July 1973
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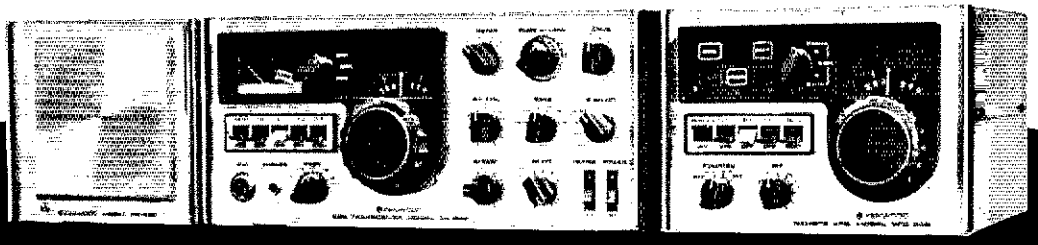

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FEATURES: • Break - in CW with sidetone • Built - in 100 KHz and 25 KHz crystal oscillator • Built - in RIT and RIT indicator light • Built - in RTTY frequency shift for FSK • Built - in noise blanker • Built - in VOX • Modular construction — repair in or out of equipment • RF AGC to prevent front end overload to strong signals • Completely solid state except final section • 1 KHz readout

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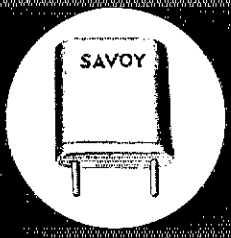

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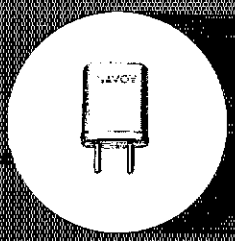

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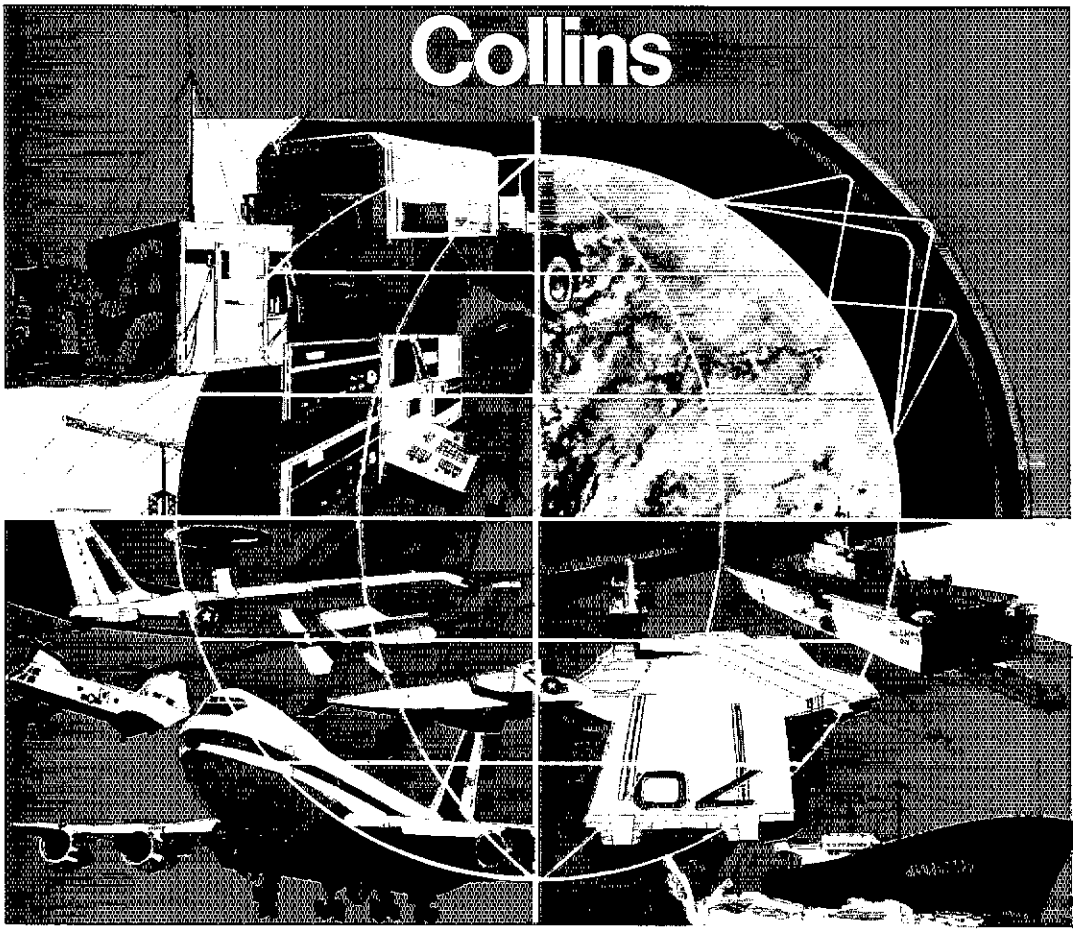

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QST

JULY 1973

VOLUME LVII NUMBER 7

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— CONTENTS —

TECHNICAL —

An FM Adapter for 2-Meter A-M Transmitters — *Austin Davitt, K1MHD* 11

An 80-Meter Pebble Pulverizer — *Doug DeMaw, W1CER and Gus Wilson, W1NPG* 16

A Simple Computing SWR Meter . . . *David Fayman, W@GI* 23

A Practical Approach to Two-Meter Frequency Synthesis, Part II — *Peter J. Bertini, K1ZJH, and Richard Van Hooft, WB2MBI* 34

1296 Revisited . . . . . *William O. Troetschel, K6UQH* 40

Technical Correspondence 45

Additional Notes on the Amateur Station Counter — *Josef Schrabal, WA2USS* 48

Mini-Powerhouse on Wheels . *Charles A. Rankin, WA2HMM* 52

Recent Equipment

The Henry Radio TS-900 56

The Sixth Amateur Satellite, Part I . . *Jan A. King, W3GEY* 66

BEGINNER AND NOVICE —

Where Can I Buy the Parts? . . . . . *Lew McCoy, W1ICP* 13

OPERATING —

The SET of '73 . . . . . *William Mann, WA1FCM* 72

DX Competition High-Claimed Scores 79

False Alarms 84

GENERAL —

The QRP Challenge – Barbados Style *Doug DeMaw, W1CER* 62

Oscar News 65

Is Prose Listening? . . . . . *John G. Troster, W6ISQ* 80

The Origin of Amateur Radio *Vicente Gasper Huelbes, EA4EX* 83

FM Repeater News 101

ARRL QSL Bureau 95
Coming Conventions . . . 95
Correspondence 90
Feedback 64
Hamfest Calendar 94
Happenings of the Month . 96
Hints & Kinks 54
How's DX? 106
I A R U News 92
"It Seems to Us . . ." . . . 9
League Lines 10
New Apparatus 50
New Books 82
Operating Events 118
Operating News 114
Public Service 84
Silent Keys 53
Station Activities 120
World Above 50 Mc. . . . 102
YL News & Views 111
W1AW Schedule 115
25 and 50 Years Ago in *QST* 93

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1200W PEP

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160M THROUGH 10M

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AC POWER SUPPLY

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FLdx400 operates SSB, (USB LSB selectable), AM, CW and FSK. Circuitry can be built in for RTTY operation. 240 watts PEP. VOX, PTT, and break-in CW.

FL-2000B grounded grid linear uses a pair of 572 B tubes. Plate meter VSWR monitor, 2 fans, built-in power supply, 80 through 10 meters, 1200 watts PEP with distortion product in excess of 30 DB down.

FT2FB $239.00
144 148Mhz
10W HIGH 1W LOW

FT2-AUTO $379.00
144 148Mhz

FP-2 AC power supply specifications: Output - 13.5 volts, 2 amps. AC input - 100/117/220/234 volts. Speaker - 5" x 3-1/5". Portable or home base operation can be achieved with the addition of the optional FP-2 power pack. This AC power pack provides regulated DC power for the transceiver and charging voltage for optional leak proof rechargeable colloidal type batteries. In addition, a high fidelity elliptical style speaker is built into the pack.

The FT-2FB opens the door to noise free broadcast quality 2 meter operation, and thanks to the repeater stations throughout the country, the 2 meter band is no longer restricted to line of sight. General coverage 144 to 148 MHz, 12 channels (3 supplied). Push to talk. Receiver .3 amps, transmit 1.7 amps, power source 13.5 volts + 10%. Dimensions 6-3/8" w. x 2-1/2" h. x 10" d., weight 4 lbs. Comes with dynamic microphone, connector plug, DC cord, fuse and mobile mount.

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SPECIFICATIONS

	YC-356D		YC-356D		YC-356D
Frequency range	5Hz to 35MHz (50Hz to 200MHz)	MAX Input Voltage	60Vp-p, less than 10 sec 15V p-p		220(W)X80(H)X270(D) (8 3/4 W x 3 3/4 H 10 1/2 inches)
Accuracy	Time base stability + 1 count	Input Impedance	HIGH 1 M ohm, Low 56 ohms	Weight	
Display	6 Digit	Input Capacity	Less than 20pF	Tube Display tube	6
Sampling time	1 multi sec. or 1 sec.	Time base Frequency	1 MHz Crystal controlled	Semi-conductors Silicon diode	12
Display time	0.1 sec 2 sec	Stability	0.0005% at 25° C 0.0025% at 0° - 40° C	Silicon transistor	9
Frequency Unit	KHz, MHz	Power Requirements A C	100/110/117/200/220/234V 50/60Hz 18V A	FET	1
Display	Display tube	D C	12—14.5V 1A	IC	26
Input Voltage	20mV—20Vp-p (0.05V—5Vp-p)				

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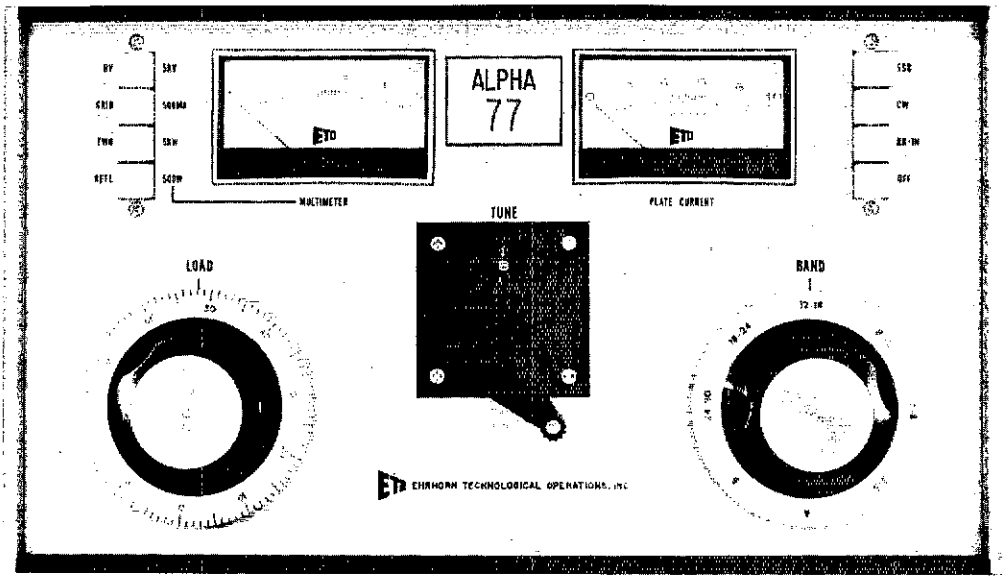

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Reports Invited. All amateurs, especially League members, are invited to report station activities on the first of each month (for preceding month) direct to the SCM, the administrative ARRL official elected by members in each Section. Radio club reports 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 ORS. 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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Manitoba	VE4EQ	Steven Fink	14 Grandcrest St.	Winnipeg 17, Manitoba
Maritime	VE1AMR	Walter D. Jones	79 Waverley Ave.	Moncton, N.B.
Ontario	VE3OV	Holland H. Shepherd	3016 Cowan Cres.	Ottawa, K1V 8L1
Quebec	VE2ALE	Joseph Unsworth	163 Mgr. Bourget	Vaudreuil, P.Q.
Saskatchewan	VE5RP	Percy A. Crosthwaite	R.R. 3	Saskatoon S7K 3J6

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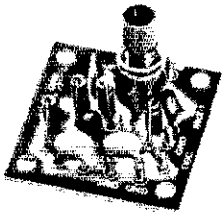

1. MXX-1 TRANSISTOR RF MIXER

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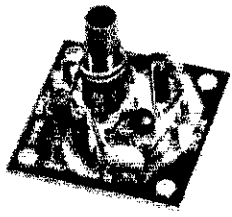
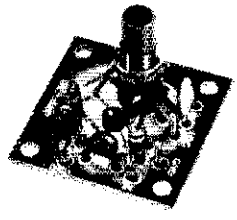


2. SAX-1 TRANSISTOR RF AMP

A small signal amplifier to drive MXX-1 mixer. Single tuned input and link output. Lo Kit 3 to 20 MHz, Hi Kit 20 to 170 MHz (Specify when ordering).....**$3.50**



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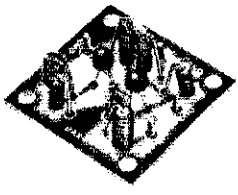

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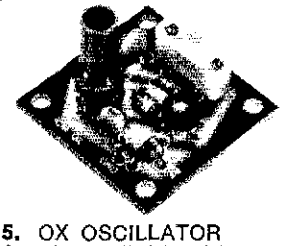

5. OX OSCILLATOR

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THE AMERICAN RADIO RELAY LEAGUE, INC.,

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

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

"Of, by and for the amateur," it numbers within its ranks practically every worth-while amateur in the nation and has a history of glorious achievement as the standard-bearer in amateur affairs.

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

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

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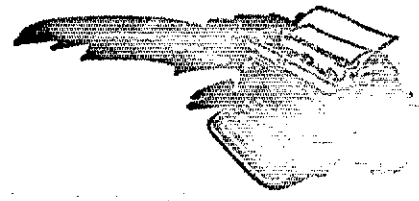
"It Seems to Us..."



PETITION DELUGE

IT IS RATHER disconcerting to examine a listing of petitions filed with and awaiting action by the Federal Communications Commission for changes in amateur rules or procedures. This is both because of the length of the list, and the wide variety of changes proposed.

