Aug. with the call WP1ORT on all bands. Welcome to new hams: WN1RXD, WN1RZW, WN1RXK, WN1RWP, WN1RYW, WA1RZP, WA1RZD, WN1SAE, WA1SBN, WA1SCF, WA1SAJ, WN1SAD, WN1SBF, WN1SCR and WA1SCP. The NHVT Net shows a decrease in activity with only 75 check-ins and 40 traffic. RM W1UBG would like more activity to help with the work load. WA1QGA is getting ready for SSTV operation. W1BYS has been camping and 2-meter FMing in W4- and W6-Land. WN1QNK active on 7149 is anxious to give rare NH QSOs. W1UBG worked SVØDB/MA and KX6BB for two new ones. WA1SCF moving to his new basement ham shack. W6JDM is now in Nashua awaiting a WI call. WA1JSD keeps the Official Bulletins aired on 6 meters. W1PS and W1MPP are in Conway for the summer. W1DXB has been on vacation in Europe. W1BXM is building 2-meter fm equipment. Traffic: W1UBG 87, WA1QGA 29, WA1SCF 22, K1PQV 5, W1EVN 2, WA1JSD 2, K1AEG 1.

RHODE ISLAND – SCM, John E. Johnson, K1AAV – The W1QP Club was all prepared for Field Day. Club Novices soon hope to reactivate the R.I. Slow Net. WN1POJ again made the highest traffic count in R.I. this month. WA1QOG worked 16 new countries on cw and helped W1QP prepare for FD. WN1RFT has a new HG10B VFO on the air and worked PY2AEK. He is working on a new antenna farm. WA3EEC/1 operates from Brown Univ. during the time he isn't studying. During the summer months try to get reports to the SCM early in the month and as activity slows during vacation time drop the SCM a note from vacationland. Traffic: WN1POJ 166, WA1QOG 12, WN1RFT 8, WA3EEC/1 1.

VERMONT – SCM, James H. Viele, W1BRG – SEC: W1VSA.

Net	*Freq.*	*Time(Z)/Days*	*QNI*	*QTC*	*Mgr.*
VTSB	3909	2200 M-S 1130 Su			W1ZCJ
VTPO	3909	2200 So	87	23	K1BQB
Carrier	3932	1300 M-S	353	7	W2QWP
Green Mt	3932	2100 M-S	405	10	W1JLZ
Vt.Phone	3932	1330 Su	78	3	W1KKM

Welcome new amateurs WN1RZU, WN1SUN, WN1SBG. Plans completed for International Field Day at Charlotte Aug. 19. Write W1FIS, So. Hero, Vt. 05486 for details and tickets. W1KJG awarded 50-year certificate by QCWA. Congratulations Parks! W1SIO has new ssb rig. W1AC has retired from printing business. WA1GKS has new QTH, tower and tri-bander. Traffic: K1BQB 137, WA2DGZ/1 33.

WESTERN MASSACHUSETTS – SCM, Percy C. Noble, W1BVB – SEC: WA1DNB. CW RM: W1DVW. 75 Meter PAM: WA1ITL. VHF/UHF PAM: W1KZS. WMEN (AREC) held 4 Sun. sessions with QNI 53 and traffic 5. NCS were WA1DNB and WA1ITL. WMN held 31 sessions with QNI 162 and traffic 113. Top 5 in attendance: W1BVR, W1DVW, WA1OUZ, W1TM, WA1LNF. The afternoon WMPN had QNI 148 and traffic 23. WN1QHR/1 is active in the New England Novice Net. W1BKG spent 6 months in Argentina for General Electric, meeting many hams and having phone patches back to the States. Boy Scout Troop 45 of Lee put on ham demonstration at the Sports Center. WA1FBE now has 1st Class phone ticket. WA1RFA has 37 states worked on 6-meter ssb. Because of summer, the news from club bulletins is rather light. From HCRA: The nominating committee has completed its task. Monthly meeting featured W1MTV's and K1IAX's new 10-7 repeater. W1KK demonstrated an easily-erected 2-meter portable antenna. From MARC: The nominating committee has complete

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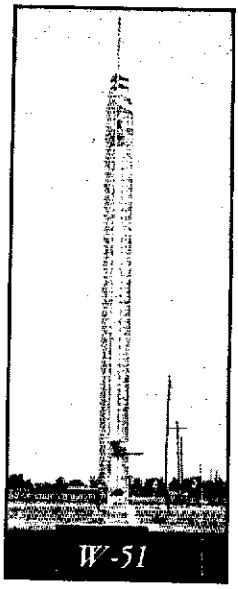
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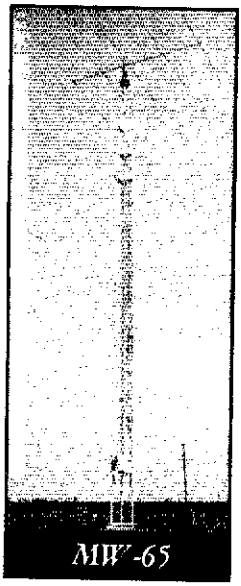
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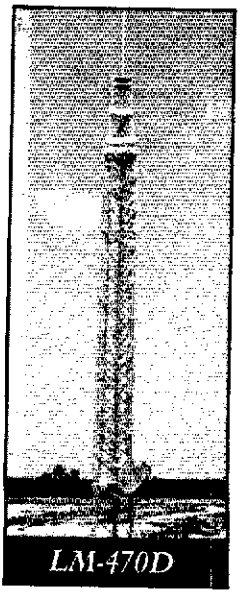
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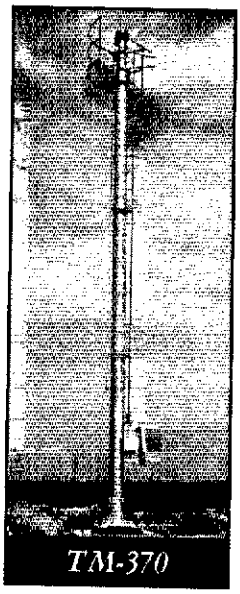
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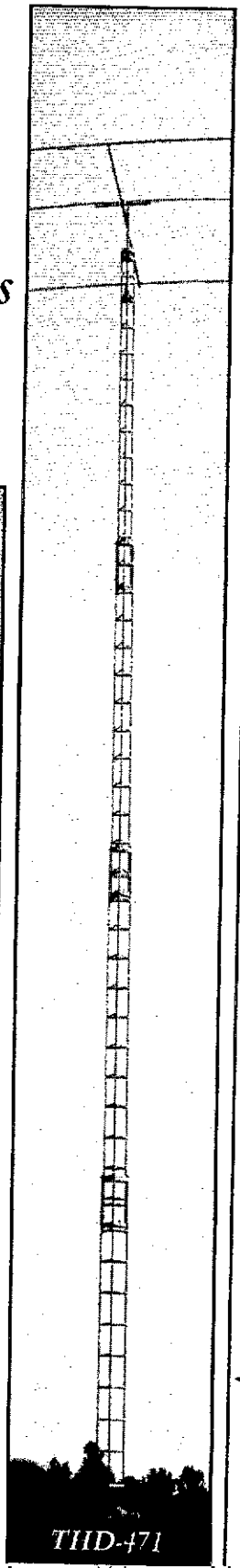
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its slate of officers. W1GUI's tower was raised an additional 10 feet with good results. From Mt. Tom RA: The auction added $70 to the club treasury. New members: WA1HPX, WA6GVC/1, K1ZQB, W1TXS, WA1PQR, WA1BXP, W1LJF, K1FNA. WA1HPX reported a serious accident through 34-94 to W1GUG who immediately notified police. From NOBARC: Club membership is now approximately 120. V of Lincoln: New officers: W1CSF, pres.; WA1PLS, secy.; WA1OTC, treas. Traffic: W1DVW 79, W1BVR 75, W1TM 49, WN1QHR/1 39, WA1LNF 29, WA1OUZ 24, W1ZPB 10, WA1FBF 2.

NORTHWESTERN DIVISION

ALASKA – SCM, Kenneth R. Klopf, KL7EVO – Hams north and south of the Alaska Range may wish to monitor 3735 in the evening for traffic from the mountain climbing expedition starting from the Richardson Hwy at Black Rapids and winding up on the Anchorage-Fairbanks Hwy near the Yanert. Have heard from many hams that O'Brien Cr. near Chitna is immune to rf both incoming and outgoing. Looks like there may be a hamfest somewhere between Fairbanks and Anchorage this summer. Check Sourdough, 3915 and AKS, 3735 for more information. The ARRL Repeater Directory 1973 is available. Alaska has changed, but still both Anchorage and Fairbanks have 34/94 machines as well as Adak (not listed). Edmonton VE6WQ 46/00 and Prince George VE7AFG 34/94. Further afield, check with your local repeater committee. IMPORTANT! FCC intends to take the top MHz of the 220 band for Class E CB. Deadline for comments Sept. 20. Comment! Traffic: (May) KL7CFX 18, KL7HER 10. (Apr.) KL7HER 13, KL7CFX 4. (Mar.) KL7CFX 14.

IDAHO – SCM, Donald A. Crisp, W7ZNN – SEC: WA7EWV. The University of Idaho Amateur Radio Club was recently affiliated with ARRL. The club pres. is WA7FSI. WA7RFR, Nampa, is now on 2 meters and has plans for a 6-meter station. An amateur station with special call sign KJ7BSA will be set up at the National Scout Jamboree at Farragut State Park in Northern Idaho in Aug. QSLs will be handled via League Headquarters. A new club in Northern Idaho and Eastern Washington is the Kamiak VHF Repeater Club. The club plans to install a 2-meter repeater on Moscow Mountain. IMN report: 23 sessions, 34 QTC, 93 QNI. IPON report: 13 sessions 22 QTC, 122 QNI. FARM Net report: 31 sesstons, 58 QTC, 1002 QNI. Traffic: W7GHT 121, WA7BDD 86, W7AXL 57, W7IY 37, W7ZNN 13.

MONTANA – SCM, Harry A. Roylance, W7RZY – Asst. SCM: Bertha A. Roylance, K7CHA. SEC: W7TYN. PAM: WA7IZR. Butte repeater has a new control and identification. They also have applied for the repeater license. The Billings repeater is being worked on and they too have applied for licensing. Yellowstone Radio Club had a picnic and auction in South Park. K7LTV recently mobiled several Mont. counties and helped out the county hunters with QSL cards. Butte Radio Club redecorated club room. W7FSP moving to Ore. and retirement. W7OIO has given up the editorship of the T-ler. He has been faithful to the post for many years. Had a nice visit with W7DEO when he spent the night in Harlowton. Six meters has been open and many stations are looking for Mont. The Mont. traffic net had 919 check-ins, 36 pieces of traffic handled and 22 sessions. Traffic: WA7JQS 211, W7LBK 129, WA7IZR 13, W7QGJ 4.

OREGON – SCM, Dale T. Justice, K7WWR – Two corrections on recent information: The Nuclear Net meets on 50.25 MHz Sun. at 1630Z. The Bend Hamfest will be Aug. 12 at the Bend Armory. Net reports: WA7NWV reports for the BSN sessions 60, traffic 137, contacts 188, check-ins 992. W7FEE reports for the Nuclear Net 4 sessions and 23 have 34/94 machines as well as Adak (not listed). Edmonton VE6WQ 46/00 K7NTS 158, K7QFG 144, W7ZB 130, WA7TXV 116, W7DAN 85, WA7MOK 34, K7WWR 30, W7MLJ 16, WA7KRH 12, W7LT 8. (Apr.) K7NTS 155, WA7BYP 64.

WASHINGTON – SCM, Arthur Henning, W7PI – SEC: W7UWT. RM: K7OZA. PAMs: W7GVC, W7MCW. VHF PAMs: K7BBO, K7LRD.

Net	*Freq.*	*Time(Z)*	*QNI*	*QTC*	*Sess.*	*Mgr.*
WSN	3590	0145	335	142	31	K7OZA
NSN	3700	0200	266	117	31	WA7OCV
AREC	3930	1700 Su	50	4	4	W7UWT
NWSSB	3945	0130	878	42	31	W7SVV
NTN	3970	1830	1131	110	31	W7PWP

Mt. Baker ARC has acquired 4-wheel truck from local Office of Emergency Preparedness and is installing gear for club and emer-

gency functions. Boeing club had very successful spring Novice class with 42 still in attendance at last class meeting reports WA7ACQ. Glad to have OT W7AXT back on air after major surgery. W7OS is the proud owner of 42 ARRL membership certificates; earliest is Nov. 11, 1919. Not many, if any, can top that. K7WTG is new prexy of Mike and Key Club. CBN net picnic is at Crystal Springs Aug 4th or 11th. Tacoma Ham Fair is Aug. 18 and 19 at Pierce County Fairgrounds south of Puyallup RM K7OZA getting mobile gear going for summer. WA7LQV boosting his tower to 65-ft. Reserve Sept. 8 for annual Skagit Salmon bake at Oak Harbor with W7REC in charge of barbecuing. This is my last report as SCM and it has been a real pleasure and privilege to have served the amateurs of our state. I sincerely want to thank all of you for the very fine support and cooperation during these two years. My best wishes to W7QGP who succeeds me as SCM. Traffic: (May) W7PI 295, WA7HKR 141, WA7OCV 124, W7GYF 65, W7PWP 53, K7OZA 50, K7VAS 49, W7APS 46, K7CTP 43, W7MCW 40, K7OXL 35, W7BQ 27, W7BUN 25, WA7RCR 25, WA7KNW 20, W7IEU 12, W7AIB 8, W7AXT 6, W7UWT 4, WA7GVB 3, W7EBU 2, WA7LQV 2, WA7AVI 1. (Apr.) W7AXT 65.

PACIFIC DIVISION

EAST BAY – SCM, Paul J. Parker, WB6DHH – SEC: WB6RPK. RMs: WA6DIL, W6IPW. If you are concerned about the 220 MHz CB invasion, get in touch with your Director and let him know. There are people using 220 MHz to good advantage, and to start chopping it up would be terrible. WB6IWS has been busy as an OO. My term as SCM will end in Nov., and if someone would like to take on the job, please let me know. Outside pressures require that I not run for another 2 year term. Please let me know. Traffic: W6IPW 335, WB6VFW 13, WA6BOB 5.

HAWAII – SCM, Lee R. Wical, KH6BZF – SEC: KH6BZF. RM: KH6AD. PAM: KH6GJN. VHF PAM: KH6GRU. SRC: KH6FOX. QSL Mgr.: KH6DQ.

Net	*MHz*	*Time(Z)/Days*
Hey Bruddah	21.295	2000 S/Su
Friendly	7.290	2030 All
Confusion (Patches)	21.400	0000 All
Pacific Interisland	14.305	0800 All
S.E. Asia	14.320	1230 All
Marine Corps	21.430	1900 All
Moonbounce	21.415	2200 S

I regret to report the death of the XYL of KH6NS. KH6HC reports receiving his DXCC and needs 9 more for WPX and 3 for WAZ. All on cw. Tats has been taking pictures of all the Honolulu ARC members for slide presentations here or on the Mainland. KH6GKE now on the Mainland. Recent Mainland vacationers and visitors have been WØDAD/KH6, KH6GJN, KH6HRG, KH6BZF. KH6GJN reports he and KH6KH are planning jogging sessions. Will the KH6 in Kaifua who called me about his Henry 2K linear please call me back, I misplaced your phone number? Recently retired is KH6GNK. WH6HSS is very active on 40 meters and having a ball in AR. Congratulations to KH6GMW, who recently was granted Life Membership. Ex-K2HBA/KH6 reports signing K4IKP. WØBWJ/Far East eyeballed with JA1ADN and VS6BS. New gear going for summer. WA7LQV boosting his tower to 65-ft. Reserve Sept. 8 Send your report not later than the 1st of each month. Traffic: (May) KH6GJN 78, KH6BZF 26, KH6AX 1, WØBWJ/KH6 1, WØDAD/KH6 1, KH6GDE 1, KKH6HC 1, KH6HRG 1, WH6HSS 1, WH6IDV 1. (Apr.) KH6GHZ 36.

NEVADA – SCM, Harold P. Leary, K7ZOK SEC: WA7BEU. YL WA7IPA received Advanced Class license. WA7ECT has new four-element beam. WA7BLB moving to Reno. W7JRW is ex-KZ5EE and K4UGL. K7ZQV passed Extra Class exam. Nev. State RACES had special meeting in Vegas on May 15 to discuss RACES docket. W7IDV and W7BKQ conducted with 20 attending WA7RZV now UNR grad. W7DNX received Master's degree. W7BVY has TH-6 at shop. SNARS under leadership of W7RB and WA7ECW handled communications at Jr. Olympics at UNR-Mackey Stadium. W7DNX, WA7MOF participated in Roseville blast communications with H and W messages. K7UGT back on 2-meter fm – 34-94 after being off the air for about 3 weeks. W7DNX, WA7MOF, WA7KQS participated in Walk for Nev. event. WA7TYY skeds Sailboat WA7CQT/R2 enroute KH6. WA7DSP, K7ICW and reporter enjoying ES on 6. Traffic: (May) W7ILX 146, WA7TYY 13. (Apr.) WA7TYY 7.

SACRAMENTO VALLEY – SCM, Norman A. Wilson, WA6JVD – The Berryessa ARC (BARK), WB6YCL, pres. and WB6PGW, secy., has 20 charter members and is now accepting applications for

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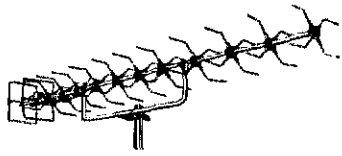

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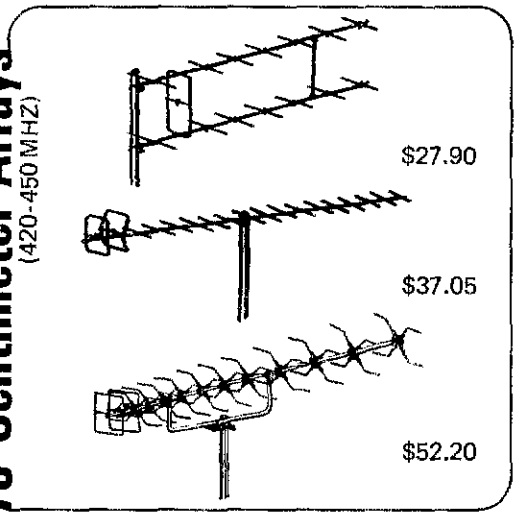

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Length 36½" 93 cm. Width 13½" 34 cm. Height 17" 43 cm.
Horizontal Beamwidth between half power points 40°
Weight 5½ lbs.
Wind Loading 23 lbs. at 100 m.p.h.
Particularly useful where Wide Bandwidth is required. e.g. T.V. Transmission

PARABEAM 18 ELEMENT YAGI Cat. No. 70/18P

Length 110" 278 cm. Width 15" 38 cm.
Horizontal Beamwidth between Half Power points 28°
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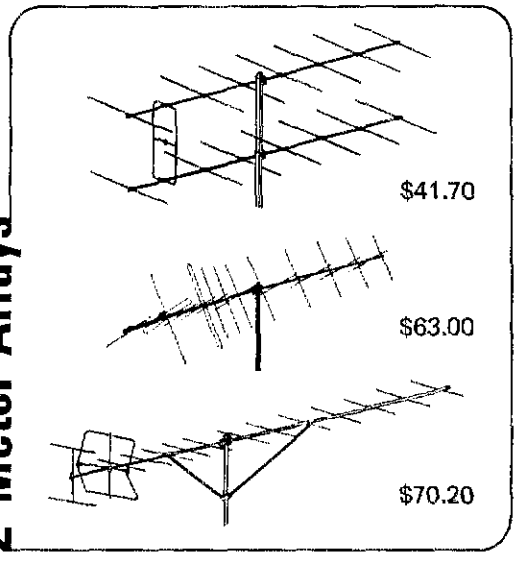
Wind Loading 39 lbs. at 100 m.p.h.
Suitable for all modes of transmission

MULTIBEAM 46 ELEMENT YAGI Cat. No. 70/MBM46

Length 104" 265 cm. Width 18" 46 cm.
Horizontal Beamwidth between half power points 24°
Weight 6 lbs.
Wind Loading 38 lbs. at 100 m.p.h.
Suitable for all modes of transmission

2 Meter Arrays



EIGHT OVER EIGHT Cat. No. 2/16

Slot Fed Double 8 Yagi
Length 102" 260 cm. Width 40" 102 cm. Height 46" 116 cm.
Horizontal Beamwidth between half power points 40°
Weight 9 lbs.
Wind Loading 65 lbs. at 100 m.p.h.

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Horizontal Beamwidth between half power points 24°
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Wind Loading 91 lbs. at 100 m.p.h.

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new members. Their 2-meter repeater, WB6ZTA, is open to courteous non-members on 146.37/97 and is QRV for any emergency communications. On May 5 the RAMS provided communications for the Placerville Manuel Guiterrez Walk for Development. On May 19 the RAMS also sponsored a meeting of the CARC. WA6QNC is now active on 6 meters. WN6RDA now WB6RDA and will be active in NCN activities and DX chasing with a new tower and quad. Poor conditions hampered K6GG's search for the recent FMT transmissions. WB6AUH was a banquet speaker at the Fresno Hamfest and stressed service projects WA6JVD helped man the swamp full of rhombics at NPG during Armed Forces Day. After 10 years WA6JVD has returned to fone (ssb these days). My first impressions were embarrassment and shame at the widespread use of abusive language and discourteous operating practices. Amateur Radio is one of the good things in OUR lives. Let's not allow it to be degraded like other aspects of our society. Any comments? Very 73 and hope your shack stays cool this summer. Traffic: WB6RDA 10, WA6JVD 7, K6YZU 6, K6KWN 2.

SAN FRANCISCO – SCM, Tom Gallagher, W6NUT – Asst. SCM: Robert Garner, W6EAJ. VHF PAM: WA6PYN. Active open repeaters in this section are presently:

QTH	*Call*	*In*	*Out*	*Mod*	*Access*
Eureka	WB6DGJ	146.94	147.48	7-7	C
Eureka	WB6DGJ	146.34	146.94	7-7	C
Eureka	*WA6JCB*	*52.76*	*52.525*	7-7	C
S. F.	K6SWS	146.34	146.94	5-5	B1800
Petaluma	WB6SXC	146.31	146.91	7-7	B1800
S. F.	K6GWE	146.10	146.70	5-5	C
S. F.	K6GWE	448.25	443.25	5-5	C
S. F.	WB6AAE	146.22	146.82	5-5	C
S. F.	WB6AAE	449.50	444.50	15-15	W
S. F.	WB6IMP	147.93	147.33	5-5	RTTY

Speaking of repeaters, W6RQ reports the telephone company gang have been waiting seven months for their WR6 license. W6EAJ, who can be found at 8 P.M. on 1820 kHz Wed. and Sun., reports assisting a stranded motorist. OA7AV and VP9DC visited the SF Radio Club. The club used the City's CD Disaster Vans on FD again this year. *Look for a special call as the SF Club operates from a Cable Car on* Aug. 4 as part of San Francisco's Cable Car Centennial. For those who plan ahead, the SFRC Christmas Party is scheduled for Dec. 8 at the Lake Merced Boat House. W6NUT putting up stacked yagis. Don't forget the nets even though it's Summer time.

Net	*Local Time*	*Freq.*	*Occurrence*
NCN	1900	3630	Dy
NCEN	1000	3920	Su
WCARS	1200	7255	Dy

New No. Cal. DX Club officers are K6SSJ, pres.; K6DC, vice-pres.; WB6ZUC, secy.; K6TXR, treas. Traffic: (May) W6RNL 24. (Apr.) W6FAX 6.

SAN JOAQUIN VALLEY – SCM, Ralph Saroyan, W6JPU – It is my sad duty to report that W6KPW has joined Silent Keys. I've known George ever since I became interested in amateur radio, that's a long time ago! We who knew him will miss him. WA6CPP made DXCC on fone. W6RRN and WA6UAA operated mountain top from Mt. Oso on 2 meters fm. The Delta Amateur Radio Club boasts 37 members and meet every 3rd Thur. at 8 P.M. at the Red *Cross Hdqtrs. WA6EXV built a 2.3 GH beacon for tests. He is also* building a 20-ft. parabolic dish for 1296 tests. The Tulare County Radio Club hold their meetings on the 4th Fri of each month in *Room 3 of the County Courthouse. The Fresno Amateur Radio* Club holds their meetings on the 2nd Fri of every month on the 10th floor of the PGE building. W6RJE gave a talk on Integrated circuits at the Kern County Amateur Radio Club. The Novice Emergency Net meets each Sat. at 0900 on 3730 kHz with WA6YWS as net mgr. All Novices who wish to upgrade your cw may join. WN6RXI placed No. 10 in the Novice Class SS. W6AJH has been active on the low bands with phone patches and message handling K6QHC is on 6 meters ssb, also active with RTTY. Traffic: WA6SCE 94, WA6CPP 4, WN6RXI 4.

SANTA CLARA VALLEY – SCM, James A. Hauser, WA6LFA – SEC: WA6RXB. RMs: W6BVB, W6RFF. Please don't forget the Pacific Division Convention Oct. 13 and 14, see you there. W6DEF and W6YBV made the Honor Roll this month. W6MMG reports WA6ZOM is back on 40 ssb. W6FZJ reports much 432 MHz DX including VK2AMW. W6AUC reports OO activity in addition to a busy net schedule. W6DEF had low traffic and lots of miles with a vacation in Europe. WA6HAD reports it took him 3 years to get a QSL from UA-Land!

NCN	NTS	3630 kHz	7/8:30 PM Dy
Specs	AREC	146 MHz	7:45 PM M
SCV	AREC	146 MHz	8:00 PM T
Gorilla	AREC	146.25 in 146.85 out	10:27 PM Su

NCN had 731 QNI and 332 pieces of traffic in Apr. (Traffic: (May) W6RSY 487, W6YBV 172, W6BVB 116, W6AUC 48, W6NW 48, W6DEF 38, WA6HAD 11, WB6MXI 6, WB6KZJ 2. (Mar.) WN6OSS 12.

ROANOKE DIVISION

NORTH CAROLINA – SCM, Chuck Brydges, W4WXZ – SEC: *W4EVN. PAM: WB4JMG. VHF PAM: K4GHR. RMs: WB4ETF,* WB4VBM. During May NC was hit by heavy winds and rain as was the Southeast. W4IRE and K4YDP pushed health & welfare traffic into Athens, Ga. Asheville area amateurs were active after a nine inch rainfall/storm. WB4CES, EC of Mecklenburg Co., reports an AREC Net through W4BFB repeater on 34/94. WN4CBE reports the new Eastern Daytime Novice Net meets daily except Sat. at 2000 GMT on 7140 . As many of you know I have been involved with a bill for proposed bill) in our State Legislature to lower our call-sign license tag fee and to classify amateur radio into its own category instead of our group being listed with others. Since this bill could not be introduced before the close of session it will be introduced in mid-Jan. when the General Assembly re-convenes so please keep the letters rolling asking your Senators and Reps to support a fee of $2.00 from the present $5.00. The introducer is Representative Homer Tolbert and my special appreciation to WB4COZ and WA4YKU also to WA4FQO for getting the ball rolling on this issue. WB4UHI reports fax picture exchanges with WB4QAQ and WB4TSB using a converted Western Union unit and normally monitors 50.4 MHz evenings. My sympathy to the family and friends of WB4CIN now a Silent Key. Bill was one of the original founders of the Carteret-Craven ARC and very active in Eastern NC. Traffic: WN4CBE 112, W4EVN 111, WB4VVP 96, K4MC 62, W4WCG 54, W4WXZ 54, W4OFO 49, WB4QQM 45, WB4UOU 23, K4VBG 15, WB4VSA 7, K4EZH 5. (Apr.) WB4OZL 163, WAØYDJ 113, K4MC *74, WB4VVP 33, WB4CES 19, WB4VSA 14, WB4HDS 8.*

VIRGINIA – SCM, Robert J. Slagle, K4GR – Asst. SCM: A.E. Martin, Jr., W4THV. SEC: WA4PBG. Asst. SEC: WA4JJF. RMs: W4HIR, W4SQQ, W4SHJ. WB4PNY. PAM: WB4RZW. BPL: W4TJF. Woodbridge Wireless Society geared to take Northern Va. FD Trophy. W8VDA/4 bending capacitor plates for remote LMO. WB4FDT sent in a circa 1938 Form 1 this month. WB4GMC reports the "Alice Cooper" release is an outstanding record? League Officials Meeting in Richmond was the best ever with RARC hosting. Director W4KFC attended everything; put a collinear 2-meter on car. WB4MRI is new PVRC. W4YZC letting traffic slip because QRL in higher bands! OO W4HU in FMT – results later. School taking priority with WB4WLK. WA4EPH new editor of Richmond Ham. WB4URW on with new R4B and T4XB. W5VZO/4 says house repairs cutting heavily into operating time (162 is bad?). W4DM spring fevered. WB4DRB heavy with Oscar. K4JKK back. *W4NPT worked in FD. VSBN QNI 1008, QTC 368.* W4KX reports still goofing off. Counties – WA4WQG 3053, WA4EPH 1000; Charlie reports he gave W4JUJ last needed county in Va. (No report from JUJ this month).