A couple of years ago there were about 45 such requests on file, and 18 others had just been disposed of as part of Docket 19162, proposed voice band changes. A new crew in the amateur division of FCC resolved to work on that backlog. Indeed, a year later, in mid-1972, some 18 more had been processed – incorporated into rule-making proposals, denied, or otherwise handled. Yet during the same period, something like 24 new ones arrived and had to be added to the list!

An appraisal today shows almost identical results the past twelve months – more petitions being filed than the FCC staff can adequately process. Thus the backlog keeps getting larger rather than smaller. (These are our counts, incidentally, and rough ones, but while they might not be precise, they indicate the trend.)

More often than not, petitions come from individuals. More often than not, they seek a special privilege or special consideration in a limited area rather than having an overall look at amateur radio. Often the petitions overlap in coverage, and in some cases are almost duplicates. This all adds up to a considerable amount of extra work for the Commission staff. Perhaps it also prompts a feeling in official circles that we hams are a bit disorganized.

Under our democratic system, governed by the Administrative Procedure Act, anyone has the right to submit a petition seeking changes in federal rules which he thinks will be beneficial – either to himself, or to a group. And the government agency involved is obliged to give it consideration, whether it really makes any sense or not, and whether it comes from a national organization of 100,000 members, or whether it comes from Johnny Ham in West Gibroux.

We don't for a moment propose changing that system. But we do suggest that budding petitioners should have second thoughts before typing up and firing off to FCC their pet ideas for rules changes. Talk it over first with fellow hams. Not on the air – most of us are too polite to take issue in such casual conversations. Take it up with the local club, and at a hamfest or convention. Ask for honest, critical appraisal. If you can't get endorsement from a substantial majority of such a group, you're wasting your time with the petition anyway, eh?

If you send a petition to FCC you can count on typical delays of one to three years before it is acted upon. Will your brainchild stand that test of time, or will it make you (and us) look foolish when the Commission finally takes action? In November, 1969, ARRL filed a petition, which still is pending, asking for expanded privileges for Technicians. Since then, more than a score of individual petitions requesting variations on the same theme have been sent to FCC – testifying to the basic validity of the idea, to be sure, but largely duplications of effort. On the other hand, we recall a petition submitted by a "progressive" magazine editor about ten years ago, apparently on a personal inspiration without taking the amateur pulse, asking that the top two MHz of six and two meters be opened up to amateur television. (Fortunately for present-day repeater users, the League filed in opposition to this unnecessary headache to FCC, and the petition was denied.)

As long as it's going to take several years for your pet idea to wend its way through Washington, why not take the time to check with ARRL Headquarters before submission? This will help avoid duplication or overlap with other petitions which may have been filed previously, thus permitting more detailed attention by the Commission to rules changes of wide significance to amateur activity. Like as not, Hq. will also refer you to your ARRL director – who is elected by the membership in your area to establish League policy in regulatory matters. Thus, your idea will have one additional outlet, and an additional test – that of a fully functional, responsive, representative, democratic system. QST

League Lines . . .

The 1973 ARRL Repeater Directory is now available, at no charge to members except postage. Send Hq. a self-addressed envelope larger than 6 x 9 inches, with 24 cents U.S. postage for first-class mailing. (Cross your fingers that new FCC regs do not mangle the listings beyond recognition!)

ARRL has requested postponement (to October 30) of the June 30 effective date of the new repeater rules (see p. 100), particularly in view of the fact that stated requirements for license applications and supporting material were somewhat confusing and subsequently were changed from time to time by rulings and interpretations from Washington. Incidentally, FCC has already granted the League's request for extension of time to comment on RACES proposals.

Another item now available from Hq. is the bound volume of annual reports, a comprehensive compilation of membership, regulatory, communications and business activities and results for the year 1972. It includes complete financial statements. Copies have been sent gratis to affiliated clubs, on request; see your club secretary. For a personal copy, send $1 to ARRL to cover cost of production and mailing.

In conjunction with the issuance of four U.S. commemorative postage stamps based on "Progress in Electronics," (see p. 60, June QST), Bruce Kelley, W2ICE, will deliver an illustrated lecture on behalf of the Antique Wireless Association at the Smithsonian Institution, Washington, D.C., on July 10. First-rate p.r. for ham radio!

Schedules for subjects to be treated at the ARRL Technical Symposium on Space Communications promise a most interesting afternoon and evening for September 14th at the Sheraton Hotel, Reston, Va., the day prior to the Roanoke Division Convention there. Additional offers for papers will still be considered, if submitted promptly. So let us know if you have a special technique or knowledge in satellite or related work you can share with technically-minded fellow hams. A brief abstract, please.

FCC apparently continues its concern about amateur use of autopatch in repeater systems. Never mind that 99.9% of such activity is not only in strict compliance with the rules, but often an outstanding public service prompting praise from authorities (e.g., reporting accidents rapidly to state police). That one incident of possible commercial or personal-business overtones is what FCC monitors will record, and is what will spoil things for the rest of us. Take heed!

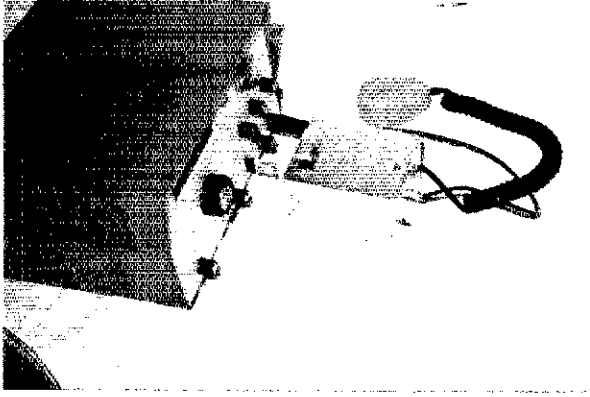
A "guest editorial" in a contemporary by an author who wishes to remain anonymous (after reading it, we can see why), aside from several errors of fact in attempting an armchair analysis of ARRL-FCC relationships, seems to ignore the basic principle that ARRL represents its membership, that when the membership becomes deeply concerned about what it considers restrictive regulations, this will also be the posture of the League. We are slightly amused that, after several pages of trying to take ARRL apart for its actions, the item admits, "Many amateurs . . . have expressed the view that portions of the recent Dockets are unrealistic and overly restrictive. Many amateurs have felt that the FCC reflects a picture of harassing the law-abiding amateur . . ." Right on!

Hq. has embarked on a joint project with NASA to encourage school use of OSCAR. Distribution of a curriculum supplement to science teachers on a pilot basis has drawn responses indicating strong interest. Copies are available to clubs to pass on to teachers in their communities.

Quote-of-the-month, from Chief Justice Warren in a broadcast case: "Calculated risks of abuse are taken in order to preserve higher values." In other words, don't write overly-restrictive regulations to try to catch every possible or imagined violation.

LATE FLASH — FCC PROPOSES 224-225 MHz FOR CB — SEE PAGE 51

An FM Adapter for 2-Meter A-M Transmitters



Now you can dust off that two-meter a-m transceiver that you have been storing all these years. This adapter will enable you to use the old rig to join the fm gang on the local repeater, or in simplex operation. No wiring changes are required inside the transceiver – just plug the output from the adapter into the crystal socket.

BY AUSTIN DAVITT,* K1MHD

A NEED to participate in the activity on fm initiated this project in converting a Clegg 22er, an a-m transceiver, to fm use. Normal operation of the Clegg 22er is unchanged. Only an addition external to the crystal socket is necessary. Fm reception is accomplished by slope detection.

Circuit Operation

As shown in Fig. 1, a unity-gain, high-input impedance circuit, U1, amplifies the audio from the microphone with minimal loading. C1 and C2 eliminate offset saturation of U2 and, in conjunction with R2, set a low frequency operating point of 8 Hz. The feedback (R3) establishes a voltage gain of 1000 for U2. A high-frequency roll off of 2 kHz is set by R3 and C3.

By placing a resistor (R4) in series with the output of the second op amp (U2), this amplifier is made to act as a current source. This current source varies the capacitance of CR1, and thereby changes the frequency of operation of the crystal. This change, when multiplied 18 times for two-meter operation, is capable of producing up to 10 kHz of deviation.

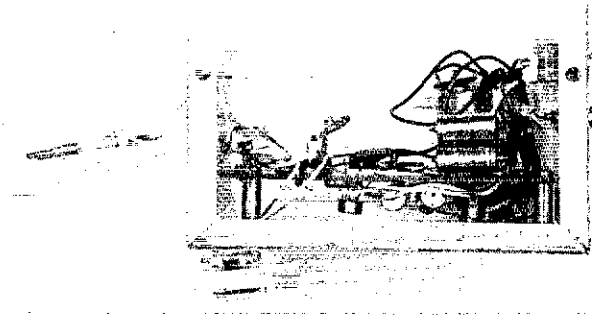
* 123 Paine St., Worcester, MA 01605.

Construction

The adapter is housed in a Bud CU-3005-A Minibox, 3 × 4 × 5 inches. A small piece of perf board is used to hold the components in place, with point-to-point wiring throughout. Those who are adept at layout and construction by the pc board method should find no problems in transferring the circuit.

Connection to the crystal socket of the a-m transmitter is via a two-pin plug of the type commonly used to connect TV Twin-Lead together. A male plug is fastened to the end of a pair of wires for the output of the adapter, and a female cable connector of the same style is used as a socket for the crystal. A standard crystal socket may be used in place of the cable connector.

The perf board is mounted on two metal spacers to support it approximately one inch from the bottom of the Minibox. The op amps are mounted under the board, between the board and



The adapter as seen from the side. The perf board is supported by two metal spacers. U1 and U2 are visible between the board and the chassis. C7 and C8 are above the board on the right. The output connector is to the left, with the crystal shown plugged in to J2 under the Minibox.

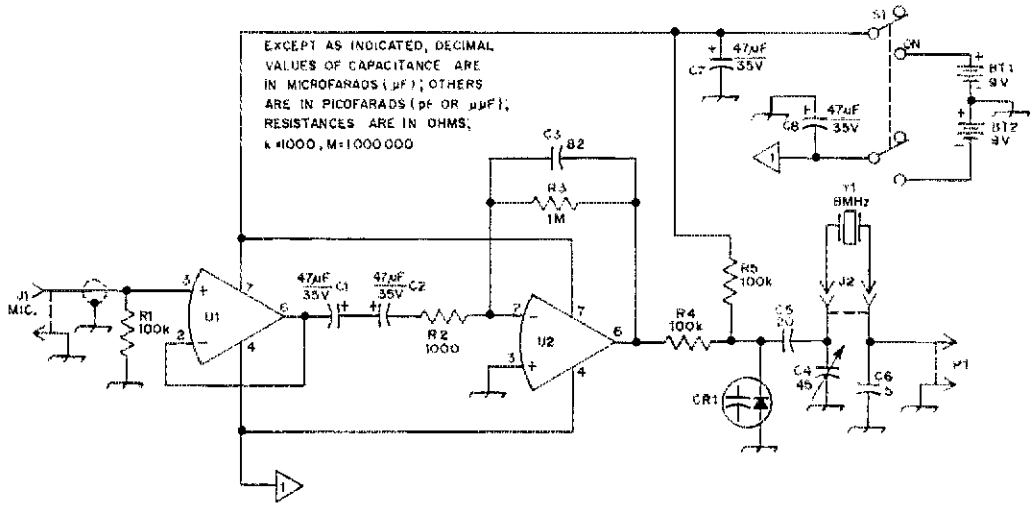


Fig. 1 — Schematic diagram of the adapter.
C4 — 7- to 45-pF ceramic trimmer, Centralab 822 BN or Erie 503 000D-7-45.
CR1 — Varactor diode, Motorola MV 1632 or equiv.
J1 — Microphone connector to match station equipment. Phono type used here.
J2 — Transmission-line connector, Mosley 300 series or Lafayette 99P40082.
P1 — Transmission-line connector, Mosley 300 series or Lafayette 99P40073.
S1 — Dpst miniature toggle switch.
U1, U2 — μA741 op amp.

the chassis. Two small batteries are contained in the box to provide the +9 and −9 V for the op amps. No other power connections are needed. The microphone connector is a phono-type fitting but the constructor may use whatever is compatible with the station microphone. Push-to-talk connections, if any, should be wired straight through to a connector that will fit the transmitter.

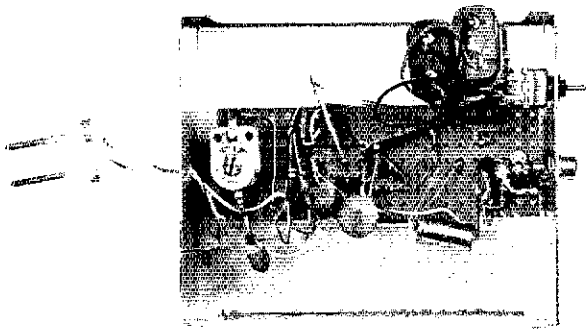
Adjustment and Use

The crystal frequency may be adjusted by means of C4 for proper netting to the repeater input. C5 and C6 also affect the frequency of operation. In addition, C5 and CR1 determine the amount of deviation, audio quality, and center frequency. There is considerable interaction between components in this part of the circuit, and a change in one value may well require a subsequent change elsewhere to obtain good results.

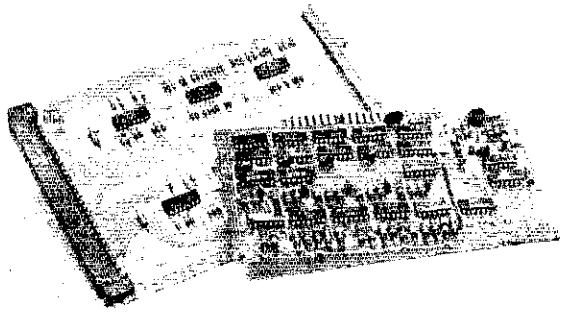
Good-quality crystals are recommended for use with the adapter. Those used by the author were 8-MHz commercial standard units. Other crystal frequencies, such as 6, 9, or 12 MHz, should perform well also. Again, some juggling of values for C4, C5, C6, and the bias on CR1 may be required to obtain optimum performance with crystals other than that specified.

The adapter is quite simple to connect and use. The audio or microphone gain control on the transceiver should be turned to minimum. A crystal should be plugged into J2, and P1 in turn connected to the crystal socket in the transceiver. The microphone connects to the adapter and the push-to-talk switch, if any, to the transceiver. The transmitter is tuned and adjusted for loading in the normal manner.