Net	*kHz*	*Time/Days*
VSMN	3947	0715/1630 local M-F
VSBN	3935	1800/2200 local Dy
VSN	3680	1830 local Dy
VN	*3680*	*1900 local Dy*
VPN	3947	1930 local Dy
VRN	3625	2000 local Dy
VPON	3905	2215 GMT T

Traffic: K4KNP 325, WB4PNY 256, W4UQ 223, WB4SGV 200, W8VDA/4 178, W5VZO/4 162, W4TJF 146, WB4RZW 105, K4IAF 101, WB4KTT 91, K4EBY 56, W4TE 52, K4GMH 50, K4GR 50, K4VIG 49, K4KA 46, W4KFC 46, WB4FDT 45, WB4RDV 33, WA4PBG 25, WB4FLT 24, WB4DRB 22, K4JM 21, WA4EPH 20. W4FQV 14, W4NPT 13, W4LQO 12, W4MK 8, WB4URW 7, WA4WQG 6, W4YZC 6, WB4UMJ 5, K4JKK 4, WA9JMG/4 3, WB4DRC 2, WB4GMC 2.

WEST VIRGINIA – SCM, Donald B. Morris, W8JM – SEC: WA8NDY. RM: WB8BBG. PAMs: W8DUW, W8IYD, K8CHW. CW Net Mgr.: WB8CYB. Phone Net Mgr.: WB8BMV. Fairmont repeater operating K8MYU, now WR8ABB. K8BUX now has WR8AAB with an excellent mountain top location. WA8UUY received Satellite DX Award No. 89 and his father obtained CPC 15. WA8NDY received Life Membership Pin at LO meeting, Richmond. K8TNY active in WVN CW Net. WVN Phone Net in 29 sessions with 286 stations handled 29 messages. W8KWL joined QCWA, West Va. Chapter. K8MHR made recording at Huntington hamfest to send to WA8ART and WB8AKU located in Saudi-Arabia. Monogalia Wireless Assn. of Morgantown plan to stay on 16-76 with their repeater. WB8LAI enjoys assembling her HW-101 kit. WN8MKL's 8RN Novice Net going good. WVNN and 8RN consolidated *July 1* on 3730 at 2200Z. WVNN in 4 sessions with 20 stations passed 130 messages. WA8EKC was '73 chmn. for the "Outstanding Amateur

Award" presented at the Mill on July 1. Congratulations to *W8DUV*, gen. chmn. '73 State ARRL Convention, her staff and Tri-State amateurs for another Outstanding Convention. Traffic: WN8MKL 152, WB8AKQ 43, WB8BMV 40, WA8NDY 20, WA8YCD 19, W8EUE 10, K8QEW 10, WA8WCK 10, W8JM 9, *WA8LFW 7, WA8OKG 7, W8AEC 6, W8DUV 6, K8ZDY 5, W8HZA* 3, W8GDP 2, W8GWR 2, W8CCR 1, W8CKX 1, WB8CPU 1, WB8CYB 1, WB8DQX 1, WB8LAV 1.

ROCKY MOUNTAIN DIVISION

COLORADO – SCM, Clyde O. Penney, WAØHLQ – SEC: KØFLQ. RM: KØOTH. PAMs: KØCNV, WAØWYP, WAØYGQ. KØSPR handled communications in connection with a motorcycle-pedestrian accident on May 29, securing prompt medical attention for the injured parties. On Armed Forces Day, KØSPR worked AIR, NSS and NPG, all confirmed. It is with deep regret that we add the call of WAØOUB to the list of Silent Keys. He will be sorely missed on our traffic nets. Net traffic for May: SSN QNI 231, QTC 145, informals 22, 31 sessions, 630 minutes. Hi-Noon QNI 716, QTC 8, informals 94, 28 sessions, 630 minutes. Columbine QNI 1101, QTC 66, informals 196, 25 sessions. (Apr.) Hi-Noon QNI 953, QTC 27, informals 148, 29 sessions, 868 minutes. CCN QNI 335, QTC 130, 30 sessions. (Mar.) Hi-Noon QNI 1284, QTC 36, informals 218, 31 sessions, 1010 minutes. Traffic: (May) WØWYX 887, WBØAXW 204, WØLQ 129, KØOTH 110, WBØHSZ 107, WØIW 78, WAØYGQ 45, WØSIN 37, W2TPV/Ø 36, WØKFH 23, WAØZPP 20, WAØTMA 18, WØBY 17, WBØHBT 17, WØNZL 17, KØJSP 15, WØLAE 15, WAØYED 11, WØJRW 10, WBØCCB 9, KØSPR 9, WØGAQ 7, WØNFW 6. (Apr.) WØLQ 95, WBØHBT 15, WØBY 11, WAØYED 9, KØCNV 4.

NEW MEXICO – SCM, James R. Prine, W5NUI – Oscar 6 activity by W5PNY on phone and WA5BMN on cw. WA5BMN would like to contact someone to work with him on 1215 or 1296 MHz moonbounce. Albuquerque Hamfest is scheduled for Sept. 21-23 at the Airport Marina Hotel. WA5RPC and WB5IXG participated in timing of the Los Alamos Hill Climb Auto Race. K5MFD, W5OJM, K5QIN, W5NUI, W5RPC participated with the Los Alamos Search and Rescue Unit in the recovery of 3 lost participants in the Rio Grande White Rock Canyon "White Water Voyage Run." The new SCM is W5RE. I would appreciate the continued support that I have received being given to him. WB6ZOK received new call WB5JKT. WA5OHI, WA5WBN and a local CB operator helped to set up code and theory classes at the Ft. Wingate Indian School in the Gallup area; much support received from other amateurs throughout the state in supplying equipment for setting up a local radio club – Heath Co. - DX-60 transmitter; WA5MAU - DX35 and VFO; WA5WBN - Heath VFO; W5NUI - Hallicratter S76 receiver. The first member of the class is awaiting his call momentarily. Traffic: W5MYM 130, W5DAD 94, W5UH 93, *WB5BHN 77, W5RE 57, W5ENI 49,* W5YQ 39, W5PDY 18, WA5OHI 11, W5TLK 10, W5BRV 4, WB5JKT 2, WA5MIY 2.

UTAH – SCM, John H. Sampson, Jr., W7OCX – SEC: W7GPN. RM: K7HLR. BUN meets daily at 1830 GMT on 7272 kHz, 856 check-ins, 36 messages. UCN meets daily at 0130 GMT on 3575 kHz, 225 check-ins, 86 messages. The Utah ARPSC Net meets Sat. and Sun. 1400 GMT on 3987.5 kHz. W7LLH and K7DKP have earned the Beehive Utah Net certificate. This section is saddened to report the deaths of WA7FBJ and W7SP. K1TMK/7 is spending the summer in Colo. New hams are WN7VXU, son of WA7HCQ and WN7VNY brother of WA7QAR. Also WN7VKR and WN7VKS are newcomers in the Sunset-Clearfield area. K7CLO took his Advanced test in June. W7HKC is on 220 MHz in Brigham City. W7DKB active with RTTY and has a Model 15 operating from his summer cabin. WA7TSB has an SB-102 on the air replacing his old rig. The Ogden Club is planning a steak fry in Aug. at which they expect to have the Division director as a guest. Summer vacations and poor band conditions are beginning to take their toll on net operations. Keep your SCM informed of your amateur radio operations. Traffic: K7HLR 135, W7OCX 97, W7UTM 76, WA7OAU 72, K7CLO 51, K1TMK/7 39, W7IQU 22, W7DKB 21, WA7QAR 20, W7FYR 12, WA7HCQ 6, W7HKC 2.

WYOMING – SCM, Wayne M. Moore, W7CQL – SEC: K7NQX. PAMs: W7TZK, K7YUG. OBSs: K7NQX, W7SDA, WA7FHA, K7YUG. *Nets: Pony Express Sun. at 0800 on 3920; YO daily at* 1830 on 3597; Jackalope Mon. through Sat. at 1215 on 7260 (alt 3.920); Wx Net Mon. through Sat. at 0630 on 3920; PO Net 1900 Mon. through Fri. on 3950. New appointment: WA7QZJ as EC for Carbon County. Field Day is now over so don't forget to send in your results for a chance at the new traveling trophy. K7ITH has moved in to Mountain View (near Casper). W7GS now on the air with his new transceiver. W7BXS is back in Casper after spending the winter in the sunny south. There was no PICON award presentation at the convention – the plaques didn't get here in time. If one of the Wyo. nominees were voted to get one, it will be

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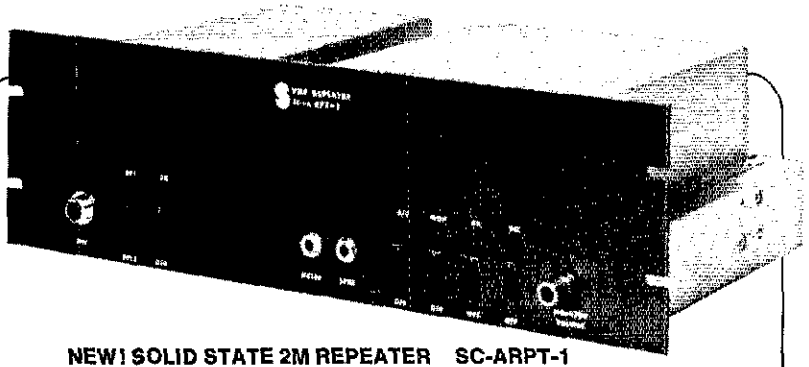

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presented at a club meeting, etc. Traffic: W7SDA 337, W7TZK 170, K7VWA 143, K7ITH 68, K7SLM 14, K7JED 2, W7NKR 2, K7TAQ 2.

SOUTHEASTERN DIVISION

ALABAMA – SCM, James A. Brashear, Jr., WB4EKJ – SEC: W4DGH. RM: W4HFU. PAM: WB4WAI. Information was received on the tornado which struck Ala. from the following: W4DGH, K4UMD, WB4SVH, WA4KYI, W4HCV, W4TXM, WB4OVR, WA4MDR, W4ZEI, WB4SWA, W4OCS, K4VZU, WA4BFN, WB4STN, K4WSS, W4WLF, WB4VFA and WN4CXD. WB4SVP/4 was heard handling traffic to and from Greensboro, Ala. WA4IQP and K4ZTT served as NCS on AENM during part of the emergency session. Congratulations to WB4SVH on passing Extra Class exam. He still is seeking NCS help on AEND, especially Fri evenings. K4UMD busy running phone patches on 20 meters. WB4WUS received first class phone and radar endorsement. Congratulations to WA4IWD and XYL on new YL. Congratulations also to WN4UNM on passing the General Class exam. K4MG is using a T4X on 160 meters. New members of Huntsville ARC are W4YGA, WN4ERL and WN4EUD. New officers of HARC are WB4UHC, pres.; K4IKR, vice-pres.; K4FTY, secy.-treas.; W4SVM, asst. secy.-treas. I was very pleased to have received one of the Amateur of the Year Awards at the HARC installation dinner. The other one went to W4SVM and K4OWV presented a "special" award to W4HFU for his outstanding contributions. New officers of the Calhoun Co. ARA are WA4VKT, pres.; VE2ABV/W4, vice-pres.; K4ICP, secy.-treas.; K4BOP, tech dir.; K4FRY, editor CQer. A "Ham-Shack/Workshop" has been built in the CCRA meeting hall, code/theory classes are being planned. WB4VFA devotes much of his on-the-air time during emergencies operating W4CUF, the Birmingham ARC station. K4VLL, WA4SUI and WB4EKJ visited K4ROR and presented him with a "homebrew" certificate in appreciation of his service as NM of AENM. We also had a visit with WB4ALW. The Mobile ARC put on another good Hamfest. Don't forget the North Ala. Hamfest to be held in Decatur the 3rd week end in Aug. Welcome to the following new hams: WN4s DCA, DDS, DEV, DEX, DFB, DFF, DGB, DGI, DHA, DJC, DKR, DKV, DKW, DME, DND, DOC, DOJ, DPJ, DQO, DVD, DVJ, DXB, DYR, EAD, EAF, EBK, EBL, EBM, ECU, ECY, EDU. WA4s DJW, DXF, DUV, ECM, EKO, ELF. WB4s DGN, DHJ, DXI, EKV. Endorsed W4INU as EC; appointed WB4BAP as OO. Traffic: WB4EKJ 193, WB4SVH 162, K4AOZ 80, WB4KSL 26, WB4VFA 18, W4HHU 11, K4HJM 7, K4UMD 7, WB4WUS 5, W4DGH 4.

GEORGIA – SCM, Ray LaRue, W4BYG – Asst. SCM/RM: John H. Boston, III, WB4RUA. SEC: WA4VWV.

Net	*Freq.*	*Time(Z)*	*QNI*	*QTC*	*Mgr.*
GSN	3595	0000/0300/1150	630	180	WB4RUA
GaSSB	3975	0100			K4VNV
GTN	3718	2300	169	30	WB4TVU

The Georgia Calendar of Events is now available to all member clubs of the Ga. Council for distribution as they see fit. WB4WXX earned PSHR (again) for June. K4OSL has been endorsed for ORS and is an OO also. WB4WMJ now OVS. W4GXW/4 is building up an SSTV station. W4JM says he's going to get on 2 meters yet! WB4MWC has finished his homebrew triple 811 amplifier. Atlanta Radio Club has received the first new repeater license in Ga. WR4AAE (22/82) – good work W4BTW, WB4HYY, WB4YCI. K4CRY received WR4ABC (37/97). WB4MDP received WR4ABD (13/73). It was good to see so many of you at the Hamfest in Atlanta. It was the best one yet. Check your league appointments. If you want them renewed or endorsed, please advise me. If you haven't got one, review a copy of "Operating an Amateur Radio Station" (send me an SASE) to see where you might be able to help out. Traffic: W4EEP 85, WB4RUA 80, WB4TVU 80, K4BAI 46, W4BYG 46, W4CZN 41, WB4WXX 40, W4AMB 39, WA4RAV 26, WB4MWC 23, W4PIM 9, W4JM 7, W4REI 6.

NORTHERN FLORIDA – SCM, Frank M. Butler, Jr., W4RKH – SEC: W4IKB. RM: WA4BGW. RTTY: WA4WIW. PAM: WA4IZM/75, W4SDR/40.

Net	*kHz*	*Time(Z)/Days*	*Mgr.*
NFPN	3957	2330 Dy	WA4IZM
QFN	3651	2300/0200 Dy	WA4NBT
QFTN	3715	2330 Dy	WB4AJL

Pensacola: WØEXD/4 now WØOL/4. K4BSS keeps FCC sked. K4LAN most active OO. The Repeater Assn. provided communications for a Bike-a-Thon. WA4BVO has tips on working 6 meters in the W4UC News. WB4MED worked a VE on 6-meter ssb. Ft. Walton: W1SL, from ARRL Hq., spoke to area hams; also visited clubs in Tallahassee and Jacksonville. WA9OVT/4 earned QFN certificate; now CAN station from RN5. Marianna: WA4MFC retired from USAF. Tallahassee: WR4AAB had receiver problems. WN4UPI/4 received General ticket; WA4DZL Tech. ticket. Jacksonville: WB4ADL and WB4VYU earned FAST Net certificates.