Since the bias on CR1 affects the junction capacitance, adjustment of the transmitter frequency should be done with the adapter turned on. If the builder finds that an audio gain control is necessary, a potentiometer may be connected between C2 and R2. One end of the control should be grounded, the other end connected to C2, and the wiper arm to R2. A value of 5000 ohms for the gain control should do. QST



Two 9-volt batteries within the box supply power for the adapter. They are seen here near the on-off switch, S1, at the upper right. J1 is mounted on the right end of the Minibox. C4, the frequency-adjustment trimmer, is mounted on the left end of the perf board.



Typical of the tremendous values available in the surplus market and at flea markets are these computer cards. The larger of the pair has digital ICs, and high-speed switching diodes of the 1N914 variety. The smaller pc board contains 21 logic ICs, plus a group of 5-percent-tolerance resistors, disk ceramic capacitors, a bipolar transistor, and some diodes. Total cost for the pair of boards was 50 cents!

Where Can I Buy the Parts?

Some Answers to the Ham's Shopping Problem

BY LEW McCOY,* W1ICP

PROBABLY THE MOST common complaint the League gets from the beginner is, "I would like to build those nice projects described in *QST* but *where* can I buy the parts?" Such a complaint is not unjustified because even amateurs living in large population centers have the same problem. In the good old days (!) the average radio-parts store owner was sympathetic to the radio experimenter's needs and maintained large inventories. It was customary in those days for a ham to walk into a radio emporium, his *QST* in hand, and have the clerk fill his order right down to the last resistor. But alas, those days are gone, and probably forever.

However, don't be disheartened. Simply because the large emporiums and chain stores don't want to be bothered with small orders doesn't mean there is no hope. One can still get all the parts for a project, but it now means going to more than one supplier. As you will see from this article there are many dealers interested in selling parts to home experimenters. More on this in a moment.

Flea Markets and Auctions

Probably the cheapest approach to acquiring a well-stocked parts inventory for your ham shack is via the "flea" market. Many radio clubs sponsor hamfests, conventions, and amateur get-togethers. It has become almost standard operating procedure for such groups to include flea markets as a feature of those meetings. At the Dayton Hamvention this year, for example, there were literally hundreds of dealers and amateurs who were selling ham gear and parts. How does one find out about such affairs? Simple. Just check the hamfest and convention calendar that is given each month in *QST*. In addition to being able to buy all those goodies you'll have the pleasure of meeting other hams and making in-person contacts.

Still another source of parts is radio club auctions. Nearly all radio clubs run an annual auction to augment their treasuries. As a newcomer to amateur radio it would behoove you to find out where the local club meets and get to know the members. Radio club auctions provide an excellent opportunity to acquire parts, and usually at very economical prices.

Buying by Mail

All of the dealers that are listed at the end of this article were queried as to what they sold, if they had a catalog available, and if so, what it cost. We have listed the price of the catalog for each dealer. The letter coding in Chart I shows what the dealers carry for stock. Also, where we have such information, we have listed minimum order requirements.

If you want to build your own gear, start accumulating a catalog file. With a little searching, you'll find that nearly any desired part will be listed in at least one of the catalogs. You'll want to compare prices on items because there can be a wide variation from dealer to dealer. We went through some of the catalogs of dealers who specialize in solid-state devices. One integrated circuit was chosen for a comparison and it was discovered that the prices for the unit ranged from

* Novice Editor, *QST*.

L	Adirondack Radio Supply	
*	185-191 West Main St.	
**	PO Box 88	
	Amsterdam, NY 12010	
L	Allied Electronics	
* $1	2400 W. Washington Blvd.	
** $10	Chicago, IL 60612	
A	Allied/Radio Shack Stores	
*	(See local phone directory)	
L	Amateur Electronic Supply	
* free	4828 W. Fond du Lac Ave.	
**	Milwaukee, WI 53216	
B	Amidon Associates	
* free	12033 Otsego Street	
** none	N. Hollywood, CA 91607	
L	AM Tech	
* free	PO Box 624	
**	Marion, IO 52302	
M, N	Andy Electronics	
* free	6427 Springer	
** f	Houston, TX 77017	
M, N	Associated Comtronics	
* sase	PO Box 200	
** none	Port Jefferson Station	
L	L.I. NY 11776	
O	Atlantic Surplus Sales	
* free	580 Third Avenue	
** none	Brooklyn, NY 11215	
B	Barken Electronics	
* free	274 Mt. Pleasant Ave.	
** none	Livingston, NJ 07039	
L	Barker & Williamson, Inc.	
* free	Canal St.	
**	Bristol, PA 19007	
L, M, N	Barry Electronics	
** 50¢	512 Broadway	
* $5	New York, NY 10012	
M, N	Budget Electronics	
* free	2704 West North Avenue	
** $10	Chicago, IL 60647	
L, M, N	Burstein-Applebee	
* free	3199 Mercier Street	
** $5	Kansas City, MO 64111	
L	Cambridge Thermionic Corp.	
* free	445 Concord Ave.	
**	Cambridge, MA 02138	
C, P	Circuit Board Specialists	
* free	3011 Norwich Ave.	
** none	Pueblo, CO 81008	
A, E	Circuit Specialists Co.	
* free	PO Box 3047	
** none	Scottsdale, AZ 85257	
J	Theodore E. Dames Co.	
* free	308 Hickory St.	
**	Arlington, NJ 07032	
I, M, N	Delta Electronics Co.	
* free	PO Box 1	
** $3	Lynn, MA 01903	
L	Dominion Radio & Electronics Co.	
* free	535 Yonge St.	
** none	Toronto, Ontario, CANADA	
L	Electronics Distributors, Inc.	
* free	1960 Peck Street	
**	Muskegon, MI 49441	
L	Electro-Sonic Supply	
* free	543 Yonge St.	
** $5	Toronto, Ontario, Canada	
B	Elna Ferrite Labs, Inc.	
* free	(Ferroxcube Products)	
** none	9 Pine Grove Street	
	Woodstock, NY 12498	
B, J	E. S. Electronic Labs	
* free	Box 434	
** none	Excelsior Springs, MO 64024	
M, N	Fair Radio Sales	
* free	Box 1105	
**	Lima, OH 45902	
P	Gregory Electronics Corp.	
* free	249 Rte. 46	
**	Saddle Brook, NJ 07662	
A, H	HAL Devices	
* free	Box 365	
** none	Urbana, IL 61801	
L	Ham Radio Center	
* free	8342 Olive Blvd.	
**	St. Louis, MO 63132	
I, K	Hammond Transformer	
* free	394 Edinburgh Rd.	
** $10	N. Guelph, Ontario	
	CANADA	
	U.S. Distributor for Hammond:	
	Genesee Radio Co.	
	2550 Delaware Ave.	
	Buffalo, NY 14216	
A	Harrison Radio	
* none	20 Smith Street	
**	Farmingdale, L.I., NY 11735	
M, N	Hazelton Scientific Co.	
* free	Box 163	
** none	Hazel Park, MI 48030	
A	Heath Co.	
* free	Benton Harbor, MI 49022	
**		
A	Henry Radio	
* none	11240 W. Olympic Blvd.	
**	Los Angeles, CA 92801	
L	Hobby Industries	
* free	Box 864	
**	Council Bluffs, IA 51501	
D	International Crystal Co.	
* free	10 N. Lee Street	
** $5	Oklahoma City, OK 73102	
D	JAN Crystals	
* free	2400 Crystal Drive	
**	Ft. Myers, FL 33901	
A, M, N	Jeff-Tronics	
* 25¢	4252 Pearl Road	
** $2	Cleveland, OH 44109	
C	Kepro Circuit Systems	
* free	3630 Scarlet Oak St.	
** none	St. Louis, MO 63122	
F	Kirk Electronics Division	
* free	Electrotec Corp.	
** $10	400 Town St.	
	East Haddam, CT 06423	
L	Lafayette Radio Elect	
* free	111Jericho Tpk.	
** none	Syosset, L.I. NY 11791	
	(See local phone directory)	
M, N	John Meshna, Jr	
* free	Box 62	
** $5	E. Lynn, MA 01904	
MFJ	MFJ Engerprises	
* free	PO Box 494	
**	Mississippi State, MS 39762	
A, E	Milgray Electronics Inc.	
*	191 Hanse Avenue	
**	Freeport, NY 11520	
A, G, H	James Millen Mfg. Co.	
* free	150 Exchange Street	
** $5	Malden, MA 02148	
A, G, L	J. W. Miller Company	
* free	19070 Reyes Avenue	
**	Compton, CA 90224	
A, M, N	North American	
* free	Electronics Ltd.	
** $3.50	2407 St. Catherine St. East	
	Montreal, 134, Quebec	
	CANADA	
N	Nurmi Electronic Supply	
* free	1727 Donna Rd.	
** $5	West Palm Beach, FL 33401	
L	Olsen Electronics	
* free	260 S. Forge St	
**	Akron, OH 44327	
F	Payette Radio	
* free	730 ST-Jacques O.	
**	Montreal 101, Quebec,	
	CANADA	
A	C. M. Peterson Co. Ltd.	
* free	575 Dundas St	
** none	London, Ontario	
	CANADA	

Flea markets offer excellent opportunities to augment your junk box. This shot shows one of the booths at the annual Rochester, New York Hamfest. *(Photo courtesy of the Rochester Amateur Radio Assoc.)*

$5.00 all the way down to 30 cents. There may be slight differences in the specifications of a particular device but it pays to take the time to shop.

One way to avoid delays in shipment is to use bank or postal money orders. While nearly every supplier will accept a personal check, some wait until the check clears before filling the order. Also, with the mail service as bad as it is these days, figure at least three weeks from the time of mailing the order to receiving the merchandise.

Chart I

Nearly all of the dealers that are listed in Chart I are there because they answered a questionaire sent out by *ARRL*. By querying them we know they are in business and are interested in filling ham orders, small or large. We have purposely *not* listed those distributors whose minimum order exceeds $10. The minimum-order syndrome makes it difficult to do business with some firms. One company we know of asks for a $50 minimum, so they certainly are not interested in small ham orders – and probably wouldn't even bother to answer your mail queries.

You'll notice also that the Heath Company is listed in the chart. While they are primarily a dealer in kits, they now have distributors around the country, listed in their catalog, who sell components in their stores. In addition, each Heath

(Continued on page 33)

J	Piezo Technology, Inc.	A, C, E	Trigger Electronics
* free	Box 7877	* free	7861 North Ave.
**	Orlando, FL 32804	** none	River Forest IL 60305
E, M	Poly Paks	O	Typetronics
* 15¢	Box 942	* sase	Box 8873
** none	Lynnfield, MA 01940	** none	Ft. Lauderdale, FL 33310
M, N	Precision Systems	E, M	Weinschenker, K3DPJ
* free	PO Box 6,	* free	Box 353
** $2	Murray Hill NJ 07974	** none	Irwin, PA 15642
D	Savoy Electronics, Inc		
* free	Box 7127		
** none	Ft Lauderdale FL 33304		

Chart I Coding

A	– New Components
B	– Toroids and Ferrites
C	– Etched-circuit board materials
D	– Transmitting and receiving crystals
E	– Solid-state devices
F	– Antenna hardware
G	– Dials and knobs
H	– Variable capacitors
I	– Transformers
J	– I-f filters
K	– Cabinet and boxes
L	– All of above, general distributor
M	– Surplus parts
N	– Surplus assemblies
O	– RTTY equipment and parts
P	– Surplus fm gear and parts

* Catalog price
** Minimum billing

To the best of our knowledge, the suppliers shown in Chart I are willing to sell components to amateurs in small quantities by mail. This listing does not necessarily indicate that these firms have the approval of ARRL.

D	Sentry Mfg. Co.	A, P	Spectronics, Inc.
* free	Crystal Park	* free	1009 Garfield Street
** none	Chickasha, OK 73108	** none	Oak Park, IL 60804
F	Skylane Products	J	Spectrum International
* free	406 Bon Air Avenue	* free	PO Box 1084
** $10	Temple, Terrace, FL 33617	** none	Concord, MA 01742
		M, N	Star Tronics
		* free	Box 17127
		** $4	Portland, OR 97217
		M, N	Surplus Electronics
		* free	10518 Connecticut Ave.
		** $5	Kensington, MD 20795
O	Teletype Corp.		
	5555 Touhy Avenue		
	Skokie, IL 60076		
K	Ten-Tec Inc		
	Highway 411, E.		
	Sevierville TN 37862		

Tube be, or not tube be? That is a question asked by many builders of amateur equipment in this era of semiconductor technology. An academic outlook would no doubt suggest using whichever component — tube or transistor — that provides the best performance per dollar. Availability of component parts enters the scene too, so the decision must be that of the constructor. This article describes a tube-type, low-power cw transceiver that performs as well as most solid-state counterparts. Mary Jane Long, ARRL Production Assistant, is shown here as she listens to a W1AW code-practice session.

An 80-Meter Pebble Pulverizer

A Tube Man's QRP CW Transceiver

BY DOUG DE MAW,* W1CER AND GUS WILSON,** W1NPG

THERE HAS BEEN more than occasional reference over the years to "rock crushers," taken in the amateur's vernacular to mean a high-power transmitter. At medium power levels we encounter the formidable "gravel grinders" used by many amateurs. Next comes the so-called "peanut whistle," which generally relates to gear built for QRP (very low power) work. Since peanuts aren't used in the circuit described here, and because the rig doesn't whistle (it is hoped!), we chose to call it a pebble pulverizer. Pebbles in this instance might represent tiny stepping stones (backwards) to the use of vacuum tubes, the latter of which are still preferred by some equipment builders. The writers have been beating the drums for solid-state circuits rather loudly in recent years, despite complaints registered by a few *QST* readers that, "There's nothing in the journal for tube-oriented people." It became necessary to address ourselves to this matter, while proving whether or not we still knew what to do with tubes once we had them in our hands!

The project had to be simple, evolve as a complete one-band amateur station, and should have some of the refinements found in modern equipment. We tackled the assignment with moderate enthusiasm, putting the drafting pen to work at drawing those strange symbols we had almost forgotten . . . circles with grids, plates and cathodes contained within! It was decided that readily available valves should be employed (TV tubes), and that the remainder of the parts should be as standard as possible. This would make the unit easy to duplicate from a parts-procurement viewpoint.

A block diagram is shown at Fig. 1 to illustrate how the circuit is arranged. A word of caution might be in order before continuing with this article: If you feel tempted to build this circuit after perusing the block drawing, and if you've been out of the tube game for an appreciable length of time, remember that there's a 250-volt bus to avoid! Having worked with operating voltages of 15 or less for several years, the authors became electrified – literally – after putting their fingers into the operating circuit while testing the transceiver. "All work and no play . . . ." can make Jack a dull boy, at least if Jack has been working with transistors for a long time!

Concerning the Basic Design

A power-output level of nearly zero to 10 watts is available from the transmitter. This feature makes possible the use of the package as a QRP machine. Alternatively, the operator can drive an amplifier to some medium-power level if he wishes to enter the gravel-grinder class. A suitable amplifier for use with this transceiver is the "Skinnier Linear," described in an earlier issue of

*Technical Editor, *QST*.
**Lab Technician.

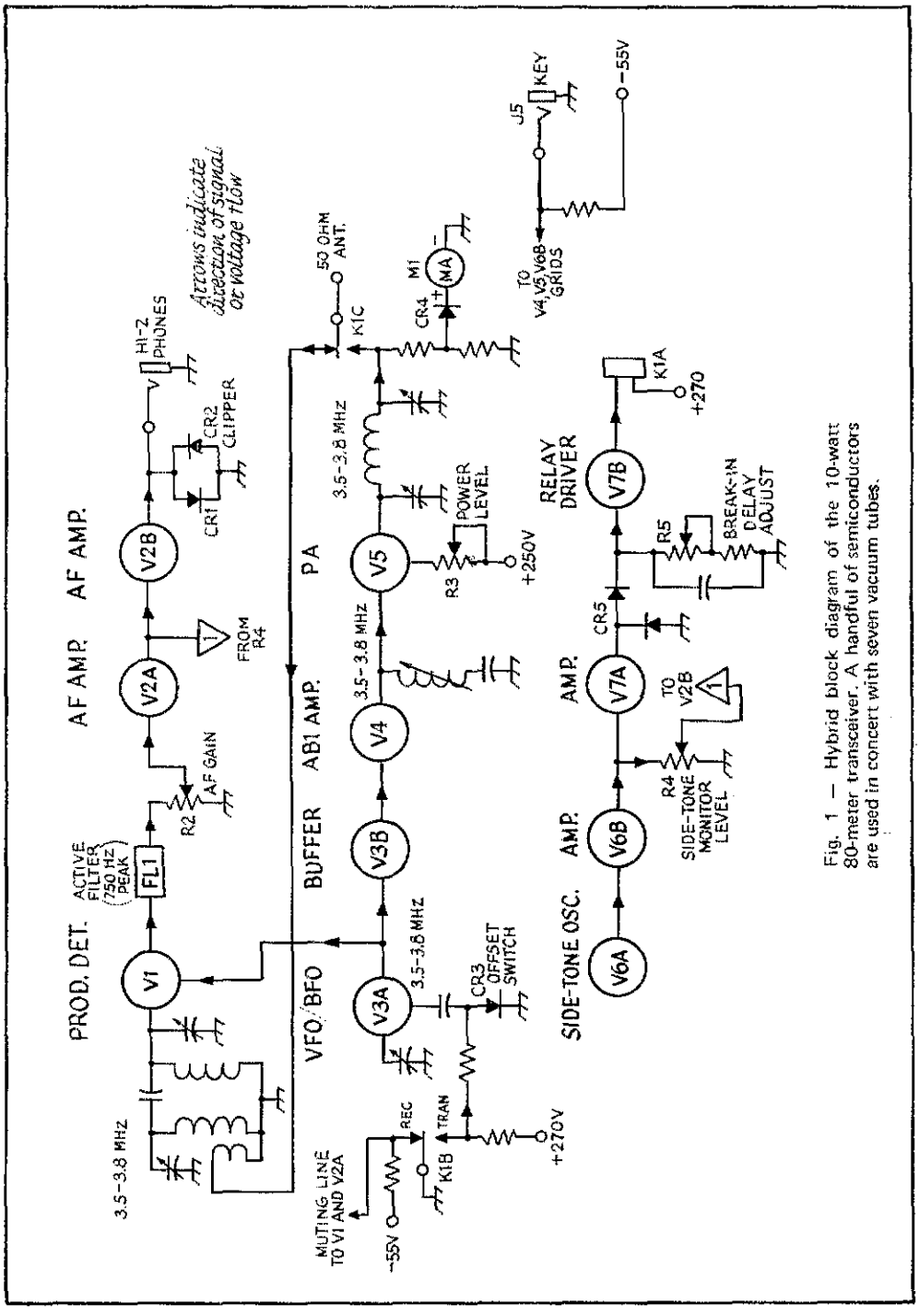
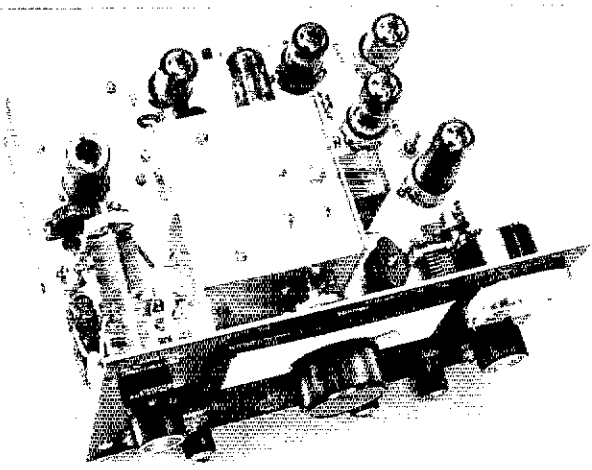


Fig. 1 — Hybrid block diagram of the 10-watt 80-meter transceiver. A handful of semiconductors are used in concert with seven vacuum tubes.

QST.[1] One can obtain approximately 65 watts of output from the amplifier when driving it with 10 watts of energy. A power-level control, R3, (Fig. 2) enables the operator to set the output from the transmitter at some value of his choice.

[1] DeMaw, "Building a Skinnier Linear," *QST* for April, 1970, p. 32.

Driver tube V4 operates Class AB1. A 12BY7A was chosen because of its independent suppressor grid which, when grounded, offers sufficient isolation between grid 1 and the plate to assure stability. Similarly, a 6GK6 was selected for the PA. This tube is merely a big brother to the 12BY7A with respect to plate-dissipation ratings.



This top-chassis view of the transceiver shows the receiver-input toroidal inductors at the lower left, adjacent to the two-gang variable capacitor. The coils are epoxied to small pieces of insulating material, the latter of which are cemented to the aluminum chassis. The small toroidal inductor for the PA stage is visible at the right, below the meter and near the PA tuning capacitor. A steatite cone insulator supports the toroid, and a fiber strip (oblong piece atop the coil) holds the inductor in place on the cone. The large box at the center contains the VFO. Observe the aluminum bracket at the left edge of the VFO, which holds the panel securely to the VFO box to reduce mechanical instability. The VFO tube projects out from the rear wall of the enclosure.

No neutralization was required in this transmitter. No back wave could be detected when listening to the transmitted cw signal.

In the interest of simplicity a direct-conversion receiver is used. A 6GX6 tube was picked because it is designed for use as a detector/af amplifier in TV receivers. By injecting the VFO output on the suppressor grid (pin 7) of V1 there is sufficient isolation between the VFO and the antenna to prevent significant receiver radiation of the 3.5- to 3.8-MHz VFO energy via the antenna. V1 functions as a product detector, thus the VFO should rightfully be called the BFO in the receive mode. Output from the detector is filtered by means of RFC2 and the two 470-pF capacitors connected to it. This prevents the VFO energy from reaching the solid-state RC-active audio peak filter (yes, we did sneak in a few solid-state items). FL1 peaks the recovered af signal at 750 Hz to establish the overall selectivity of the receiver. FL1 has a gain of 2, thus bolstering the gusto of the audio channel. V2 further amplifies the recovered audio from V1 and increases it to headphone level.

A double-tuned toroidal input tank is used ahead of the detector to provide good front-end selectivity. R1 is used as an rf-gain control to prevent receiver overloading when operating near other 80-meter amateur stations. Diodes CR1 and CR2 were added to clip an annoying transient that was heard in the phones when the T-R relay, K1, was actuated.

During the transmit mode V1 and V2A are biased to cutoff by −55 volts which is controlled by K1B. However, V2B is allowed to operate continuously so that the side-tone signal can be heard in the phones for monitoring one's own fist. K1B also controls a positive voltage which is used to saturate CR3 in the VFO/BFO. This switching diode shifts the oscillator frequency by approximately 800 Hz to make the rig compatible with most transceivers in use. During receive the oscillator operates 800 Hz lower in frequency then when in the transmit mode. The amount of offset varies with the operating frequency. It is 800 Hz at 3.575 MHz with the values shown. The offset becomes greater as the operating frequency is increased – roughly 1000 Hz at 3.8 MHz, and 600 Hz at 3.5 MHz. This results from the change in *LC* ratio of the VFO tank as C5 is tuned through its range.

Some Added Frills

We picked the brains of the Heath engineers, purloining the side-tone circuitry from the HW-101 transceiver. Rather than invent the wheel a second time it seemed practical to take advantage of the manufacturer's engineering time and money and use the basic circuit they developed. The phase-shift oscillator (V6A) is a direct steal, and the remainder of the circuit from V6B to V7B is an adaptation of the Heath circuit, tailored to meet the needs of this transceiver. In addition to providing a monitoring note, output from V6A is amplified and applied to CR5 and CR6. The dc output from the diodes is used to saturate relay driver V7B under key-down conditions. A variable time-constant *RC* network is connected in the grid circuit of V7B to establish the release time of K1A. R5 is mounted on the rear apron of the chassis where its setting can be changed readily to meet the operator's requirements. Zener diode VR1 provides a fixed-value bias to assure that V7B is cut off during receive.

The circuit of Fig. 2 looks complex as a result of the break-in and side-tone features. It is hoped that the reader will not be discouraged from heating up the soldering iron and pitching in, merely because the project appears difficult. The convenience of the added circuitry is well worth the effort and cost of including it. If, however, this rationale can't be accepted the builder can delete the T-R relay and replace it with a dpdt ceramic switch. V6A and V6B circuitry can be retained if side-tone monitoring is desired, but all of the V7 circuit can be discarded.

Credit for this very stable VFO goes to George Grammer, W1DF, whose two-part *QST* article on VFO design contains the basic circuit used here.[2]

[2] Grammer, "VFO Stability — Recap and Postscript," Parts I and II, *QST* for Sept. and Oct., 1966.

Drift from a cold start to 15 minutes of operation showed less than 100 Hz change in frequency. As painful as the admission is, that's on par with the performance of most solid-state oscillators! No chirp can be detected on the transmitted signal, indicating that V4 and V5 have no detectable pulling effects on the VFO.

Power Supply

Possibly, nothing could be more boring than the building of a power supply. The chore of buying and assembling a large and expensive power supply is certainly an unfortunate byproduct of one's use of tubes in a piece of ham equipment. The circuit of Fig. 3 is needed to power the transceiver. T1 supplies a regulated 105 volts, 250 volts unregulated, and 6.3 volts ac for the filaments of all stages but the VFO. Voltage for the VFO heaters is taken from the 6.3-volt winding of bias transformer T2. This was done to help isolate the VFO from the rest of the circuit. T2 provides negative 55 volts for the grid-block keying circuit. It is used also to mute the receiver. The power supply is separate from the transceiver, but those who wish to can combine the circuits of Figs. 2 and 3 on one chassis. If this is done the power supply should be located well away from the receiver portion of the transceiver, lest hum be introduced into the audio channel.

Suggestions About Assembly

The chassis used for this equipment measures 5 × 9-1/2 × 2 inches (Bud AC-403 or equivalent). There is nothing magical about these dimensions, and those wanting to shrink or expand the overall size of the transceiver should feel at liberty to do so.

A homemade box was fashioned from 1/16-inch aluminum stock. The dimensions are 2-1/2 × 3-1/4 × 3-1/4 (HWD). A suitable enclosure can be made from sections of double-sided, copper-clad pc board, or the builder may elect to construct the VFO in a Minibox. Regardless of the method used, the walls of the box should be as rigid as possible to assure good mechanical stability of the assembly. A further aid to this cause calls for attaching the front panel of the transceiver to the VFO box by means of metal posts or brackets (see photograph).

A Jackson Bros. dial mechanism, No. 4103, [3] is used in this model. Approximately 1-1/2 inches of stock were sawed from each vertical side of the rectangular dial frame in order to decrease the height of the panel. Any smooth-running vernier dial can be used provided it does not exhibit backlash.

Test and Alignment

Receiver checkout should be the first order of business. Connect a signal generator or 50-ohm antenna to J3 (Fig. 2). Set VFO tuning capacitor C5 at maximum capacitance (fully meshed plates). Tune in a signal at 3.5 MHz and adjust the front-end peaking control, C1, for maximum received signal. Next, adjust trimmers C2 and C3 for peak response with C1 set at approximately two-thirds maximum capacitance. VFO trimmer C4 can be tweaked to assure that 3.5 MHz reception occurs when C5 is fully meshed. If the receiver section is operating properly, one should be able to hear a 0.1-μV signal in the high-impedance phones, faintly. A 1-μV signal should be quite loud when tuned for a 750-Hz peak response, consistent with the characteristics of FL1.