VYU also renewed OPS. XYLs WB4OTZ and WB4RFL did dispatching for the Ch. 7 TV auction pickups. Starke: WB4OMG prepared an updated list of county hams. Ocala: W4NKO earned FAST Net certificate. K4FCZ reinstalled SB-34 mobile, and has new Drake line at home. Inverness: K4CVO reports the Citrus ARA meets 2nd Wed. of each month. Daytona Beach: WB4NJI earned FAST Net certificate. WA4CRI, W4OIQ and WB4YPS are new DBARA members. WB4WTL working on both hf and 2-meter mobile setups. Orlando: WB4SQA renewed OBS and ORS. WB4WHK needs Vt. for WAS. Enjoyed seeing everyone at the Hamfest here. The 1973 ARRL Repeater Directory is out Traffic: (May) WA9QVT/4 274, WB4WHK 188, KØBAD/4 152, K4BSS/4 148, WA8ZDF/4 125, WB4OMG 122, WB9FUZ/4 83, WB4NJI 72, WB4VYU 65, WA4EYU 56, WA4VCK 50, WA4BPE 48, K4CVO 43, WB4DXN 37, W4NGR/4 31, W4RKH 31, W4LDM 26, W4LSR 26, WB4ZQC 26, WA4FJA 23, W4DFP 21, K4FCZ 20, W4GUJ 18, K4EZE 17, WB4FJY 17, WB4SKJ 16, WA4BXT 14, WB4ZPC 9, WB4VAP 6, WB4NHH 5, K4OER 4, WA4VZF 4, KØECG/4 3, WB4WTL 3, K4FLV 2, W4IA 1. (Apr.) K4GJ 26, K4CFS 23, K4FCZ 10.

SOUTHERN FLORIDA – SCM, John F. Porter, W4KGJ – Asst. SCM: Woodrow Huddleston, K4SCL. SEC: W4IYT. Asst. SEC: W4SMK. RMs: K4FAC CW, K4EBE RTTY. PAM: W4OGX. WB4AIW and K4SCL made BPL this month. WB4AJL received a Tropical Phone Traffic Net Certificate. OVS report received from WB4TUP. WN4ZTZ has 41 confirmed for his WAS. WB4CNX new General. K4KQ has been busy turning Novices into Generals. K4NE handling loads of phone patches for USCG Cutter "Steadfast" operating in the Gulf out of St. Petersburg. Lew also achieved 1st in Fla., 2nd in country in OOTC QSO Party. Sorry to see WB4HKP leave our section. Northern Fla. is getting a good man. WB4HKP made PSHR this month. Congratulations to WN4BSP and WN4UPJ – both passed their General Class exam. Your SCM attended the St. Pete Hamfest and the Orlando Hamfest/ARRL State Convention. We had the Red Carpet treatment at both events. Thanks to the Central Fla. FM Repeater Assn. for the invitations to their nice banquet. The XYL and I had a ball LO meeting was attended by W4RKH SCN N. Fla., W4BYG SCM Ga. KØBAD/4 Mgr. RN5, W2TUK pres. ARRL, W4DQD Dir SE Div., K4THA V. Dir. SE Div., W1SL asst. Tech. Editor QST, W4IKB SEC N. Fla., WA4IZM PAM N. Fla. and yours truly. We need an active OO for the 75- and 40-meter phone bands. Someone with years of experience and the necessary equipment. Some of the signals in our state should be talked about. A friendly note from an OO is a lot better than a pink ticket from the FCC. Have you had someone tune up and down the band and check your signal lately. You may be surprised. Traffic: WB4AIW 586, K4SCL 530, WB4GHD 484, WA4IJH 204, WA4NBT 196, WA4SCK 175, K4FAC 144, WB4HKP 105, W8BZY/4 100, WB4UNV 97, WB4TON 85, W4BM 65, W4EH 56, W4DOS 52, WB4HJW 50, W4DVO 45, K4NE 40, K4BLM 38, WB4AID 33, WB4WNX 29, K4QCG 24, W4TJM 21, K4SJH 16, K4QG 15, W4KGJ 12, W4DDW 11, W4SMK 11, W4BCZ 9, WB4QID 9, W4NTE 8, W4OGX 8, WA4ESS 6, W4MML 5, WA4ALF 3, WB4ALF 2, WB4PNG 2. (Apr.) K4GEW 2.

WEST INDIES – SCM, Pedro I. Piza, Jr., KP4AST – SEC: KP4CB. OBSs. KP4QM, KV4FZ. OO: KV4HW. Two meter activity keeps growing at a tremendous rate. KP4s VG, AFK, BHM, AYX, CO. DHD, DGK and VP2VAI/KP4 are new stations heard on this band. KP4ANG and KP4AST worked H18WPC and H18RO on two meters. KP4AST worked K4IID on 2 meters for the first stateside to KP4 contact on 2-meter fm. We need some activity from KV4-Land on 2 meters. Come on boys, we need some activity reports.

SOUTHWESTERN DIVISION

ARIZONA – SCM, Gary M. Hamman, W7CAF – RM: K7NHL. PAM: WA7JCK. Maricopa County AREC held an unannounced emergency exercise on May 13 with good results. Communications were provided by WA7CNP, K7JWB, K6MUX, WA7PNY, and W7UXZ for the Explorer Olympics at Mesa. The Ariz. ARC Post 710 has been providing daily communications from Camp Geronimo, near Payson, to the Phoenix area via 80-meter ssb and cw. Don't forget to register for the SW Division Convention at Burbank on Oct. 20-21. W7DRR received a Bell and Howell Fellowship Award as a result of being an outstanding applied science teacher. W7AE, ex-K7KRU, made an emergency phone patch for LU6HGE and located medication for a young girl needing brain surgery. The girl is now recovering from the surgery. WA7TZO was recently appointed as a Class I OO. Any station desiring appointments should contact your SCM. Section net awards were earned by K7GLA, WA7JCK, WA7KQE, WA7NHQ and K7NTG. ATEN: 31 sessions, 682 check-ins, 78 QTC, 691 minutes. Traffic: K7NHL 267, K7NTG 200, K7MTZ 35, WA7VLA 31, W7PG 27, W7AE 24, WA7TZO 23, W7DQS 22, W7CAF 13, W7DRR 9, K7ZMA 7, WA7KQE 3, K7NMQ 2.

LOS ANGELES – SCM, Eugene H. Violino, W6INH – Asst. SCM: Leigh Jones, WB6OLD. SEC: WA6QZY. RMs: W6LYY and WB6ZVC. Many hamfests and other get togethers have passed with only a few left for the summer vacation months. One expected is with the SOWP group who as yet does not have a date. W6PZY, LA section mgr. of SOWP has been very busy keeping the members active on 3935 kHz. W6HUJ getting active on DNTS between work skeds. WA6SWY sporting new Swan 500-CX and four-element tri-band beam and studying for Advanced ticket. W6IVC spending most of his time on RTTY nets handling traffic, also checks into SCN and PCN. WB6IMV pumped 5 tons of cement into the base of his new tower and finished the installation with the help of WA6OZC, WA6ARC, WB6MWT and WA6MEM. He now has the used tower for sale. The So. Cal VHF club is having monthly transmitter hunts. Those interested contact WB6YVP. W6MLZ recently was named "Ham of the Year" at the Dayton Hamfest. Congrats Ray. W6AOA now sporting new 2-K-4 Linear and can be *heard on 20 meters most of the time. Just received info that* WA6FXM, W6UQX, K6NA and W6RTN participated in a medical emergency in connection with LU2HBX regarding a small girl with *blood clot on brain due to an accident. Have sent the particulars to* Hdq. and are in the Public Service Diary this issue. Seen on the Queen Mary were WA6JHD and W6MYC. New OPS/OBS WA6BCO has been doing a good job plus being elected pres. Marina ARC, experimenting with active audio filters and handling traffic. The San Gabriel RC AREC group participated in the Monrovia Days Parade, using the W6FNO repeater kept things going smoothly. K6LSO blew the rectifier diodes in his new Henry 2-K-4 plus other rig problems. W6AWP has new homebrew 10 watt two meter amplifier, made from parts he won at the RC. WA6KUS is now the chief raffle mgr. at the San Fernando RC and has devised a system to help keep attendance up. WB6KXC won the LERC QLF contest at 16 wpm. K6ASK says he did well in the last FMT contest and wants more activity in this respect. K6UYK plans to have the SCN group at his place in Oct. This is the yearly SCN get together and always a good group; also Ted has been very good about originating traffic for the group. WB6OYN racking up big traffic totals even after undergoing open heart surgery. K6ASK made a few attempts to work through *Oscar and finally made it, still working on antenna improvements.* Traffic: W6INH 289, WB6OYN 183, K6UYK 168, WA6IKO 146, WB6ZVC 107, W6QAE 94, W6LYY 80, WB6KJI 65, W6OEO 46, *WB6KGK 43, W6USY 36, W6NIR 16, W6OAW 15,* WA6KZI 12, W6HUJ 10, K6CL 8, W6NKE 7, WA6SWY 6, WA6IDN 5, W6HUJ 4, WB6TPO 3, W6FD 2.

ORANGE – SCM, William L. Weise, W6CPB – Asst. SCM: Richard Birbeck, K6CID. SEC: WA6TVA. PAM: K6YCI. RMs: WB6AKR, W6BNX. Renewals: K6YCI as PAM; WA6BDX and W6BAM OBSs. K6GMI has been appointed OPS for the Desert Hot Springs area. Hal is very active on several nets. Welcome aboard Hal. With the temperature rising in the desert as summer approaches Desert RATS goes on reduced meeting schedule until Sept. The NEN Novice Traffic Training Net now meets on 3730 kHz, 9 A.M. *local each Sat. Novices wishing to learn traffic procedures or* increase their skills should check in. The Orange County Council of Amateur Radio Organizations meets every odd month. The Council, *through your club representative, would appreciate new items for* consideration. Items should be of such nature they would benefit all clubs and amateurs. A joint meeting of all clubs is planned for Aug. 21 at Fullerton Radio Club. Our Director W6KW will be guest speaker. Radio clubs holding Novice classes should gear their ttraining to the new FCC questions. If your club does not have the new questions, copies will be forwarded on request by the SCM. Congrats to WØHAW/6 for placing first for Calif. in the Zero District 1973 QSO Party. W6BUK is kept busy meeting with OCWA pals on 40 and 75. If going on vacation please drive defensively, we all want to see you when you return. PSHR: WA6TVA 49, WB6AKR 39. Traffic: W6ISC 245, K6GMI 165, WB6AKR 79, WA6TVA 61, WA6YWS 40, K5BBM/6 8, W6QBD 5, W6CPB 2, WA6FIT 2.

SAN DIEGO – SCM, Paul C. Thompson, W6SKS – Asst. SCM: Art Smith, W6INI. SEC: W6GBF. RMs: W6GBF, W6LRU. I wish to thank everyone for their gracious assistance over the past two years. The results of the election for the next SCM will be announced as soon as they are available. As indicated in my bulletin it has been my privilege to be your SCM and I regret that I cannot continue in this position. I know you will assist as diligently as ever to build the section. Field Day participation by El Cajon, SOBARS, North Shores, Palomar and Imperial Valley Clubs was fun for all. With emergency power and some very strange antenna designs the total were good. OVS W6DEY changed Globe Hi-Bander from ant to fm. WA6BDW is mobiling while assisting the Handicapped. W6BGF back on the air after a short stay in the hospital. W6VNQ holds 3 TCC skeds per week. San Diego Mt. Rescue WB6IOX had program at the *AREC Breakfast. New 250 MHz counter for K6HAV.* WA6AMK is now regular on SCN and RN6 with new antenna tuner. WA6IIK is QRP with Ten-Tec on all bands and reports good DX. WB6CFT new

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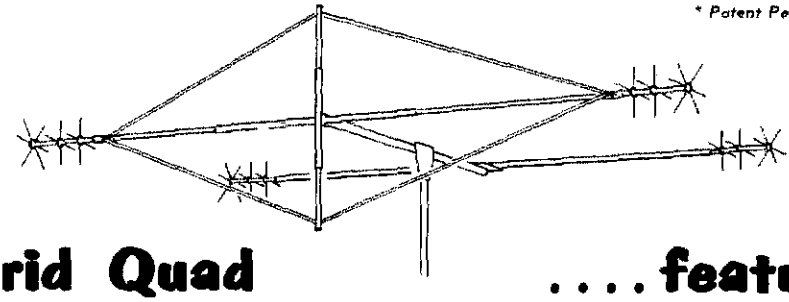

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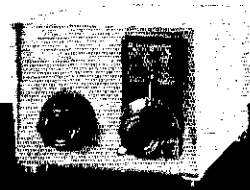

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ANCS for AREC 3770 kHz Sun. 10:30 A.M. K6SDR rebuilding all antennas. Many thanks to the stations in the section who are participating in the SKYLAB Flyovers through this area. Your assistance will make this survey information valuable to science in the years to come. PSHR: W6LRU 44, W6BGF 44, WB6VKV 34. Traffic: W6BGF 274, W6LRU 153, WB6VKV 147, W6VNQ 132, W6DEY 44, WA6AMK 32, WA6BDW 19, W6SRS 15.

SANTA BARBARA – SCM, D. Paul Gagnon, WA6DEI – SEC: W6JTA. RM: W6IJ. PAM: K6EVQ. If you are interested in becoming an EC, ORS, OPS appointee contact the above respectively. The Ventura County AREC Net meets on repeater WA6SIN on Tue. at 1930. The practice drills came in handy on Memorial week end when the group mobilized to provide communications for the CHP and Sheriff at a fatal accident in the mountains. Those involved were K6ITY, K6YLQ, K6VIE, WA6DEI, WA6UZB, WA6UEQ, WB6MWJ, WA6LLI, WB6URX, WB2LRS and WA6VUY. See story in Public Service Column. The new EC for the Ventura District is WA6LLI. Harry requests an updated form from all stations. The Santa Maria AREC held a special communications drill for the police evaluators. It was well organized by WB6IIJW. Club speakers: K6CFJ at MAKRAC in Camarillo on Noise Blankers; W4SDL at CVARC in T.O. on Impedance Matching; WA6DEI at Poinsettia and Explorer Post 2955 in Ventura on FD operation; W6OAL at Poinsettia and CVARC on Satellite Communications. Explorer Post 2955 is the newest member of the Tri-Counties RC Council. Has your group joined? W6IDU took a trip to Ark. with 40-meter mobile. WA6IDQ now signing K9AIY in Wisc. EC W6CDN held an emergency drill for the So. Bay Civic Assn. in Morro Bay. WA6GEN has new eight-element 2-meter beam. WB6PGK and WA6DEI made PSHR. WA6JDS and XYL made trip to Hong Kong. WN6TGV has new quad. MAKRAC installation dinner was held at Love restaurant in Camarillo. New officers are WA6DEI, pres.; K6QPH, vice-pres.; K6YLQ, secy.-treas. Check your club activities through the radio council to avoid conflicts. See you on the section AREC Net on 3935 at 2000 Wed. Traffic: WB6PGK 167, WA6DEI 102, W6JTA 18, W6JDU 9, WA6MBZ 9, K6QPH 6, WA6GEN 4, WN6MLJ 4, WA6PFF 2.