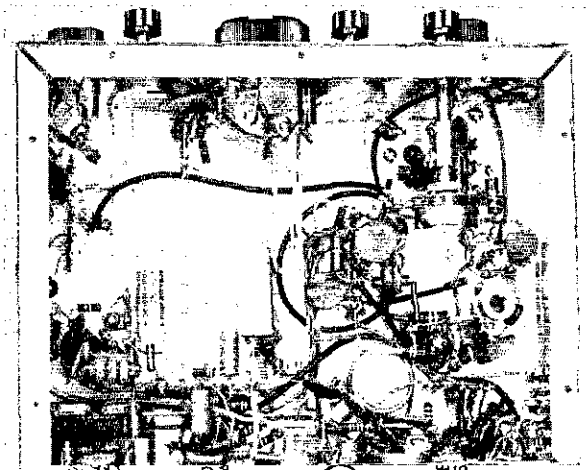
Connect a 50-ohm dummy load at J3. Insert a key at J5 and actuate the transmitter by closing the key. Relay K1 should close at this time. Set power-level control R3 for maximum screen-grid voltage at V5 and observe the reading on M1. When the PA tank is tuned for resonance and correct loading, the pointer of M1 should rise to roughly 3/4 scale. Adjust the slug in L5 for maximum meter deflection, which indicates a peak in grid drive to V5. Normal operation will provide 2.5 V rms at pin 2 of V4, and 35 to 45 V rms at pin 2 of V5. Rms measurements can be made by using an rf probe with a VTVM. Details on building a probe are given in the measurements chapter of the *Handbook*. Power output across a 50-ohm load can be determined by:

$$W = E^2/R$$

Thus, if one measured 22 V rms with the probe, the power output of the transmitter would be 9.68

(Continued on page 22)

[3] Dial mechanism available from Barry Electronics, 512 Broadway, New York, NY 10012.



Bottom view of the transceiver. The MFJ Enterprises RC-active audio filter is located at the lower left in the chassis. The rf gain control is mounted on an L bracket (upper right of photograph) inside the chassis, near the 6GK6 PA stage. Receiver circuitry (6GX6 and 12AT7A) is located at the lower left in this view.

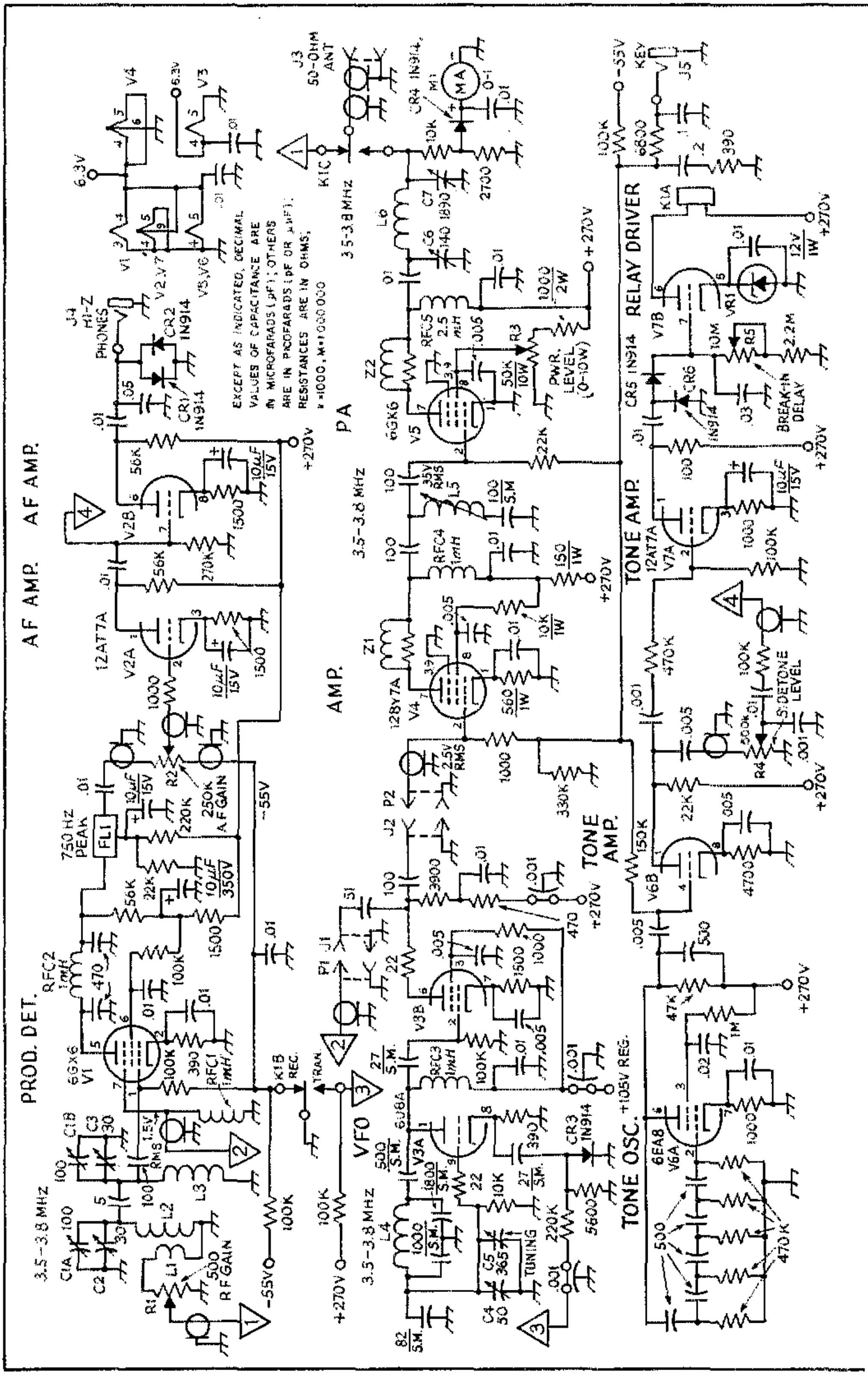
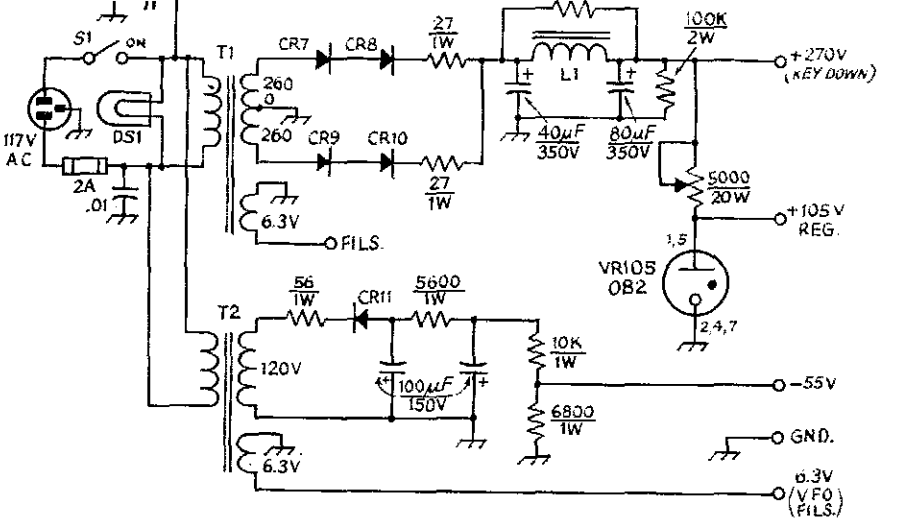

PROD. DET.
AF AMP.
AF AMP.
PA
AMP.
VFO
TONE AMP.
TONE AMP.
TONE OSC.
RELAY DRIVER
EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (μF); OTHERS ARE IN PICOFARADS (pF OR μμF); RESISTANCES ARE IN OHMS; K=1000, M=1000 000

Fig. 2 — Schematic diagram of the tube man's QRP transceiver. Fixed-value resistors are 1/2-W composition unless otherwise noted. Fixed-value capacitors are disk ceramic unless specified differently. Polarized capacitors are electrolytic. Triangles containing numbers indicate circuit points that are joined.

C1 — Dual-section 100-pF variable (Millen 24100 RM or equiv.).
C2, C3 — 3- to 30-pF mica compression trimmer.
C4 — Miniature 50-pF air trimmer (Millen 26048 or equiv.).
C5 — Miniature 365-pF variable (Miller 2111 or equiv., J. W. Miller Co., 19070 Reyes Ave., Compton, CA 90224).
C6 — Miniature 140-pF variable (Millen 19140 or equiv. Millen parts available factory-direct. James Millen Mfg. Co., 150 Exchange St., Malden, MA 02148).
C7 — Mica trimmer, 650 to 1890 pF (Elmenco 310 or equiv.).
CR1-CR6, incl. — Silicon switching diode (1N914 or equiv.).
FL1 — RC-active audio filter (MFJ Enterprise CWF-3 used in max. selectivity mode. P. O. Box 494, Mississippi State, MS 39762).
J1, J2 — Phono jack.
J3 — Coax connector (SO-239 type used here).
J4, J5 — Phone jack.
K1 — Plate-sensitive relay, 2pdt, 5000- to 10,000-ohm field coil. Surplus Sigma 22RJCC/8000G-PAL used in this circuit. Sigma 62R2S-5000 suggested as new part.
L1 — 9 turns No. 24 enam. over L2 winding.
L2, L3 — 54 turns No. 26 enam. on Amidon T-68-2 toroid core, 17 μH. (Amidon Associates, 12033 Otsego St., N. Hollywood, CA 91607).
L4 — High-Q inductor, 2.5 μH. Polycoils No. 1741 with 11 turns removed. (Originally 30 turns, 3/4-inch dia., No. 18 wire, total inductance 4 μH.)
L5 — Slug-tuned inductor, 92 to 187 μH (Miller 42A154CBI or equiv.).
L6 — Two each Amidon T-68-2 toroid cores (stacked). Wind 36 turns No. 22 enam. wire to occupy all of available core area (15 μH).
M1 — Miniature 0- to 1-mA meter.

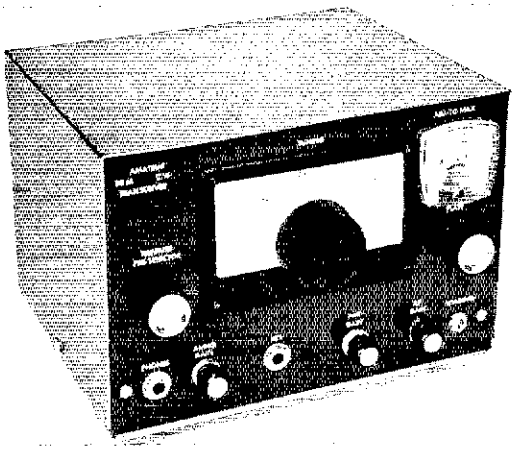


EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (μF); OTHERS ARE IN PICOFARADS (pF OR μμF); RESISTANCES ARE IN OHMS; K=1000, M=1000 000.

P1, P2 — Cable-end phono plug.
R1 — 500-ohm carbon control, linear taper.
R2 — 250,000-ohm audio-taper carbon control.
R3 — 50,000-ohm, 10-W, wire-wound control.
R4 — 500,000-ohm linear-taper carbon control. Screwdriver-adjust type.
R5 — 10-megohm linear-taper carbon control. Screwdriver-adjust type.
RFC1, RFC2 — 1-mH miniature rf choke (Millen J300-1000 or equiv.).
RFC3, RFC4 — 1-mH rf choke (Millen 34300-1000 or equiv.).
RFC5 — 2.5-mH rf choke (Millen 34300-2500 or equiv.).
VR1 — 12-V, 1-W Zener diode.
Z1, Z2 — Parasitic choke, 6 turns No. 24 enam. wound on 56-ohm, 1-W composition resistor. Mount close to tube at pin 7. Use resistor pigtails as anchor points for winding.

▲

Fig. 3 — Schematic diagram of the transceiver power supply. Fixed-value capacitors are disk ceramic except those with polarity marked, which are electrolytic.
CR7-CR10, incl. — 1000-PRV, 1-A silicon diode.
CR11 — 600-PRV, 500-mA silicon diode.
DS1 — 117-V neon panel lamp assembly.
L1 — 15-H, 75-mA filter choke (Stancor C-1002 or equiv.).
S1 — Spst toggle.
T1 — Power transformer, 520 V ct. 90 mA, and 6.3 V at 4 A (Stancor PC-8420 or equiv.).
T2 — Power transformer, 120 V at 15 mA, and 6.3 V at 0.6 A (Stancor PS-8415 or equiv.).



In this close-up view of the 80-meter cw transceiver one can see the slots on the right and left sides of the dial plate where part of the metalwork has been removed to lower the height of the frame. Calibration marks are given for each 10 kHz of the tuning range. The PA loading capacitor (lower right of panel) is a screwdriver-adjust type. It need not be adjusted once it is set for a 50-ohm load, provided 50-ohm antennas are used.

(Continued from page 19)

W, a typical maximum amount for this circuit. QRP enthusiasts can calibrate R3 for various power-output levels by making rms measurements and marking the panel accordingly. Thus, if the operator desires a 2-W output he would use the formula:

$$E \text{ rms} = \sqrt{WR} = \sqrt{2 \times 50} = 10 \text{ V rms}$$

Side-tone control R4 should be adjusted for a monitoring level that best suits the operator. Similarly, the break-in delay control, R5, can be set to provide the time lag preferred.

Tag Ends

No attempt has been made, nor is one anticipated, to modify this circuit for use on bands other than 80 meters. It is likely that a skilled amateur could adapt the circuit for operation on 160 or 40 meters without encountering major problems.

All long rf and audio leads should be made with shielded cable. RG-174/U coax is suitable for both applications. The remainder of the wiring can be done with insulated hookup wire. Dress all of the leads as close to the chassis as practical, keeping them short and direct.

The panel and cabinet top are made from sheet aluminum. A bottom plate is affixed to the chassis by means of No. 6 sheet-metal screws. Four adhesive-backed rubber feet are used on the bottom plate of the unit. Decorative touches befitting a tube-type rig include a Hunter Green spray-paint finish and white press-on decal lettering.

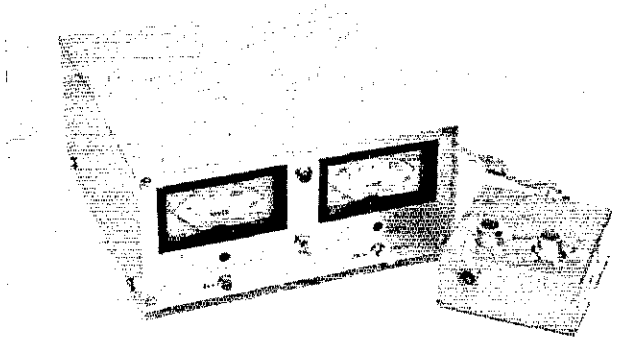
Shaped keying is used to help assure a clean cw note. Harmonic output was measured at −40 dB or better, as observed on a spectrum analyzer. Maximum chirp is less than 10 Hz when L5 is tuned for the worst condition. The driver plate tank should be set for minimum VFO pulling, consistent with proper drive to the PA. There will be no chirp if care is taken during this adjustment.

One should bear in mind that the receiver will not provide single-signal reception. That is, a cw note can be obtained either side of zero beat. In effect, this means that during crowded band conditions there can be twice as much QRM as when using a well-designed superheterodyne receiver. When answering another station's CQ, be sure to tune the receiver down from the *high-frequency* side of zero beat. This will make the transmitter frequency compatible with that of most transceivers in current use. No TVI could be observed while testing the transmitter at full output when a solid-state TV set was operating three feet away from the transceiver. No high-pass filter was used with the TV set, and no low-pass filter was connected to the transmitter.

The moment of truth came when W1NPG fired up as W1INF (ARRL Operators Club) at 2115 GMT and was answered by WN2MKX. RST 599 reports were given by each operator. Later that same day the rig was used with an end-fed 90-foot wire at W1CER. The first CQ brought a reply from WB4TTD in Florida. Our QRP signal was copied RST 579. ARRL staffer K1ZND is considered to be a very discerning cw operator, especially with respect to the quality of amateur equipment. He took the transceiver home during the weekend of the ARRL CD Party and had his first 50 contest QSOs with it. His comment was, "It's a real neat little rig."

Still another opinion of the performance characteristics was obtained when W1GRE of the ARRL technical staff put the transceiver through its paces at his home QTH. While using a 102-foot-long dipole, 20 feet above ground, YV5CKR was worked at 0500 GMT. The QRP signal was reported as RST 589. W6EVL was worked subsequently, providing a coast-to-coast 80-meter contact. Though a great many operators consider QRP to be anything under 100 watts, the feeling of accomplishment is much greater to these writers when the equipment provides less than 10 watts of output. Many dedicated QRPers consider power in excess of 10 watts as QRO!

Those wishing to work with the strange-looking glass cylinders that can be found in most ham junk boxes should find this circuit interesting. Certainly, it can serve well to dilute the ethereal pollution caused by QRM, and could be the answer to your need for a compact portable rig to use on vacations and trips. QST



A Simple Computing SWR Meter

BY DAVID L. FAYMAN,* WØGI

IT SEEMS SAFE to assume that most radio amateurs are familiar with one or another of the popular types of SWR indicators or in-line rf power meters that are available today. Nearly everyone has one and knows how to use it. The instrument is typically installed in the transmission line between the transmitter and the Transmatch and tune-up is supposed to be simple. However, now and then it really gets confusing. Sometimes it's mighty hard to tell what's going on while making adjustments; the SWR is increasing but so is the power output. And how about the other case when SWR is decreasing but forward power is falling off? Most of us have been there only too many times.

A bad experience during the 1971 Field Day really pointed up the problem. We had a random length end-fed wire and somebody's pet Transmatch along with a garden-variety SWR meter. This was the "worst case," with an unknown antenna, an unfamiliar tuner, and an operator in a hurry. During attempted tune-up the transmitter power level was constantly changing and so was the SWR. In short, all indications were moving around so much that until resonance was finally found nothing made very much sense. It was a fiasco! We traced the problem to the SWR meter and resolved that "next year things will be different."

The basic trouble is this: the instruments that we are commonly using, no matter what kind they are, fail to present to us directly the indications that we need. SWR (more properly voltage-standing-wave ratio or VSWR) is solely a measure of load-to-transmission-line mismatch and is entirely unrelated to power level. Unfortunately, all of the present VSWR meters are highly sensitive to power level. We all know that when an antenna or a Transmatch is adjusted, the load that the line presents to the transmitter changes and hence the power output changes as the adjustments are made. The result is that VSWR meters give the following basic indications:

1) Readings that are proportional to forward power.

2) Readings that are proportional to the mismatch but which, *unfortunately, are also proportional to the forward power.*

So with the power level changing during adjustments, the operator is left to his own ingenuity to decipher the results. If he has two meters to look at he can attempt to calculate some sort of ratio in his head. If he has one meter with two scales, plus a switch and a sensitivity control, he has problems! What is really needed is an instrument that responds only to changes in VSWR and ignores changes in power level. Such an instrument would allow tune-up in two orderly and independent steps.

1) With transmitter power applied to the system the antenna matching is adjusted for minimum VSWR, period.

2) The transmitter is peaked up for maximum forward power output; end of job.

This article describes a newly designed VSWR meter working in consort with a directional wattmeter that makes the two-step tuning just described a practical reality. The new "box" was field tested last year at our Field Day site, and for once antenna tuning was more fun than agony.

Referring to the photograph of the instrument, the meter on the left reads forward power in watts for a 52-ohm line with two power ranges, 200 watts and 1000 watts full scale. The right hand meter reads VSWR. A push button allows the operator to observe reflected power. This button is used during calibration and from time to time to show nonbelievers! While the VSWR indications are not entirely independent of the forward power level, they are dependable for tuning purposes over a 40 to 1 power range. In practice this allows the type of orderly tune-up that is desired. As a matter of fact it is difficult to describe how really easy tune-up has become since this instrument was installed in the shack. I hope it never quits working during a contest!

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The instrument is described in two parts. First the directional wattmeter will be outlined, then a description of the VSWR meter. An appendix is included, dealing with the question of errors in VSWR measurements that are characteristic of this and most other instruments.

The Wattmeter

The directional wattmeter has been fully discussed by Bruene[1] and DeMaw.[2] The rf head (directional coupler) is a close rendition of the one shown by DeMaw except that the calibration resistors have been moved from the rf head to the instrument housing. Fig. 1 is a schematic diagram of the coupler with its matched-diode peak detectors. A length of dual-shielded phono cable provides the interconnection between units. Fig. 2 is the schematic diagram of the wattmeter circuitry that is contained in the main cabinet. In his design, DeMaw uses a sensitive meter after the detector outputs, but in this circuit detector preamplifiers are used to amplify the dc detector-output levels to accommodate the VSWR "computer." Also, different power ranges can be selected by switching the gain of the preamplifiers while holding the diode load resistance constant.

The detector-output voltages are positive and after amplification they are displayed on the power meter. Since there is an inversion, the meter is arranged to read negative-going signals with a full-scale range of −10 volts. Fig. 3 shows the scale calibrations for the power meter. The data for the calibration were taken on a borrowed, home-built version of DeMaw's design and should be typical of units similarly constructed.

Referring to Fig. 2, the function switch, S2, is used to switch the preamplifier inputs from the detector outputs to calibration voltages and S3 switches power ranges. The preamplifiers use inexpensive 741C operational amplifiers that are widely available these days. The Signetics N5556V is a better choice but is more costly. Dc amplifiers are a little fussy to use so a few words about them may be in order. The gain of the preamplifier is determined by the ratio of the feedback resistor to the input resistor. The feedback resistors are adjustable to set the gain, and switchable to change ranges. This all works fine but for a dc amplifier it is also required that zero voltage input give zero voltage output, regardless of the gain. This is not easily achieved over a wide temperature range. Op amps that use bipolar transistors in the input stages suffer errors because of input bias currents and this will require some compensation. Another separate effect that causes errors is input offset voltage. The sum of these two imperfections results in a nonzero output voltage for zero input. In the circuit (Fig. 2) the input offset voltage is nulled out by the offset controls R12 and R17. These potentiometers need to be adjusted only once unless the amplifier chip or some other component is replaced. Input offset currents, although small, are troublesome and are difficult to compensate exactly with simple circuitry in a variable-gain amplifier. A compromise design is used here that involves matched input resistors. The scheme is not perfect (it is called "over compensation") but it works well enough for this application. (Those interested in op amps would do well to study Ref. 3 or the dozens of manufacturer's applications notes on the subject.) Some folks have spent a lifetime trying to get zero output for zero input but for our purposes 0.5 percent of full scale is close enough. With an output swing of ten volts (negative), offsets at the output less then 50 mV will be barely detectable and can be considered zero. The "matched" input resistors (R10, R11,

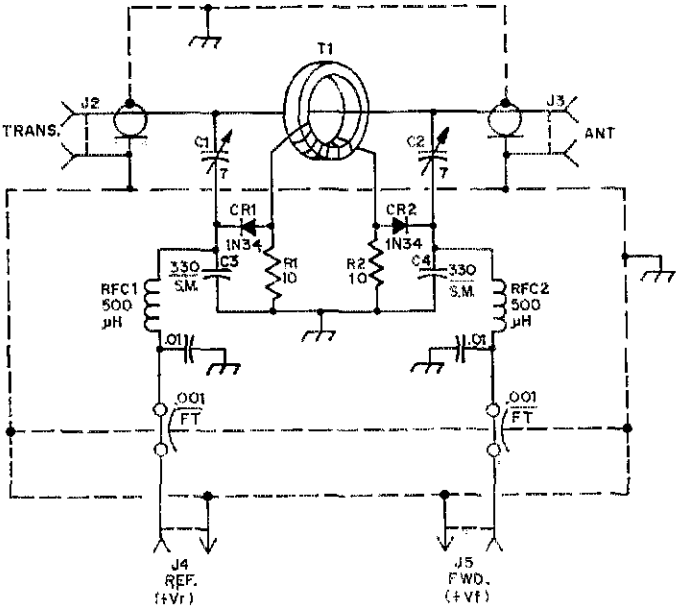


Fig. 1 — Schematic diagram of the rf head. For details on a similar wattmeter, see Ref. 2 or recent editions of the *Handbook* (47th through 49th editions).

C1, C2 — 1.3- to 6.7-pF miniature trimmer (E. F. Johnson 189-502-4. Available from Newark Electronics, Chicago, IL).

CR1, CR2 — 1N34 diode (matched pair recommended).

J1, J2 — Chassis-mounted connector of builder's choice. Type SO-239 used here.

J4, J5 — Phono jack, panel-mounting type.

R1, R2 — Matched 10-ohm resistors.

RFC1, RFC2 — 500 µH rf choke (Millen 34300-500 or equiv.).

T1 — Toroidal transformer. 35 turns of No. 26 enam. wire to cover entire area of Amidon T-68-2 toroid core (Amidon Assoc., 12033 Otsego St., N. Hollywood, CA 91607).

R15, and R16) are 5-percent resistors soldered carefully so as not to overheat the resistor body. It is not really practical to attempt a precision match on these resistors since the source resistance of the diode detector is in series with the amplifier input resistance. Measurements have shown that the detector source resistance is a variable quantity, being very low at high detector outputs but rising rapidly at low output level.

The VSWR Meter

This circuit sets out to "compute" the VSWR using a combination of analog and pulse circuits. The whole idea may seem unduly complex but it turns out that finding the ratio of two dc voltages

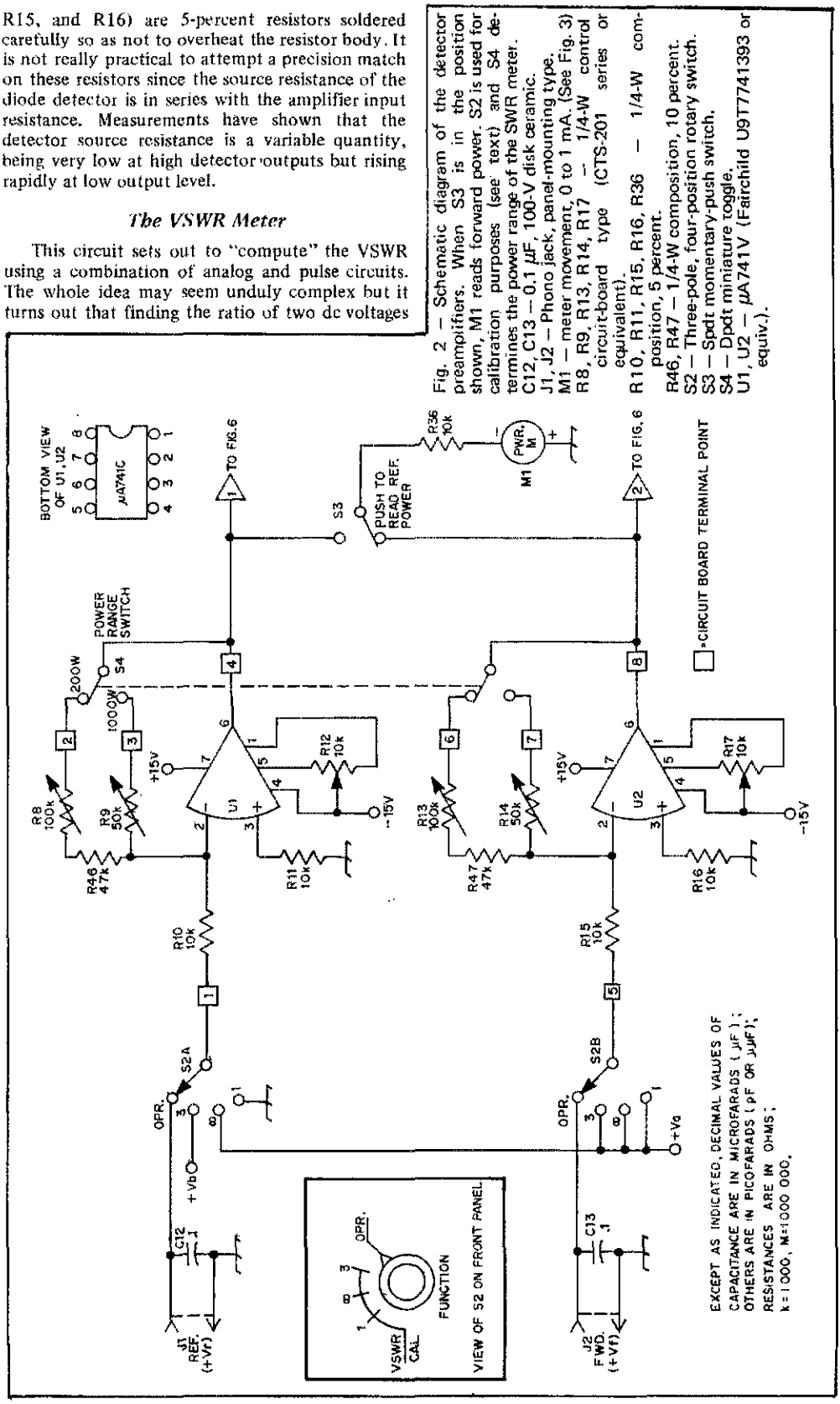
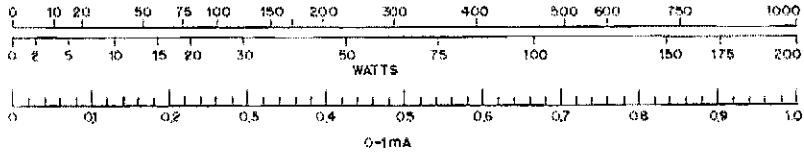


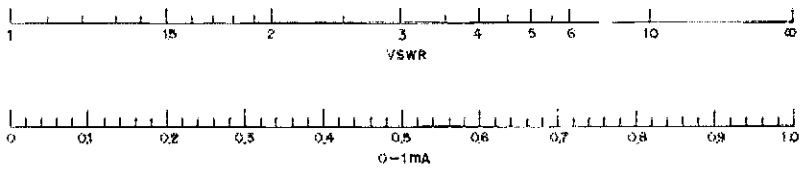
Fig. 2 — Schematic diagram of the detector preamplifiers. When S3 is in the position shown, M1 reads forward power. S2 is used for calibration purposes (see text) and S4 determines the power range of the SWR meter.
C12, C13 — 0.1 μF, 100-V disk ceramic.
J1, J2 — Phono jack, panel-mounting type.
M1 — meter movement, 0 to 1 mA. (See Fig. 3)
R8, R9, R13, R14, R17 — 1/4-W control circuit-board type (CTS-201 series or equivalent).
R10, R11, R15, R16, R36 — 1/4-W composition, 5 percent.
R46, R47 — 1/4-W composition, 10 percent.
S2 — Three-pole, four-position rotary switch.
S3 — Spdt momentary-push switch.
S4 — Dpdt miniature toggle.
U1, U2 — μA741V (Fairchild U9T7741393 or equiv.).