WEST GULF DIVISION

NORTHERN TEXAS – SCM, L.E. Harrison, W5LR – Asst. SCM: Frank A. Sewell, W5IZU. SEC: K5QKM. Asst. SEC: WA5KHE. RM: W5QU. New ECs are W5DWV, W5GY and K5ZCO. Congrats. Tex. Slow Speed CW Net on Sat. and Sun. evening @200Z, WB5DBK, Mgr. Panhandle ARC meets at the Amarillo PD 1st Mon. each month. Temple ARC reports Tex. Slow Speed CW Net bulletin read to club, Aeronautical Center ARC bulletin presents well prepared thumb-nail sketch of 41st W.G. Conv. Congrats to SFC Pyroufis and staff. Most all nets have completed '73 picnics by now so Tex CW Net only one left. Caprock ARC has new editor for N/L – WN5IRL. FB OM. Silent Keys are WA5JXO, WA5URW. Members please note Docket 19723 asks for comments on RACES, SECs and NTS Mgrs. should read latest CD Bulletin on this subject, be sure you understand the five basic questions. K5PCW has noticed several ECHO boxes operating in the low bands. RWK advises new publication in his area – Plano ARC Bulletin and called P.A.R.K. - K5MUB, pres.; K5QNY, vice-pres.; W5NQQ, secy.; K5MWC, treas.; WB5ETZ, act. mgr. The League Club bulletin off the press and covers FD, new FCC study guide, minute No. 40 (ref:pp 86 Jan. '72 Brd. mtg.) ordering study FD rules, insurance coverage and Oscar/NASA school program. Greetings to the newest ARRL affiliated club Top of Panhandle Amateur Radio Club. It is the SCM's understanding that House Bill No. 142 of the Tex. Legislature, authorizing "Ham" call letter plates on Pick-up trucks is now on the Governors desk awaiting his signature. Thanks to all of you for your short visits with the XYL and I during our Euless sojourn. Anyone need appointment applications. I've plenty. Traffic: (May) W5QU 142, K5QKM 57, W5QWV 40, WA5QGE 33, WB5BFW 25, W5GQZ 20, W5SHN 15, W5IZU 14, W5GSN 11, W5YK 3, W5LR 2. (Apr.) W5QU 150. (Mar.) W5QU 135.

OKLAHOMA – SCM, Cecil C. Cash, W5PML – Asst. SCM: Leonard R. Hollar, WA5FSN. RM: W5RB. Asst. RM: WB5EEY. PAMs: W5MFX, WB5CWX and K5DLF. Quoting W5JJ "Have been playing with a Ferranti ZN414 IC, one that has all the active and most of the passive components of a complete receiver" ! How about that sports fans? Since W5RB took the bull by the horns as RM the OLZ net has grown by leaps and bounds, has even blossomed out to an asst. WB5EEY who has revived SSZ (the slow speed net at 2145 local time). New officers of the Tulas ARC, W5OK are WA5WRC pres.; K5ZCJ, vice-pres.; W5GZD, secy-treas. The club meets each 4th Mon. in the American Red Cross Building. Had a nice long letter from WA5TSJ about the emergency setup in the Okla. City area and their recent operations following a tornado in Mustang. Operation was through the 22/82 repeater, transmit antenna at the 800-ft. level and the receive antenna at 1400-ft. on Channel 9 TV tower. The 34/94 repeater also was used. Congratulations to new

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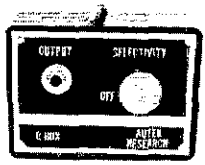

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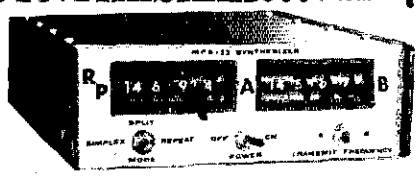

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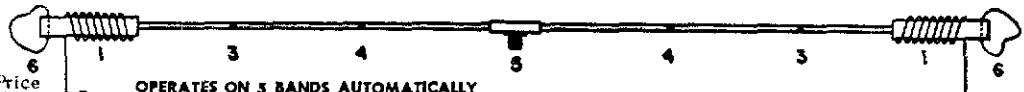

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Advanced WB5FTF. Have you upgraded? Do you have a new license? Has anything at all happened around your shack? Let me hear from you I can't print what I don't have. The repeater directory was ready for delivery in June. By the time you get this in the Aug. issue the new "Net Directory" should soon be ready. Traffic: K5TEY 329, W5RB 75, WB5EEY 38, W2FIR/5 26, W5MFX 26, WA5ZOO 25, WB5AZS 19, W5FKL 18, W5SUG 18, W5PML 14, WB5ELG 10, WA5OUV 10, WB5FIK 5, K5LUJ 6, WA5WRC 6, WA5FSN 3, K5ZDB 3.

SOUTHERN TEXAS – SCM, Arthur Ross, W5KR – SEC: WA5YXS. WA5UHT will soon have 2-meter ssb. WB5EDS reports Novice QRM up around Corpus Christi with 13 Novices licensed via ham class at Delmar College. OO W5RIY reports two scouts in his troop passed the Novice exam. Rice Univ. ARC is new ARRL affiliate with WA5RXT as pres. K5MEN reports SAARC ham class brought one Novice to General and one to Advanced. WA5VBM assisted Red Cross with H & W traffic following Jonesboro, Ark., tornado. WN5GQH and WN5GQI operated portable from campsite in Ozarks and mobile on return. WA5ZBN is new ORS; brother WB5IOG requested the same appointment. WA5ZBK worked some JAs on 20 during morning hours. WB5FMA passed Extra Class exam; erected a 72-ft. tower with help of WB5DQE, WB5DYA, K5FRK, WN5JJZ, WA5TMJ, WA5ZBJ, and a CBer studying for Novice! WB5AMN keeps nightly sked with father-in-law on 40, reports that Old Dad is a whiz on cw. W7WAH/5, who has made PSHR every month since July 1972, enjoys chasing DX on cw, but will give ssb a whirl this summer. Houston .28/.88 repeater has call WR5AAA, first in S-Land. K5RVF is pres. of South Jefferson Co. ARC. K5CWF and WA5ZLJ made first-in-El Paso two-way contact on 444 MHz May 23. WA5ZLJ suggests a gentleman's agreement between cw and ssb ops to leave 50.100 to 50.150 for cw. Texas VHF FM Society's Frequency Coordinating Committee working hard and getting things organized; they will have computer assistance. Tex. A&M Station, W5AC, being renovated. W5KLV upgraded to Extra Class and became Life Member of ARRL. K5EHY new EC for Cameron Co. WA5VJW/VJX struck by lightning; rig damaged but no injuries. WB5DBK has new Clegg FM27B. W5ABQ, TEX CW RM, puts out swell bulletin for TEX. WB5GVO a regular QNI on TEX SS Net and now a regular on TEX CW Net. W5NQ received certificate from ARRL for having same call for 50 years. Tex. Traffic Net (TEX) having fish fry Sept. 29, 30 at Whitney, Tex. Traffic: WB5CUR 226, W5ABQ 193, WA5YXS 154, W7WAH/5 110, WB5BWV 71, WB5DBK 64, WB5AMN 62, WA5YEA 62, WA5VBM 60, WA5TJI 49, WB5EDS 38, WA5ZBK 38, WA5ZBN 33, W5TQP 31, W5TFW 30, K1ONW/5 29. W5HWY 28, WB5DQE 27, W5KLV 27, WB5FMA 21, WA5ZBJ 20, W5JVR 18, W5QO 16, WB5IOG 14, K5EFH 10, K5RVF 7, WA5UHT 7, K5ROZ 6, K5HVI 3.

CANADIAN DIVISION

ALBERTA – SCM, Don Sutherland, VE6FK – Asst. SCM: Mrs. Donez Booth, VE6YL. SEC: VE6XC. PAM: VE6ALQ. VHF PAM: VE6AMC. ECs: VE6FM, VE6ATY, VE6WJ, VE6AGZ, VE6AXH. ORSs: VE6LZ, VE6YL, VE6WG, VE6BAT. OVS: VE6MX. OOs: VE6MJ, VE6TY. OBS: VE6MJ. OPSs: VE6HN, VE6VS, VE6FS, VE6AXH, VE6ASL, VE6YL. The Hat Ham Club and CARA classes have produced quite a number of new hams. I wish to welcome them all and wish them lots of success. EC VE6FM and VE6QW are quite busy with repeaters. The APSN wishes to pass their sincere sympathy to PAM VE6ALQ and his XYL on their recent sad loss. NARC once again held a splendid awards night. Winners in the many categories were: VE6MC, VE6AXW, VE6APH, VE6APJ, VE6JW, VE6AK, VE6AOE, VE6NS, VE6SF, VE6OP, VE6RP, VE6PS (Boner?), VE6DD. CARA will keep you posted re the convention during Century Calgary. The dates Aug. 1,2,3, are already selected. The Calgary Inn will be headquarters. Mark the dates on your 1975 calendar. Traffic: VE6FS 46, VE6XC 31, VE6FK 19, VE6YW 18, VE6WN 10, VE6FV 6, VE6AGZ 4, VE6MJ 4.

BRITISH COLUMBIA – SCM, H.E. Savage, VE7FB – Summer time plays havoc with the nets, 3755 kHz will need relief NCS, also do check the British Columbia Emergency Net 3650 at 0300 GMT. VE7BKL, OM VE7BGU, ; VE7ATI, OM VE7ATH; VE7AEJ, OM VE7AHM and lots of old timers can join that list. VE7BMM, 1st Boy. Sure is nice to receive so many of the club newspapers, Beaver Valley always has some nifty ideas to try. VE7BOZ our 3755 kHz net PR man left the Province and we now are in the need of a PR man. Asst. Dir. VE7LL has a camping-van complete with all communications FT-101 – plus two meters will soon be off to the East. Traffic: (May) VE7LL 83, VE7BLO 50, VE7CCJ 17, VE7CDF 11, VE7MW 8, VE7TT 7. (Apr. VE7CCJ 17.

MANITOBA – SCM, Steve Fink, VE4FQ – RM: VE4LG. PAM: VE4FO. ECs: VE4IH, VE4NE, VE4NW, VE4DI. ORSs: VE4PG, VE4RO, VE4KE, VE4EA. OVS: VE4MA. OO: VE4SW. OBSs: VE4HE, VE4KE. WARC held a successful auction May 27. The next one will be sponsored by ARLM in the fall. We welcome VE4RM back to Winnipeg. Congratulations to the new hams from the

VE4RRC commercial radio-operator course and the Winnipeg Tech. Voc. evening course. Our nets, MTN and MEPN, wrapped up some impressive statistics this past season. The 2-meter net is now in operation in Winnipeg, meeting on the repeater channel (VE4XK) *Sun. at 12 noon local time. MTN: 29 sessions, 121 QNI, 33 QTC.* MEPN: 31 sessions, 646 QNI, 32 QTC. Traffic: VE4RO 45, VE4PG 44, VE4TY 24, VE4FK 14, VE4QW 12, VE4CR 8, VE4JA 8, VE4DR 7, VE4NE 5, VE4YC 4, VE4EJ 2, VE4FO 2, VE4PA 2, VE4QK 2, VE4WT 2.

MARITIME – SCM, W.D. Jones, VE1AMR – RMs: CI1ARB, VO1CA. New appointments: CI1ARB, RM; VE1ZN, OVS. CI1ARB is now mgr. of *The Atlantic Provinces Net, CI1PEI with CI1GV* operating had the first QSO with VE3RCMP, a station operated from Ottawa to commemorate the centennial of the R.C.M.P. During this first QSO Governor General Mitchner and Commissioner W.H. Higgit sent greetings to the Officers and Men of L Division R.C.M.P. Congratulations to VE1AWN and VE1AJF on the new Advanced Class tickets. CI1AIB is to be congratulated, Noreen *started a radio class with 15 attending and finished with the same* 15. Traffic: VE1AMR 133, VO1CA 129, CI1ARB 65, VE1ZH 47, VE1AKB 10, VE1AFM 6, VE1AYJ 4, VE1AMB 1, VE1AWP 1.

ONTARIO – SCM, Holland H. Shepherd, VE3DV – Don't forget the big event this month for the RTTY gang is the SARTG World Wide RTTY Contest. If you haven't already made your reservations for the RSO Convention at Kingston Aug. 17-19 it is very likely that you won't find any space available at the Sat. night banquet. This should not stop you from registering, however, because there are lots of forums and exhibits. Also being held during the RSO Convention but at the Ontario Park, Kingston, will be the 2nd Picnic of the OQN/ECN. VE3GFN and VE3AWE are co-hosts of the get together and they request that you bring your comments on the NTS in writing. VE3GOG's successor as mgr. of the popular NWON is VE3BRZ of Fort Francis. Rob was active as VE3FVO and also as VE2BXY. I am most pleased to have Rob accept appointments as PAM and OPS. The NWON will be found every evening on 3750 kHz at 7:15 P.M. It is always nice to find versatility and dedication in anyone, *but when it happens in an amateur it is a very* lucky SCM. Such is the case of VE3FRG who through his work on the OPN has recently taken on OPS as well as ORS. Thanks Bill. VE3DV has been nominated to the ARRL Emergency Communications Advisory Committee and if approved will be looking for advice and support from every SCM, SEC and EC across Canada. VE3CJ, Canadian Division Dir. visited SCM in May for general discussions. The OARC found an excellent method to hold a meeting with a purpose by having a July picnic complete with hot dogs and pop for everyone. Nice way to end the season and bring in the XYLs and the kids. Repeater VE3STP on Mount St. Patrick has been greatly improved by new antenna system. Traffic: VE3SB 183, VE3FQZ 151, VE3EHF 133, VE3GFN 106, VE3DPO 97, VE3GJG 92, VE3AWE 59, VE3GT 56, VE3DVE 45, VE3FRG 42, VE3DU 31, VE3ASZ 26, VE3EWD 26, VE3ATR 18, VE3EHL 14, VE3FGV 13, VE3BEB 10, VE3DH 7, VE3VD 6.