▲

Fig. 3 — Approximate scale calibration for the wattmeter based on measured data. Exact calibration could be accomplished by checking against an instrument with known calibration accuracy.

Fig. 4 — VSWR scale calibration based on theoretical computations (Equation 2). This assumes that a 1-mA meter movement and the calibration procedure outlined in the text are used. For errors affecting VSWR accuracy, see the appendix. ▼



is not completely trivial (especially when the voltages vary over a large range). *The task at hand is to compute the ratio of the reflected-voltage to the forward-voltage outputs of the detector preamplifiers.* This ratio is equivalent to the reflection coefficient on the transmission line.

$$K = \frac{Vr}{Vf} \qquad \text{(Eq. 1.)}$$

Where Vf and Vr are the respective *amplitudes* of the forward and reflected traveling waves on the transmission line. The VSWR is given by:

$$VSWR = \frac{1 \pm K}{1 - K} \qquad \text{(Eq. 2.)}$$

Fig. 4 shows this relationship (equation 2) calculated in terms of scale calibration for a 1-mA meter movement. It probably looks very familiar.

Fig. 5A is a simplified block diagram of the ratio computer and Fig. 5B shows the wave forms. Fig. 6 is the final schematic diagram with wave forms. The circuit is repetitive in nature and is driven by the 60-Hz line. One computation occurs for each line cycle (every 16.67 ms) and the "answer" is in the form of a pulse-width-modulated current, the average of which is read on the meter. Incidentally, there is nothing magic about the line frequency for use as the "clock," but it is convenient.

In order to trace the action through one analog computing cycle assume some initial conditions in Fig. 5A.

1) Flip-flop reset ($Q = 0$, $\overline{Q} = +4$ V)
2) FET "on" (drain-source resistance low)
3) Integrator output (U3) = zero voltage
4) Vf = −1 volt
5) Vr = −0.5 volt ($K = 0.5$, VSWR = 3)
6) Meter current = 0 (because $Q = 0$)

When the line frequency derived pulse (Po) occurs at time to the action begins. Po " sets" the flip-flop ($Q = +4$ V, $\overline{Q} = 0$) and two things happen.

a) The FET is biased "off" allowing Vf to charge the capacitor C1 through R1. (Here, R1 = R18 + R19 and C1 = C15. See Fig. 6).

b) The flip-flop output Q delivers 1 mA to the meter ($Q = +4$ V, R2 = 4 k)

The integrator output, VI is a positive going linear ramp and at any time t, VI is given by

$$VI = \frac{t\,Vf}{R1C1} \qquad \text{(Eq. 3.)}$$

As VI rises, the algebraic sum of VI and −Vr (at the comparator input) approaches zero. When this happens the voltage comparator issues a negative pulse P1 (at time t1) that resets the flip-flop. P1 thus kills the circuit and returns everything to the initial conditions. The next clock pulse, Po, that comes along initiates a repeat performance. The wave forms in Fig. 5B show what happens for several clock cycles. Although it may not be obvious, the width of the current pulse delivered to the meter is directly proportional to the ratio of Vr to Vf. Equations 4 through 7 show why.

at

$$t = t1, \qquad VI - Vr = 0 \qquad \text{(Eq. 4.)}$$

thus,

$$Vr = VI \qquad \text{(Eq. 5.)}$$

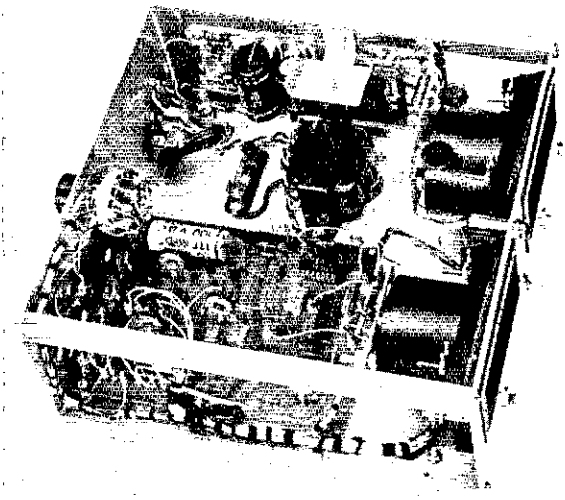
so that from Equation 3,

$$Vr = \frac{t1\,Vf}{R1C1} \qquad \text{(Eq. 6.)}$$

giving

$$t1 = R1C1\,\frac{Vr}{Vf} \qquad \text{(Eq. 7.)}$$

A repetitive current pulse 1 mA amplitude and t1 ms wide is given to the meter each clock period T (in this case T = 16.67 ms). If the integrator time



Interior view of the VSWR meter. The aluminum bracket just above the power transformer is the mounting and heat sink for U7. R38 and R39 are mounted on the small pc board on M2. The large pc board in the lower left-hand corner contains the pre-amplifier and computer circuits. The power supply board is visible under the heat sink for U7.

constant, R1C1 is adjusted to be equal to T, equation 7 can be rewritten.

$$\frac{U}{T} = \frac{Vr}{Vf} \qquad \text{(Eq. 8.)}$$

Since the average value of the current pulse train is exactly

$$IAVG = \frac{U}{T}\ mA \qquad \text{(Eq. 9.)}$$

it follows that the meter directly indicates the reflection coefficient.

$$IAVG = \frac{Vr}{Vf} = K \qquad \text{(Eq. 10.)}$$

The natural inertial damping of the meter movement does the averaging. (Some inexpensive meters are quite underdamped and may require some help in the form of capacitance across their terminals to complete the averaging process. A "fuzzy" needle is the tipoff. The nifty thing is that if the voltages Vr and Vf are anywhere within the range of op amp capability (a few millivolts to about ten volts) the ratio is computed properly and that's just what we need.

Well, it's a nice story but as usual there are a few tiny little problems. To wit –

1) If Vr = Vf, (Vf = 0, K = 1, VSWR = ∞). The integration takes up the entire period T. Unless the switching wave forms are perfect the pulse P1 may not show up and the circuit can "latch up." It can only recover when the ac power is removed! Not too handy.

2) If Vf = Vr = 0 (happens every time the transmitter power goes away) the circuit tries to "compute" zero divided by zero. The meter reading is nonsense. It's disconcerting to see a VSWR of 4, or such, when the rf power is off!

3) At very low power levels (less than one percent of full scale on the wattmeter) the op amp and other errors build up to a point that the VSWR readings are not very accurate.

4) At low VSWR readings the current pulses become narrow and timing delays (rise and fall times) get to be rather important. This can cause some inaccuracies.

The final schematic (Fig. 6) differs from the simplified diagram (Fig. 5A) chiefly because of this mixed bag of trouble. A brief rundown of the "fixes" and how they work may be of interest.

Problem 1 is solved by assuring flip-flop reset just prior to the end of a computing period. A pulse P2 is derived from the leading edge of the 1-ms one-shot output and forces reset if P1 is a "no-show." This happens at $t = 15.67$ ms, which corresponds to a VSWR of about 32. The result is that in use, no VSWR greater than 32 can be indicated on the meter. It's no great loss since readings that high don't mean much anyway, as is explained in the appendix.

Tiny little problem 2 (zero divided by zero) could keep you awake nights! No elegant solution was ever found and in the end a brute-force fix was devised. Referring to Fig. 6, transistors Q3 and Q4 form a meter muting circuit. The base of Q3 senses the forward voltage (output of U2) and if it is less negative than about 600 mV the negative return lead of the meter is opened (Q4 goes to cutoff). This mutes any nonsense VSWR readings when the forward power approaches zero. Luckily this is an automatic fix for problem 3 too.

Problem 4 was solved with a well-placed resistor. R21 feeds a small fraction of –Vf directly to the comparator input (U4, pin 3). The result is that the comparator now issues pulse P1 when,

$$Vf - Vr - 0.1\ Vf = 0 \qquad \text{(Eq. 11.)}$$

or,

$$\frac{U}{I}\ Vf - Vr - 0.1\ Vf = 0 \qquad \text{(Eq. 12.)}$$

yielding,

$$IAVG = \frac{U}{T} = \frac{Vr}{Vf} + 0.1\ mA \qquad \text{(Eq. 13.)}$$

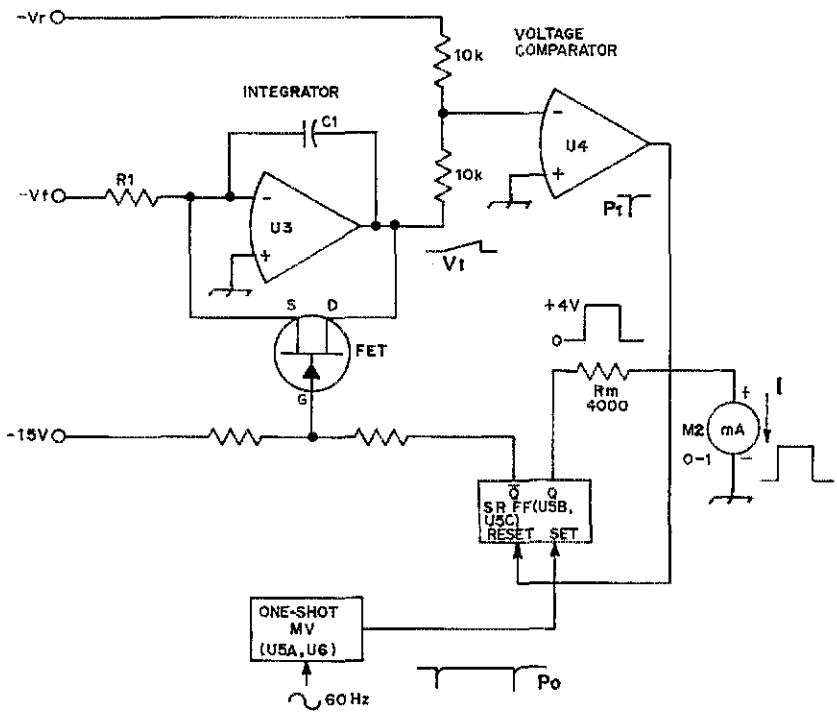
Equation 13 says that when Vr = 0, t1 is not zero as before. Instead a 10-percent duty-cycle current pulse train remains. This 0.1-mA average current is simply a constant that is balanced out by the "meter zero" control R38. The scheme assures positive operation of the pulse circuits for very small ratios and averages out many of the delay errors.

There are a few other items in the schematic that need to be explained. The flip-flop is a

set-reset type made from cross-coupled NAND gates. This setup requires negative input pulses to change states. Q2 is the FET driver and, R26, and R29 set the negative gate voltage for FET cutoff. About −6 volts worked well for several FET types tested. The gate voltage (collector of Q2) goes a little positive when Q2 is fully saturated, because VCE (sat.) is always less then VBE

Power Supply

The power supply provides the regulated voltages required for the various integrated circuits. The schematiac diagram is shown in fig. 8. Integrated circuit regulators are used to provide stable output voltages. It is important to keep rf out of the box, so bypassing the line and the



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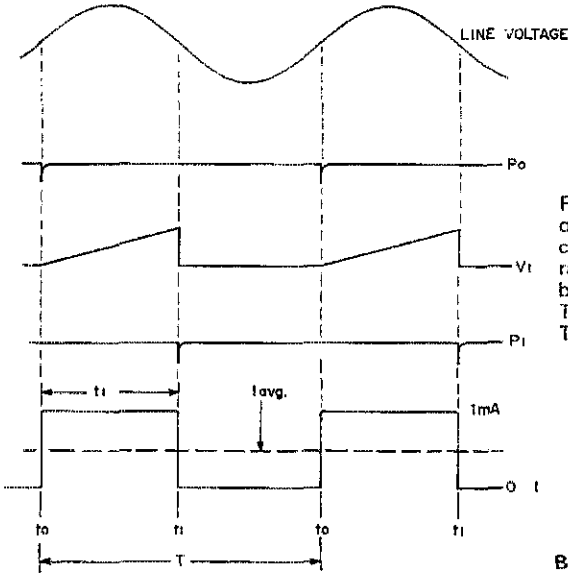

B

Fig. 5A and 5B — A simplified schematic diagram of the ratio computer is shown in Fig. 5A. The current through M2 is directly proportional to the ratio Vr/Vf. The exact phase relationships for the bold-face variables (Fig. 5A) are shown in Fig. 5B. The wave forms are for ratio of Vr/Vf equal to 0.5. This corresponds to a VSWR value of 3.

transformer secondary is important. CR5, R5, and R6 supply low-level calibrate voltages Va and Vb. These are the prime VSWR calibrate voltages and are used as the sole basis for adjusting R18 (the integrator time constant) during the calibration sequence. As shown Vb = 0.5 Va, corresponding to VSWR = 3. If precision resistors are not available, two closely matched resistors around 300 ohms will work. Probably the best bet is accurately measure the two voltages (be sure S3 is in the "VSWR = 3" position) and calculate the reflection coefficient K and the resulting VSWR from equations 1 and 2. This will establish a precise calibration point on the VSWR scale. A small red mark on the meter face will make it easy to find.