QUEBEC – SCM, Joe Unsworth, VE2ALE – SEC: VE2BDM. Westminister ARC produced five new hams. VE2ATF is new on 2 meters. *VE2BU* has moved to the Lake Simco area in Ont. *The ZIP* code for SCM is J7V-2W4. A new type of 2-meter mobile unit being used in Montreal area, the Unimetrics Ultracom-25, 12 channels at 25 watts of RF via KW Electronics, VE2s XX, DM, ABF and ALE. Look for VE2ATL via VE2TA and look for VE2ARX on 20 and 2 meters. VE2AGI and VE2AOL maintain VE2AT. VE2AGO has moved to Bouchardville. VE2BLT skeds Honduras. VE2BB back *home and heard on 75 meters. VE2BAL took on an XYL in May.* Excellent job done on MARCs Marcogram by VE2TD. VE2s XZ, MG, XO at Toronto SSB dinner in Apr. MARC produced ten hams this year, VE2s BYE, BAC, AXK, BKM, AIT, DPM, BEU, DFK and Jean Taillon and Jean Talon and one Advance Class with VE2BLC by the efforts of VE2s DDU, BLN and HM in the francophone section. The following very active in Blind for Amateur Assistance this year are VE2BB, VE2DW, VE2AAO, VE2AJV, VE2BEZ, VE2BQQ and Don Virgo, Bill Blackstone. Some CB operators violate 28. to 28.5 MHz on 10 meters, get DF antenna out and help clean up the practice with accurate reports in your respective areas. Hurry and develop your 1¼ meters repeaters and stop the CBers from taking over any portion of this band. PSHR: VE2APT 28. Traffic: VE2DR 62, VE2EC 52, VE2BP 24, VE2OJ 20, VE2ALE 16, VE2APT 10, VE2AJD 9.

SASKATCHEWAN – SCM, Percy A. Crosthwaite, VE5RP – The AREC participated with EMO in a simulated hospital exercise. VE5RJ is our EC and VE5CU is asst. director to EMO Saskatoon who report *the AREC is working together with EMO more than* ever. I would like to welcome VE5XH, VE5VC, VE5NJ to SATN 10 Region Net. I have attended a combination picnic and meeting at Prince Albert and the Regina monthly ham meeting. Traffic: VE5GL 40, VE5HP 32, VE5IX 9, VE5PD 6, VE5KZ 3, VE5HE 1, VE5JB 1, VE5LC 1.

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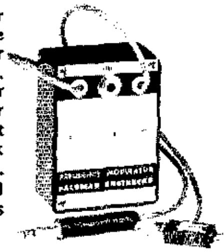

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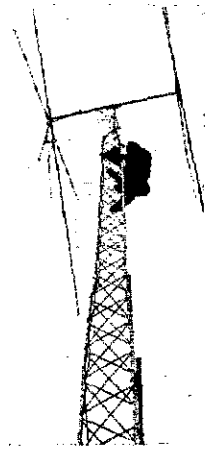

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CINCINNATI Hamfest: The 36th annual hamfest will be held Sunday, September 16, 1973, at the all new Stricker's Grove on State route 128, one mile west of Ross (Venice) Ohio. Check local area map for location. Lots of food, flea market, contests, and model aircraft flying. $7 covers everything. For further information, contact Jim Wellman, W8HSI, 725 Stout Ave., *Wyoming OH* 45315.

18TH ANNUAL Ham fest by Four York County clubs again sponsored at Elicker's Grove, 1/2 mile west of York airport or 10 miles west of York Pa off U.S. Route 30. Rain or shine Sept 2, 1973. Watch for signs after flying into York airport call 225-1189. Registration begins at 0900 hours. Talkins 146.16-146.76 (repeater) 146.94-146.94 and 52.525 fm. Registration fee $3. XYLs and children free. No charge for flea market sales. Any person engaged in selling is expected to register. Transmitter hunt 2 & 6 meters. Plenty of picnic tables. Ladies free bingo. For information write K3POR, LeRoy Frey, 170 S. Albermarle St., York PA 17403.

SEPT. 30, 1973, Grant County RAC annual hamfest at 4-H park, Marion, Ind. Admission donation $1. XYL 50c, children under 12 free. Large inside and outside flea market and exhibit area (no set up charge), food, inducements, tech sessions, camping, *ladies bingo. Call in .94 simplex. For flyer write H. Pence* WB9GAT, 524 S. Washington, Montpelier, IN 47359.

DRESS up your shack! Your call letters engraved in black, white, teak mahogany, or walnut plastic — please specify. Self-stick back for shack or rig mounting. 2" x 8" postpaid. $2.75. Select gold or silver finish desk holder — $2.50 extra. NYS residents add 7% sales tax. WA2OLP, Engraved Sign Co., 14 Eve Lane, Levittown, NY 11756.

WANTED, manual, for HQ180, buy or borrow to copy. *VE3CKU, 45 Paisley West †1003, Cooksville Ontario L5B 1E4.*

CASH paid for your unused tubes and good ham and commercial equipment. Send list to Barry, W2LNI, Barry Electronics, 512 Broadway, *NY NY* 10012.

CALL Toll-free: (800) 327-7799. Ask for Bob Hoffman (Jaro Electronics Corp.) We buy all types of tubes. Top prices paid for Varian, Eimac, Amperex. Address: 412, 27th Street, Orlando FL 32806. In Florida call collect (305) 843-9551.

WANTED: *An opportunity to quote your ham needs 34 years a* ham gear dealer. Collins, Drake, Galaxy, Tempo, Kenwood, Ten-Tec, Hy-Gain, and all others. Also $25,000 inventory used gear. Request list. Chuck, W8UCG, Electronic Distributors, Inc.

HAM ticket - Amateur radio license course for Novice, General Advanced, Extra Class. Write for information. Clayton Radio Co. 220 Mira Mar Av. Long Beach CA 90803.

SPIDERS for boomless quads. Heliarc welded aluminum. Al's Antennas, 1339 So. Washington St., Kennewick WA 99336

VERY in-ter-est-ing! Next 6 big issues $1. "The Ham Trader," Sycamore IL 60178

TRANSFORMERS rewound, Jess Price, W4CUJ, 507 Raehn, Orlando FL 32806

TELETYPEWRITER parts, gears, tape, supplies, toroids, tuning forks. Sase list. Typetronics, Box 8873, Fort Lauderdale FL 33310. W4NYF. Wanted: parts, late machines.

NOVICES: Need help for General ticket? Complete recorded audio-visual theory instruction. Easy, no electronic background necessary. Write for free information. Amateur License, PO Box 6015, Norfolk VA 23508.

WANTED: tubes, transistors, equipment, what have you? Bernard Goldstein, W2MNP, Box 257, Canal Station, New York NY 10013

PREPARE for ham exams! Use Posi-Check. Original, expertly devised, multiple-choice questions and diagrams covering all areas tested in FCC exams. Keyed answers, explanations. IBM sheets for self-testing. General Class $4.25, Advanced Class $4.50, Extra Class $4.75. General Class includes new FCC recommended questions over rules and regulations, for General Class only. Each applies to its own class only. First class mailing included. Add 25c per copy for air mail Send check or money order to Posi-Check, P.O. Box 3564, Urbandale, Des Moines IA 50322

JEHOVAH's Witnesses who are amateurs write Bob Ellis WA4UQG, 160 Lagoon Rd. SE, Winter Haven FL 33880 or call (813) 293-3595.

HAM Hawaii. Maui oceanfront three bedroom two bath luxury penthouse apartment for rent by week or month completely furnished plus Yaesu, TH6DXX and automobile. K6OE, Box 218, Carmel Valley CA 93924.

MANUALS for most ham gear made last 25 years. Send sase for quote. W0JJK, Hobby Industry, Box 864, Council Bluffs IA 51501.

WANT to buy: Barker & Williamson model LPA-MU matching unit for B&W kilowatt grounded grid linear amplifier model LPA-1. Will buy entire LPA-1 if necessary to obtain the tuned input circuit. Carter Glass III, W4JUK, 3237 Landon St., Lynchburg VA 24503.

WANTED for cash: Sideband Engineers model SB3-DCP inverter with W-72 interconnecting cable. W0DVZ, Box 475, Ottumwa IA 52501.

HW-100 with Swan dial, HP23, HP13, $200. Want 2 mtr fm xcvr. K1DIK, 84 Langholm, Nashua NH 03060.

COMPLETE station $525 firm or separate as listed. HT37 $185, SX101A $155, HA2 with ps $125, home brew linear (matches HT37 1000 watts) $100, D104 $15, Johnson matchbox two 10 element 2mtr collinears with stacking kit $25. Will not sell separate before chance to sell complete. Also have back issues of QST from 1925 up, most complete, send sase for list. Would prefer to sell complete. Write K1VNE, Tom, 22 Lockwood St., Bellows Falls VT or call days (802) 254-9988, (802) 463-4209.

MOBILE ignition shielding gives more range, no noise. Kits and custom systems. Literature. Estes Engineering, 543-A West 184th, Gardena CA 90248.

WESTERN Union Desk-Fax Telefax transceiver manual: Complete theory of operation, adjustments, lubrication, preventive maintenance, troubleshooting, parts list. Includes all schematics and mechanical parts drawings. $3.80 postpaid. Bill Johnston, 1808 Pomona Drive, Las Cruces NM 88001.

CASH for ssb gear (working or repairable). State condition and price in first letter. Elvin Miller, Box 869, Marion IN 46952.

SELL Hallicrafters FPM-300. New. Retiree completely discouraged in learning code, I quit. Cashiers check — $525 UPS prepaid takes. Billy Parker, Route 1, Big Rock TN 37023.

GONSET Communicator III, 2 meters — $100; Gonset 3063 2-meter power amplifier — $75, package — $160; Motorola P-33BAC with Ni-Cads 94/94 34/94 — $125; Heath HX-20 — $110; HR-20 — $75; HP-20 — $25; HP-10 — $35; Hustler 80-10 mobile antennas mast mount — $35, package — $245, you pay shipping. W5PNY, 2506-A 35th St., Los Alamos NM 87544.

WANTED: Gordon rotator also 75S3B. For sale collectors item — unmodified original ssb G.E. YRS-1 with ins. book — $100. W9EWB, Walt Kohlhagen, 818 Oakley Ave., Elgin IL 60120.

WANTED: Pre 1930 radio/wireless parts, tubes, magazines, books, literature, Amateur, broadcast or longwave receivers — transmitters. Tesla and Oudin coils. Western Electric loudspeakers, headsets, tubes, amplifiers Telephone and telegraph equipment. Will Nangle, 761 North 29th St., Milwaukee WI 53208.

HY-Gain 18AVQ vertical, 80-10 meters, only one year old, like new, half new price: $35 plus shipping. C. Counselman, 123 Radcliffe Rd., Belmont MA 02178.

GALAXY GT550A w/ac supply only 6 hours use w/new warranty — $499; Comcraft CTR-144 less than 30 hours use w/warranty card — $325; and 40 & 80 meter Cliff Dweller wks. F.B. — $125. First money order or bank cashiers check will prepay the freight to you in USA. Wm. Ogg, 2706 Portobello Drive, Torrance CA 90505.

SELL: Heathkit HW-100 and HP-23A power supply — $225. Also DX-150A receiver — $75. All in good shape with manuals. Going to college. David Rone, WB4RLB, Box 728, McMinnville TN 37110. Phone (615) 473-3587.

WANTED: repairable Collins 75S-1 receiver, mail info price to K5ETI.

THE island of Montserrat: work a contest this year with Caribbean breezes cooling your finals. Modern 2-bedroom house for rent, 100 yeard from the ocean. Feel free to use HW-101, SB-200, Hy-Gain quad 65' — $85 weekly. "Do" Beverstein, VP2MZ, 60 Amsterdam Ave., Toronto Canada M4B2C2. (416) 755-2117.

CAVITY-tuned pwr. osc. Maxson 1241 w/pwr. supp. & mod. 250-2500 MHz (50 to 14 watts). Good cond. Manual & freq. charts — $325. C. Hoff, 1018 Gladys Av., Long Beach CA 90804.

WANT Ameco TX-62 and VFO-621. State condition and price. K9DHD. 1006 Wilson, Wheaton IL 60187.

4CX1000A: new with socket — $90, will sell separate. Trammell, 1507 White Oak Ct., Martinsville VA 24112.

WIRELESS Collector's Catalog No. 1 — $1 refundable first order. Midco, Box 15370, Long Beach CA 90815.

SELL: 53-MHz Heath GD-57 R/C system, complete — $95; HG10-B Heath VFO — $30; 3-element Cush Craft 15-meter beam — $35. All like new, will ship, except beam. WB0CXY, James Redhage, 15 W. South St., Bowling Green MO 63334.

FOR SALE: Heathkit gear, as follows: HG10-B VFO — $20; DX60B xmitter — $60; HD10 keyer — $20; Johnson 250-Watt Matchbox — $25. All in good operating condition. Buyer pays freight. WB2IKE, 170 Ridgewood Road, Buffalo NY 14220.

VIBROPLEX wanted: super deluxe "Presentation" model or "Original" model, only. Must be in good operating condition. Will pay shipping R. Crockett, W1CF, 2 Ripley Lane, Weston MA 02193.

WANTED: tech manual for receiver R-501/FRR-21. E. G. Roberts, WA2LFN, 111 Patricia Lane, Syracuse NY 13212.

TELETYPE — Mod 15, ex condx — $55; Mod 14TD, good — $15; BC453, new — $15. Bruce Springer, W5TCD, 902 Kerry, Ft. Worth TX 76126.

DISCOUNTS on all Shure and Electro-Voice microphones. Shure 444 list price — $51, only $24.57; E-V 619 list price — $59.50, only $26.78. All units postpaid, guaranteed. Check or COD. Other models available. Advance Sound Company, 188 Warner Road, Huntington NY 11743. (516) 368-7620.

HALLICRAFTERS SR-400 transceiver with ac supply, mint — $600; Heathkit SB-200 linear with matching custom-gray panel mint — $200; Heathkit GR-78 receiver, excellent — $100; Comdel Speech Processor — $60. WB6UPO, L. Cramer, 330D Sierra St., El Segundo CA 90245.

FOR SALE: complete two-meter home station, easily converted to tunable fm — send for details. Bob Aberle, W2QPP, 33 Falcon Drive, Hauppauge NY 11787.

WANTED: one ac power supply for NCS3 rig, including all cables. Best price, first letter. Sidney Tritsch, RD 1, Box 64, Lockwood NY 14859.

LOW fm: transmitter, receiver, transceiver/repeater-receiver, coax, antennas. Antiques: radios, books, electrical devices. Miscellaneous. WA3JWF, 89 Shagbark Drive, Shavertown PA 18708.

ANTENNAS: TH6DXX up two weeks with balun — $160; TA33 JR 1 year old — $55, WB2ORO, Matt. (516) 798-8168.

CLEANING out extra gear; xmtr, rcvr and parts. Send s.a.s.e. for list. Dana French, K1WKS, 9 Mechanic St., Medway MA 02053.

SP600-JX — $210; Eico 425 Scope — $25; Valiant — $90; 6kV 500 mA, complete P/S — $60; will ship & consider offers. Wanted 500 Hz mechanical filter for 75A4. Chris Wartes, K7UWT, 15419 20th Pl. W., Lynnwood WA 98036. (206) 743-9453.

ESTATE of K9EWB. Collins station 32S3, 75S3, 30L1, 516S2 and FM-1 microphone. Original cartons and instructions. Make offer to widow, Mrs. June Ruoff, 2282 Coulee Dr., La Crosse WI 54601. Telephone (608) 788-4261.

WANTED: old ARRL Handbooks, any year. Craig Roberts, WB5HKO, 3515 Houma Blvd No. 4, Metairie LA 70002.

QST give away club or library preferred. 1964 thru 1971, two issues missing. Duffel, Rt. 1, Box 22, Thompson Falls MT 59873.

MODEL 28KSR with LK38BBR variable speed keyboard, model 14 typing-reperf and TD, all — $250 FOB firm. K5YBT, P. O. Box 631, Vidalia LA 71373. (318) 336-7496.

WANTED: CQ magazines from 1945 through 1952, complete years only. W1GRE, 225 Main St., Newington CT 06111.

WANTED: good used cassette recorded audio visual theory instruction course. J. Rock, 12011 E. Lenora Dr., Spokane WA 99206.

SB-101 & HP-23A — $325; 1 kW homebrew transmatch — $18. W2WHK, 210 Utica St., Tonawanda NY. (716) 692-5451.

"DON and Bob" guaranteed buys. Discount prices, plus full warranty. Trlex MW50 tower — $250; MW65 — $331; W51 — $386 Fobcal; Ham-M — $99; TR44 — $59.95; AR22R — $31.95; Mosley C1.36 — $149; CL33 — $124; TA33 — $114; MC3B — $91; S402 — $143; MP33 — $90; Belden 8214 RG8foam 17¢/ft; Motorola HEP170 epoxy diode 2.5A/1000PIV 29¢ ea. $25/100; quote Clegg FM27B; Genave GTX2; Regency HR212; Midland 13600; Eimac; Drake; Collins and CDE replacement parts; Hallicrafters FPM300 — $595L — $499; hardbound technical magazines, many types from Petrochemical library — $3/yr, write needs. Collins 75A4 — $345; Kenwood T599 — $350. Shipping charges collect. Madison Electronics, 1508 McKinney, Houston TX 77002. (713) 224-2668.

HR2A, 94/94-16/76-34/94-52/52-22/82 mint — $175; touchtone console transistor interface — $25; Hy-Gain 5/8 wave deck mount — $20; Heath frequency counter IB-102, prescaler IB0192 counts to 175 mcs mint — $210. K4JK, 3958 Tanglebush, Huntsville AL 35810.

SELL: Johnson Ranger — $75; Globe Scout 680A, plus 755A VFO — $45; Heath Sixer (HW29A) — $25. Arthur Pini, WA2BVK, 7 Amory Dr., Valley Cottage NY 10989.

SALE: EMC model 502 Signal generator, 6 ranges, 11 kHz to 108 MHz — $25. I ship. WN5IGF, Joel Harrison, Star Route, Judsonia ARK 72081.

WANTED: Drake linear L4B, W1DBS, John Savonis, 410 Blake Road, New Britain CT 06053.

FOR SALE: Hallicrafters HT32 exciter — $125; Hallicrafters HT41 linear amplifier — $150; Collins 75A3 receiver with speaker — $125; 10 & 15-meter cubicle quad antenna with mast — $40; CDR TR44 antenna rotator — $40; central electronics mod. A sideband slicer — $20; Johnson Viking phone patch — $20. Transmitter & receiver rack mounted with blower. Original cases & manuals included. Entire package including shipping — $450. Deane B. Moore, 29276 Snapdragon Place, Canyon Country CA 91350.

COLLINS MP-1 power supply — $75; Heath 12-117 volt 175-watt converter — $15; Comco VHF-FM model 608 marine transceiver, new — $175. W5Cl, 5508 Montrose, Dallas TX 75209.

HOOSIER Electronics — Your ham headquarters in the heart of the Midwest where only the finest amateur equipment is sold. Individual, personal service by experienced and active hams. Factory-authorized dealers for Regency, Genave, Drake, Standard, Clegg, Hallicrafters, Ten-Tec, Kenwood, Tempo, Midland, Galaxy, Hy-Gain, CushCraft, Mosley, Ham-M, Hustler, plus many more. Orders for in-stock merchandise shipped the same day. Write or call today for our quote and try our personal friendly Hoosier service. Hoosier Electronics, R. R. 25, Box 403, Terre Haute IN 47802. (812) 894-2397.

WANTED: Elmac AF-68 with ac supply, must be in good condition. Send details and asking price. Cdr Wren, DA1GS, NATO WSS, APO New York 09172.

DX-60, with extra 6146 and leads — $55. You ship, WBØFGQ, Box 47, Hazelton IA 50641.

SELL, trade HW-7 with 115 VAC power supply — $75, R390/A receiver — $300; CV-157 ssb converter — $300. K9HJU. (312) 349-9002.

Gonset Sidewinder 900A, 2-meter ssb & Cush Craft 11-element Yagi & 100 ft. RG-59/U. Entire station like new, incl manuals — $200. Lerner, 14009 Breeze Hill Lane, Wheaton MD 20906. (301) 460-3313.

BC221 J. freq. meter — $25; BC221 AK freq. meter — $30, both have ac power supply; National NC66 receiver with RDF66 direction finding unit — $30. W2HO, Mountain Rd., RD2 Box 156, Monroe NY 10950. Phone (914) 783-1622.

TEXAS hams, the Texas slow speed cw traffic net is now operating every Saturday and Sunday evening at 0100 GMT, 3748 kHz. The net is for all Texas hams who wish to familiarize themselves with cw net procedures at a moderate to slow cw rate QNI and join the net. Jim McCarthy, WB5DBK, Temp. Net manager.

SWAN 250 with 516E1 Collins supply, microphone, halo — $250; 516F2 supply — $35; Collins MM-1, new — $15. Wanted: 7/8 air heliax connectors — desperate! Olean, K1WHS, RFD No. 1, East Lebanon ME 04027.

WANTED: cw filter for FTDX560, George Epperson, WB6TGM, 11 W. Banbury, Stockton CA 95207.

NOVICES: Drake 2NT with 10 crystals on 15 and 40 — $99; Heath HR-10B, new tubes aligned, mint condition — $75. Mike, 2977 Mariposa Dr., Burlingame CA 94010.

FOR SALE: Heath HR-20 receiver and HX-20 transmitter, ssb-cw combo with power supply — $200. Post-paid' Heath Sixer — PTT & squelch — $25. Post-paid. WAØTSU, Pete, 613 Fountain St., Albert Lea MN 56007.

SELLING — National NC-200 transceiver with matching ac power supply — $225; Hammarlund HW-129-X receiver e/w speaker — $125; Apache transmitter e/w Astatic T3 mic. — $125; 600-watt cw transmitter — $50; Model 2B asr teletype — $225. M. Lindquist, 35 Wayne Drive, Plainville CT 06062.

FOR SALE: CE20A with BC458 VFO and QT-1 anti trip — $80; Jennings 0-300 mmfd. vacuum variable @ 10,000 volts; new 4-250A and slightly used 4CX300A — best offer Norm Bash, WA8COB, 403 Gillette St., N. Baltimore OH 45872.

NEED: one or two each CG46116, CG46117 Navy RAX receivers. Sid Wolkin, WA2EEA, 2311 De Sisto Dr., Rahway NJ 07065.

SELL: Robot SSTV monitor — $225; Yaesu FL2000B amplifier (1500 WPEP) — $250; Knight VFO — $20. WB4YDX, 3259 Roxburg Dr., Lexington KY 40503. (606) 277-2867.

CE200V — $315; SB200 used 1 hour — $330. W9UCZ, S. W. Acres, Harrisburg IL 62946. (618) 252-7064.

CONTACT us for new or reconditioned Kenwood, Tempo-One, Drake, Collins, Hy-Gain, Mosley, Henry linear, towers, antennas, rotators, other equipment. We try to meet any deal and to give you the best service, best price, best terms, top trade-in. Write for price lists. Try us. Henry Radio, Butler MO 64730.

NOVICE rig for sale: Heath DX-60B xmtr (new 6146A, 90 watts, cw or phone) and HR-10B rcvr — will demonstrate — $100, you ship. WB6HNE/4, 4215 N.W. 17th Ave., Gainesville FL 32601.

WANTED: Drake 2B and 2BQ in mint condition. WA1RSG, 1133 Fienemann Rd., Farmington CT 06032.

SIX meter ssb: HX30, CN50, beam, rotator, parts for 200 W linear — $90. WB2SEZ, 559 Princeton Avenue, Bricktown NJ 08723.

APACHE TX-1, excellent condition — $50. Jim, WA6ONK. (213) 793-9011.

SERVICE manuals most Hammarlund equipment, since 1930 — $5, each, postpaid. Will align your Hammarlund receiver to original specifications 15 years factory experience. Wayne Cordell, K4HCS, Blue Ridge Communications, Rt 4, Weaverville NC 28787. (704) 645-7070.

WANTED: Technical material model GPR-92 communication receiver, please state condx and lowest price. Jay Spivack, K2EGA, 779 Montclair Dr., Claymont DE 91703. Tel: (302) 792-1385.

SELL: Johnson "Thunderbolt" desktop kW — $200; homebrew 6 and 2-meter 50-watt a-m xmtr — best offer. WB2FZK. (201) 381-0575. No shipping.

DRAKE T4XB, R4B, AC4, MS4 in mint condition. Used by XYL. WB4FNV for QSO with me in Greenland for six months. Spare rig since. &700. Also Mosley triband quad and Ham-M each brand new, never removed from boxes — $75 each. Sale due to move overseas. Contact parents, Box 8, Krebs OK 74554. You pay shipping. K5MZJ.

YAESU FTDX-401 transceiver, mike, and speaker, used six months — $550. J. Jones, 569 Park Meadow Drive, San Jose CA 95129.

SELL: FT-101, 160 m, w/xtal, cw filter, fan and mic., mint condx. D. Sachnoff, 9429 Ohio, Omaha NE 68134.

FOR SALE: Hallicrafters SX-117 receiver with calibrator — $150. John H. Guthrie, W3SJL, St. Marys PA 15857.

WANTED: SB-102; SB-101; SB-401; Heath TT1A tube tester; trade model 15 page printer with keyboard; model 14 typing repertorator; model 14 transmitter distributor; Technical Material Corporation Frequency Shift Exciter and handbook receiving converter. WAØUMZ, 220 Greenway, Arkansas City KS 67005.

SELL: Drake R-4B, one year old, absolute mint condition — $350. Joh n Mullen, P.O. Box 5883, San Francisco CA 94101. (415) 921-6608.

COLLINS filters: 3.1 kc @ 455 i-f (new S-line case — $21.50. KØARV, 2925 Wildwood Ct, NE, Cedar Rapids IA 52402.

SELL: RME 6900 receiver with matching speaker and manual — $130; Viking II with SB-10, VFO — $90. Russ, WA9MAQ, 3417 Marquette Road, Apt. A3, Peru IL 61354.

SELL brand new Drake SC2, SC6, CCA CPS1 and SCC1. Never used — $225. W3WIP.

FOR SALE: Drake R4B; T4XB, ac power, all cables and books used as back up set for about twenty-five hours — $650; Herald or Heath HM15 swr meters each $7.50; Realistic dual-impedance dynamic mike — $10; Vibroplex Champion key — $10. You pay shipping. R. B. Conaughty, 318 Windward Island, Clearwater FL 33515.

HENRY 2K-4 amplifier, mint — $550; Hy-Gain 400 rotator, new, sealed carton — $139. Telephone. W2GRR. (201) 753-8152.

DYNAMIC Electro-Voice microphone, 676, new — $40. Prep petch meter, two systems, compass, remote power supply, August, 1971, QST, page 36. Wm. McFadden, W8DFA, 29 Vernon Ave., Wheeling WV 26003.

STATION sellout! R-4A; T-4X, MS-4, p.s — $600; mike — 12; tower, 60 ft. — $100; TH3MK3 beam — $105; TR-44 w/150 ft. cable — $55; LA-400C 500W linear — $75 (s/20-827's); Ten-Tec PM2B — $50; 450 ft. RG-8/u — $95; B & W 590G switch — $12; SWR — $5; 24-hour clock — $12, all in very good condition. WBØDHP, Mark Starkebaum, Box 297, Gunnison CO $1230. Phone (303) 641-0460.

SELL: 75A4 Collins serial 2718, mint condition, 500 and 3.1 kc filters. Needs repair. Tunes 50 kc low — $225 or best offer. K9PVY, Sherman Hochman, 5271 N. Shoreland Ave, Mil. WI 53217. (414) 962-4546.

COLLINS mech filter, 455 kHz; .5, 2.1, 4, 6 kHz ect. usb and lsb sets. Also 220, 250, 500 kHz. Collins crystal filters, 455 kHz; .050, .1, .54 kHz ect. Crystal monolithic 10.7 MHz; 3, 6, 12, 15 kHz ect. Many more. Sase list $10 to $22.50. WB6ORT, C. Isham, 6275 Arnold Way, Buene Park CA 90620.

SPECIALIZED repair service. We offer a complete repair service on all Collins receivers & transceivers listed. R-388-389-390-390A 391-392A. All S-line receivers & transceivers including 51S-1 651S-1 receivers. We stock and sell all parts for the above receivers. We also service all Collins Avionics equipment. Such us Arc-73, Arc-94; Arc-102; Arc-114-Z; Arc-115-116-131-134 Arc38-38A-Arc-58-618-T. We also buy the above Arionics sets any quantity any condition. We will send price list upon request. D & R Electronics, R. D. No. 1, Box 56, Milton PA 17847.

COLLINS 32S1, 516F2, and 75S3 with manuals and in clean as new condition — $850 FOB. WA5OKC, 12823 Westleigh, Houston TX 77077.

SELL: Heath HR-10B, operates, but needs some repair. Best offer. Chris Crawford, 905 Glencrest, Longview TX 75601.

CLEAR OUT prices. Johnson Viking II, VFO, D-104 microphone, all parts kilowatt power supply, power amplifier parts, 304TL tubes list, W8YMB, 3703 Boston Rd., Brecksville OH 44141.

SELL: Heath SB-200 — $150; TR-44 rotor — $25; used Hy-Gain 20-meter beam — $15. Al Devlo, 3320 Jessica St., Newbury Park CA 91320. (805) 498-4753.

DO-it-urself DXpedition. Stay at ZF1SB-Cayman Is. Vertical antenna and Caribbean at your doorstep. Diving-fishing if band folds. Write Spanish Bay Reef Resort Box 800J, Grand Cayman B. W. I.

2-meter fm, Sonobuoy transmitters, all solid state, 2-watt output, simple conversion, details and schematic included. Limited supply — $14.95 postpaid. Monks Electronics, 313 Old Farms Rd., Simsbury CT 06070.

WANTED: Collins 312B-4 station control K6DR, Box 13265, Sacramento CA 95813.

CV-172A/U facsimile frequency shift converter, instruction book — $85. Want 51J3 or R-388 receiver, Tom Howard, 46 Mt. Vernon St., Boston MA 02108. (617) 742-0916.

COLLINS R390 mint condition — $395; Collins KWS1 ser 1370, mint — $495; HW16 transceiver — $85, D104 w/stand, new cond. — $25; 4CX1000A, new — $85; Gonset Comm II, 2 m — $68. W2FNT, 18 Hillcrest Terr., Linden NJ 07036. (201) 486-6917.

CRYSTALS airmailed: general purpose, MARS: Novice, active FT-243, all frequencies, minimum five 40 m 15 m, 10 m — 99 c each, 80 m — $1.59 — cover bands inexpensively — rock solid. Less than five 80 m — $1.75 other — $1.50. Novice — four band, eight crystal, edge limit and QSO — package — $9.95, go 160 m, special FT-243 base — $1.90, five — $1.75 each. GP FT-243 .01% 32 pF, 3500-3600 — $1.90 ea. (five $1.75), (nets, ten same $1.45), 1700-3499, 8601-13000 fundamentals, 10,000-30,000 overtones $2.95. Add 50 c each for .005%, 75 c for HC-6-U above 2000. Airmail 15 c/crystal 1st cl. 10 c. Free order-listing. Bob Woods, W0LPS, "Since 1933." C-W Crystals, Marshfield MO 65706.

COLLINS 75S3B 30K round emblem, 32S3 516F2 late series — $1295; 312B4 — $135. Burce, W2RHE, 2609 Finlaw Ave., Pennsauken NJ 08109. (609) 662-6575.

SB-101 xcvr/cw filter, HP-23A, HP-13A, SB-600, SBA-100-1 (mobile mount), Turner 355c mike, excellent, manuals — $425, takes all FOB. Donald J. Mayhall II, WA5WQF, 835 Merridel Houston TX 77024.

SELL: Collins 75A-3 CV591A/URR ssb converter, Johnson Ranger. All very clean, in excellent condition. Best offers. WB8IPG, 26316, Falmouth, Warren MI 48089.

PERFECT HR-2 with .16/.76, .28/.88, .31/.91, .34/.94/.94 — $175 delivered; Ten-Tec PM-1 80-40 transceiver with cabinet, unopened factory carton — $44 delivered. K1LEC, Box 73, N. Springfield VT 05150. (802) 886-8121.

COLLINS 75S3B with 200 cycle filter serial 17959, 32S3 serial 11053 with 516F2 ac supply, 40L1 serial 17662, all mint, complete with manuals and cables — $1500, Heath 10-12 5 inch scope — $40; Knight KG686 rf generator — $25. WA9SZZ, 1715 South 16th, Manitowoc WI 54220.

SELL: Drake TR-4C AC4 power supply HW32 other equipment. Send sase for details. Chas. Cragle, 612 Mulberry, Shamokin PA 17872.

HEATH GR-54 general coverage receiver — $45; Hustler 4-BTV 40-10 meters trapped vertical — $25; crystals — $1 each. Transformer oil — $1/gal. All in good condition. Edward A. Urbanik, 923 Linda Vista Drive, West Chester PA 19380. (215) 696-5562.

WANTED: Heath SB-4W series and accessories. Sell — SB300, SB600 — $198 ppd. Alpine, 415 Demarest Ave., Closter NJ 07624. (201) 767-0123.

PAIR 7034/4X150A tubes, guaranteed ok — $10; LM10 frequency-meter with calibration book, excellent — $40; Heath VTVM — $12; Heath "Seneca" 6 & 2 xmtr — $95; Heath Pawnee 2-meter transceiver — $75. Joe Harms, W4BLQ, Box 158, Edgewater FL 32032.

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WANTED: QSTs from 1970 back, also QRP xcvr, Ultimate Transmatch. WA3NMW, Ed Herbert, 410 N. Third St., Minersville PA 17954.

SELL Drake TR-4 34PNB, AC4, MS4, RV4, DC3, SB200, Classic-33, package deal only. Best offer. K8YNO, 5632 Haughey, Wyoming MI 49508.

FOR SALE: Johnson kilowatt Matchbox, excellent condition — $150; Mosley Classic-36, unopened — $140. Alden Cook, 35 Hidden Village Rd., West Falmouth MA 02574. Phone (617) 548-1268.

SELL plate xfmrs 3600---3600 at 1 amp 110/220 pri — $25. Paul Bittner, 814 4th St., Virginia MN 55792.

TR-44, new, 100' cable — $75 postpaid. Paul Alexander, 1215 W. Madison, Kokomo IN 46901.

SBE-34 with mike — $1260. PY2DXI/W3, 1920 Old Forty Foot Rd., Harleysville PA 19438. (215) 368-7959.

SELL: Swan 350, 117-C VX-1, mike, manual mint condition — $295. W6DJZ, 3748 Floresta Way, Los Angeles CA 90043. Phone (213) 294-0284.

HEATHKIT frequency counter, IB-101, frequency scaler IB-102, factory aligned, both — $225. Wm. S. McFadden, W8FDA, 29 Vernon Avenue, Wheeling WV 26003.

COLLINS 51J-4, serial 3333, product detector, 3 filters, excellent. Best offer over — $450. W4SVX, 306 W. Amherst, Melbourne FL 32901.

SELL: SB-301, SB-600 receiver with 400 cx filter, mint cond. — $225 firm. R. J. Melrose, 9949 Mango, Houston TX 77034.

QST's, CQ's 1946-1973, 3 for $1, prepaid. Sase, W3FYW, 9 Diane Drive, Malvern PA 19355.

SELL: Hallicrafters SX101A receiver, perfect inside and out, price — $135; will ship. R. Mazzucca, 63 E. End Ave., Shrewsbury NJ 07701. (201) 741-6896.

VLF receiver 15-600 kHz in 4 bands, excellent Navy type RBA — $75. W5NCY 2721 Robert E. Lee, New Orleans LA 70122.

LAVOIE Spectrum Analyzer UPM-17 (18 m) band switching 10 mc-16gc — $350; R-244 receiver 215-234 mc w/deviation and "S" meters — $35; APR-5A receiver 1000-6250 mc — $60. Trade vhf/uhf gear, list sase. W4API, Box 4095, Arlington VA 22204.

SELL: Drake 2-C and 2-NT — $275. Bob DuVal, 621 East 26 St., Brooklyn NY 11210. (212) 859-2758.

MUST sacrifice Collins 32S3 — $595, 516F-2 pwr — $75; 75S3B — $595; 312B-4 speaker console — $125 ship FOB. W. Casby, 40 Cooper Road, Red Bank NJ 07701.

jE-Z way RBS-40 crank down, tilt over tower ground post, Ham-M, Classic-33 antenna. WB2MOI, 16 Raynor Ave., Mt. Vernon NY 10552.

WANTED: Swan 500-350 or 270 with ac ps and manual in good working condx, cash or trade. Box 8352, Savannah GA 31402.

HEATH SB-301 and SB-600 for sale — $200. Also HW-16 and speaker — $75. W. P. I. Wireless Assoc., c/o Allen Carnicke, Pres., 29 Clarkson Street, Bridgeport CT 06605.

SELL: Yaesu FTDX560 — $400; 18AVT/WB — $40; Mosley CL-33 — $85. W1RML, 31 Midwell Rd., Wethersfield CT 06109.

NEED money for college Must sell-out. Heath SB-401, SB-303 with a-m/cw filter; SB-600 speaker. Excellent, all for — $575 or best. HW-16 plus xtals — $80 or best. Looking for HW-22A or HW-101. WB9HPJ, 6649 South Fairfield, Chicago IL 60629.

AMPEX 7500 color vedeo tape recorder — 1" format, mint condition, spare head — $600 or trade for ssb transceiver WB2GKF, Stan Nazimek, 506 Mount Prospect Avenue Clifton NJ 07012.

NATIONAL NCS-3 transceiver and ac power supply, Heathkit electronic keyer, and EV619 microphone. All for $260. Excellent condition. Milbury, WA1JKO, RFD No. 3, Manchester NH 03103. (603) 434-4557.

ROBOT model 70 SSTV monitor, 6 mo. old — $225. WA8KBL, Paul Lange, 715 W. Jackson, Flint MI 48504. (313) 238-5939.

WANT 62S1 Collins transverter, State price and condition. W9LV, 6303 Lands End Lane, Indianapolis IN 46220.

WANTED: Heath HX-10 transmitter in good working condx. Doug Behrendt, 641 Longford, Rochester MI 48063.

ESTATE W3BI, R4A, T4X, MS4 — $500. kW Matchbox — $100; Waters 369 reflectometer — $35; Electrovoice 664 mic — $30; Waters II Hybrid coupler — $25; Triplett 630 — $25. George Weed, Pardee Lane, Wyncote PA 19095. (215) 887-2682.

COLLINS 75S-3B round emblem (ser. no. 85285). Mint — $575. Robert D. Sherwood, 2159 N. 65th St., Milwaukee WI 53213. (414) 257-0982.

SELL: 75S-3C — $850; 32S-3 — $775; 516F-2 — $100; 62S-1 — $500; BTI LK-2000HD — $595. W3GN, 209 Florida St., Laurium MI 49913. (906) 337-2499.

SIGNAL/One: New, revised, complete CX7A/CX7, technical operating manuals, prepaid — $27. New CX7A, sealed, warranty — $1895. Mint, used — $1295. Payne Radio, Box 525, Springfield TN 47172. Days (615) 384-5573. Nites (615) 384-5643.

SELL: Heath HW-16 — $80, Calrad SWR — $15, WN9LEX, Jeff Hudgens, 2107-103 Hazelwood, Urbana IL 61801. (217) 367-9468.

SWAP 1st edition (1926) and other editions ARRL Handbook. Want 2nd, 5th, 15th editions. K6WM, 850 Groff Pomona CA 91768.

HEATH SB301 with cw filter — $175. K. F. Casey, 2904 Roma Terrace, Manhattan KS 66502.

SELL: Swan 270B from estate of W5MOQ, used only a few hours, absolutely like new — $360. W5LJT, 11927 Wink Dr, Houston TX 77024. (713) 781-2470.

COLLEGE bound: must sell all, HW-100, SB-600, HP-23A, Electro-Voice 911 mike, excellent condition — $250 or best offer. All replies answered. Glenn Scott, 7130 Nancy St., Columbia SC 29204.

HEATHKIT Apache — $85; Mohawk & spkr — $115; the pair — $175. Fine shape with manuals. No shipping. K1GAW, 484 Main St., Portland CT 06480.

WA1PIP college bound, mint, factory aligned and tuned Heath's HW-101, HP-23A, SB-600, HDP-21A, HN-31 — $895. Also brand new DX-150A receiver — $79 and Hy-Gain 18AVT/WB — $49. Box 306, Williston VT 05495.

HT-44 and power supply extra final tubes — $200; SX-117 rec. both in best condition — $200. Almost new 18AT/WB antenna — $30. Also 444-T mic — $20. A. E. Wilson, Sr., Box 392, East Brewster MA 02640.

MOTRACS: Late solidstate models, Hi-Band, low-split, with all accessories and manuals. A-1 condition. Best reasonable offer. Paul Cuda, WA7QEX, 13502 SE Harold St., Portland, OR 97236 Tel. (503) 760-2846.

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FOR SALE: CX7A with 400Hz cw filter, maint. manual plus two 8072 tubes, $1450 plus shipping. John Hipp, P.O. Box 431, New Milford CT 06776. Tel. (203) 354-9735 anytime.

SELL — HQ-140X, DX-60B, HG-10B, All for $110.00. You ship. Gene Elmore, Jr., 209 Vallis, Spencer WV 25276.

SELL: Hy-Gain 2 Element 40 Meter Beam and balun $95. Keith Bryant, 115 Laffer, Sigourney IA 52591.

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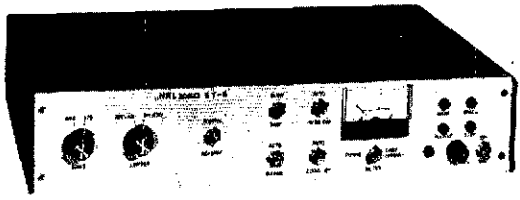

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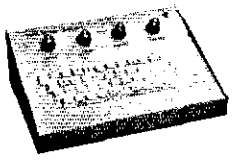

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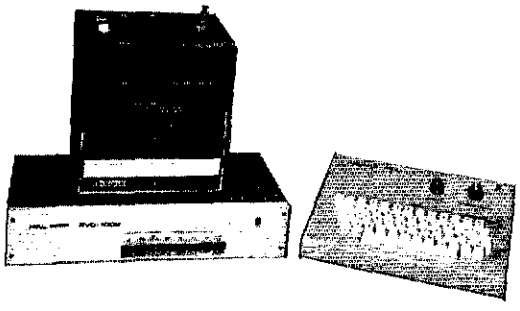

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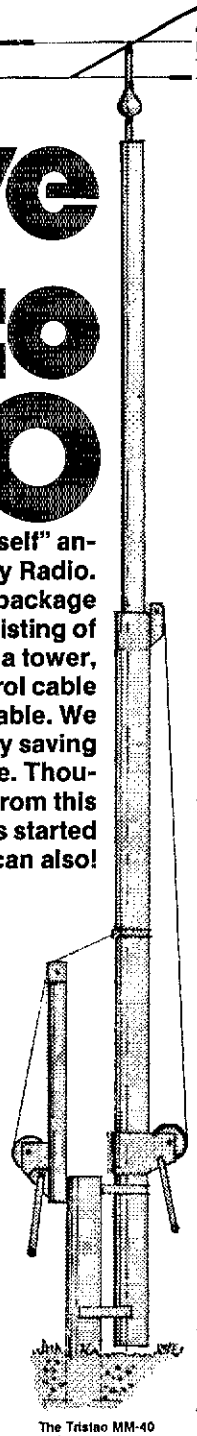

The Tristao MM-40 with accessories shown

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Optional MRB-80 rotor base	98.95
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Optional MAF-40 raising fixture	104.95
Optional MARB-40 rotor base	225.45
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* These antennas are not recommended for use with the MM-40 or the MW-35
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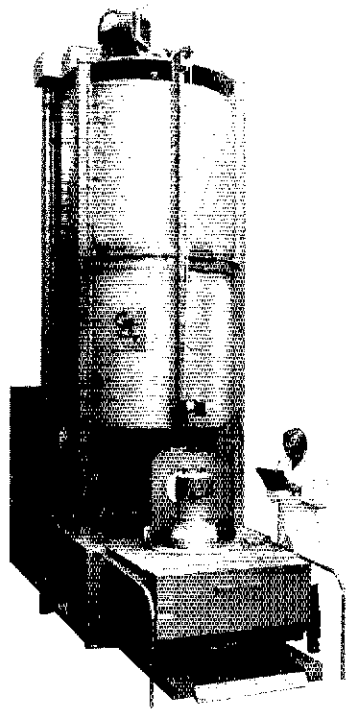

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