Construction

The unit shown was housed in a tight-fitting home-built cabinet. It measures 3-1/2 × 8 × 8 inches. The front panel contains the two meters, the ac power switch and pilot lamp, plus the rf power-range switch and reflected-power push button. The layout is a matter of taste.† The rear panel contains the input jacks and the function switch, plus an access hole for the power cord. Access holes are provided for control adjustments. The bulk of the wiring is contained in the two circuit boards and the interconnection wiring that remains is neatly cabled. The only critical point is to keep the high-voltage ac wiring away from the rest of the cables. The components all run cool except for the two voltage regulators. The MC1468G dual regulator needs a heat sink of the kind designed for a TO-5 package and the five-volt regulator should have its tab bolted to something metallic.

Calibration

There is a best order to follow in setting up the circuit. Do the "one time" adjustments first.

1) Preamp zero adjustment (U1 and U2): Using a VTVM at pin 6 of first U1 and then U2, ground J1 and J2 (Fig. 2) and adjust R12 and R17 for zero output.

2) Preamp gain adjustment: Place S2 in VSWR = ∞ position and switch to the 200-WATT range. Adjust R8 to give a power reading of 125 watts. Depress S3 and adjust R13 for a matching reading. Now switch to the 1000-WATT range and repeat by adjusting R9 and R14. The exact calibration in power isn't too important but be sure to have a close agreement between the forward and reflected readings on each power range.

3) Integrator U3 zero adjustment:

a) Ground pin 6 of U2 and pin 12 of U5.

b) Adjust R23 to obtain zero voltage at pin 6 of U3.

4) Comparator zero adjustment:

a) Ground pin 6 of U1, pin 6 of U2, pin 6 of U3.

b) Adjust R35 for zero voltage at pin 7 of U4. Now set up the VSWR meter.

5) Set function switch S2 to the 0 position and adjust R38 for zero reading.

6) Set S2 to VSWR = ∞ and adjust R39 for full scale.

7) Set S2 to VSWR = 3 and adjust R18 for VSWR = 3.

The last three adjustments interact a bit so they need to be repeated a couple of times until everything is "on the nose."

The remaining task is to calibrate the power meter and rf head "on line." DeMaw describes the method but not everybody has the equipment to do the job. Lacking the right gear, one can simply go with the calibration procedure just described, it is plenty close enough for most purposes. No matter what, the important thing is that the detector outputs be closely matched. This is checked on line as DeMaw describes and if things don't match up, some adjustments in the rf head are in order. As a last resort a compensating resistor can be placed in series with the detector output that is "high." This resistor should be placed either in the rf head or in the detector line between J1 and J2 and S2. Unless you are a measurements buff, the precise calibration of the wattmeter is not too important, but there are some cross checks that can be made to determine how well everything lines up. Assuming that forward- and reverse-power calibrations match, the VSWR readings can be cross checked by noting that

$$K = \sqrt{\frac{Pr}{Pf}} \qquad \text{(Eq. 14.)}$$

Bruene (ref. 1) published a graph that converts this to VSWR. The relationship is:

$$VSWR = \frac{1 + \sqrt{\frac{Pr}{Pf}}}{1 - \sqrt{\frac{Pr}{Pf}}} \qquad \text{(Eq. 15.)}$$

I think I would like to thank Tony Shirer, WØRZF, who challenged me to improve on VSWR meter designs and then suspended my license to fly his radio-controlled airplanes until the article was done! Tony also etched the boards and made many corrections to the text. The rf head was built by Ken Olson, KØTLQ, and the loan is greatly appreciated. Ken also helped with the boards. Bob Matreci assisted in finding a couple of the circuit improvements and breadboarded several alternative circuits.

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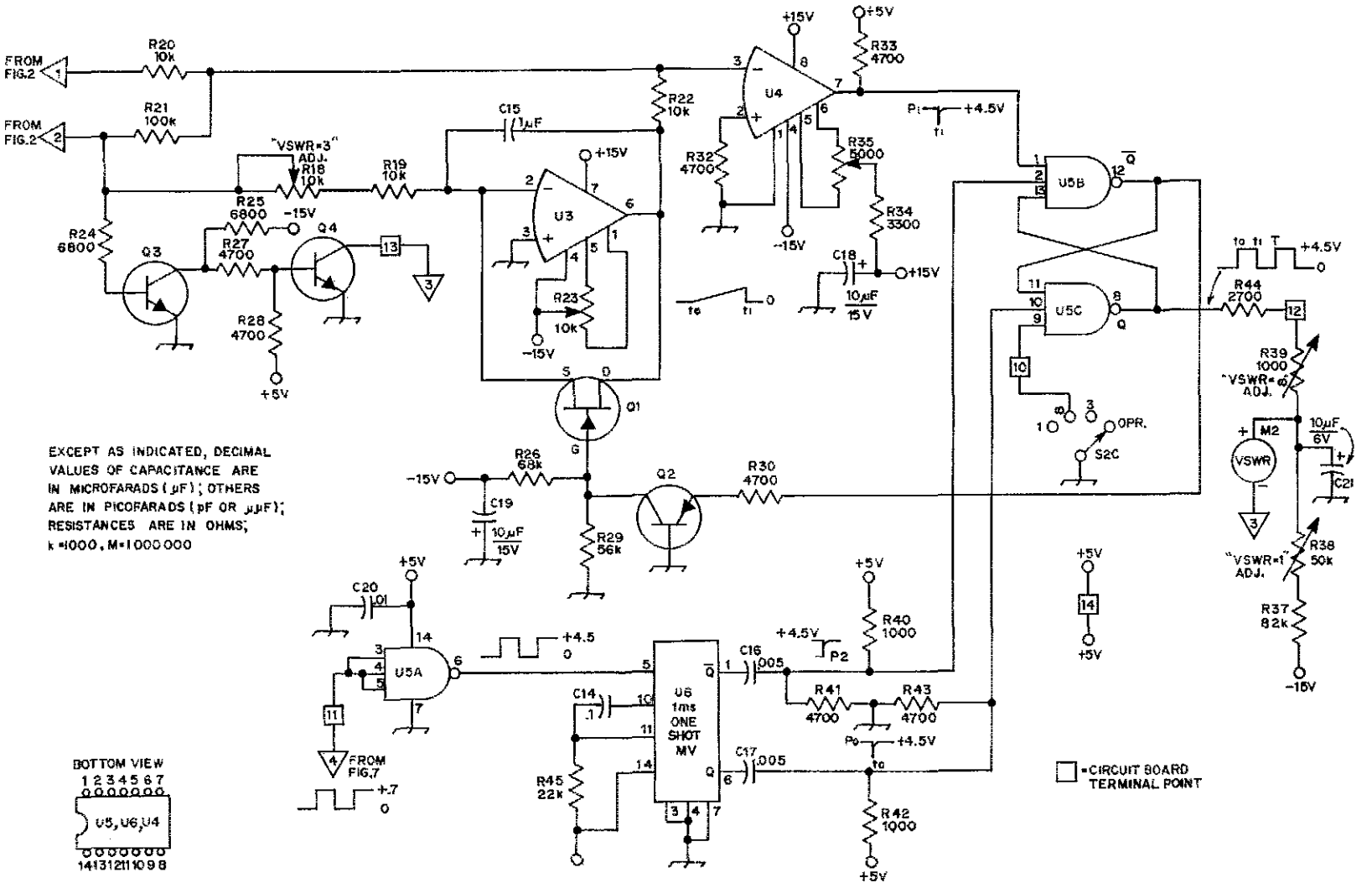
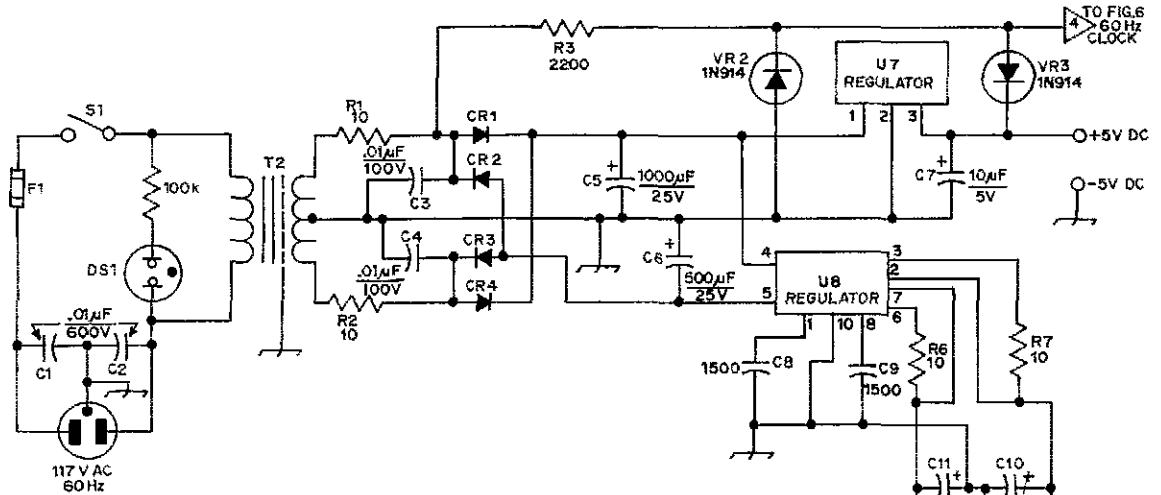
[1] Bruene, "An Inside Picture of Directional Wattmeters," *QST*, April, 1959.

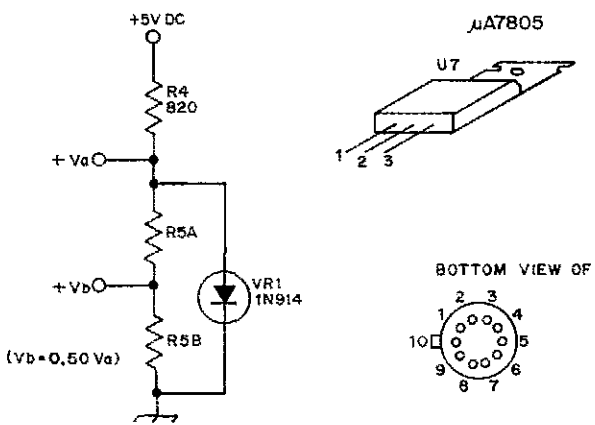
[2] DeMaw, "In-Line Rf Power Metering," *QST*, December, 1969.

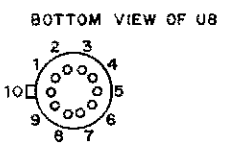
[3] Smith, *Modern Operational Circuit Design*, Wiley-Interscience Division of John Wiley & Sons, Inc., New York.

† Scale templates and parts layout are available by sending 50 cents and a self-addressed, stamped envelope (business size) to ARRL Hq., 225 Main St., Newington, CT 06111.


FROM FIG.2
R20 10k
R21 100k
"VSWR=3" ADJ. R18 10k
R19 10k
R22 10k
C15 .1µF
R25 6800
-15V
R24 6800
Q3
R27 4700
Q4
R28 4700
+5V
U3
R23 10k
-15V
+15V
U4
R33 4700
R32 4700
R35 5000
R34 3300
C18 10µF 15V
P1 +4.5V
t1
U5B
U5C
R44 2700
R39 1000 "VSWR=∞" ADJ.
10µF 6V
C21
M2
VSWR
R38 50k "VSWR=1" ADJ.
R37 82k
OPR.
S2C
Q1
R26 68k
C19 10µF 15V
Q2
R30 4700
R29 56k
EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (µF); OTHERS ARE IN PICOFARADS (pF OR µµF); RESISTANCES ARE IN OHMS; k=1000, M=1000000
C20 .01
U5A
FROM FIG.7
+.7
+4.5
C16 .005
P2 +4.5V
R40 1000
R41 4700
R43 4700
C14 .1
U6 1ms ONE SHOT MV
R45 22k
C17 .005
P0 +4.5V
R42 1000
BOTTOM VIEW
1 2 3 4 5 6 7
U5, U6, U4
14 13 12 11 10 9 8
=CIRCUIT BOARD TERMINAL POINT







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

▲ Fig. 6 — Schematic diagram of the VSWR ratio computer including "fixes" discussed in the text. Resistors are ten-percent-tolerance composition except for those noted below.
C14, C15 — Mylar, 100 V.
C16, C17 — Disk ceramic, 100 V.
C20 — Disk ceramic, 25 V. M2 — 1-mA meter. (See Fig. 4 for calibration.)
Q1 — FET (n-channel) MPF102 or equiv.
Q2, Q3 — 2N3639.
Q4 — 2N3288, GE-11.
R18, R19, R23, R35, R38, R39 — 1/4-W control, circuit-board type. (CTS-201 series or equivalent).
R20, R22 — 1/4-W, one-percent film.
R32 — Five-percent composition.
U3 — μA741V (Fairchild U9T7741393).
U4 — Comparator LM311. LM311N (National Semiconductor).
U5 — Triple, three-input NAND gate, SN7410 (Texas Inst.).
U6 — Monostable multivibrator, SN7412 (Texas Inst.).

◀

Fig. 7 — Schematic diagram of the power supply and calibrator circuits. Unless otherwise noted, resistors are 1/2-W ten-percent composition.
C1, C2 — 600-V disk ceramic.
C3, C4 — 100-V disk ceramic.
C8, C9 — 100-V disk ceramic or 1500-pF mica.
CR1-CR4, incl. — 0.5-A, 50- PRV rectifier diode.
DS1 — 117-V neon pilot lamp assembly.
F1 — 1-A fuse (Slo-Blo) in clip holder.
T1 — Power transformer, 117-V pri., sec. 17 volts ct at 0.15 A (M. Weinschenker, Box 353, Irwin PA 15642).
VR1 — 0.5-A, 50- PRV rectifier diode or 1N914.
VR2, VR3 — 1N914.
U7 — 5-V regulator (Fairchild UGH7805393).
U8 — Dual 15-V regulator (Motorola MC1468G).

Appendix

VSWR METER ACCURACY CONSIDERATIONS. From a practical operating standpoint the accuracy of VSWR measurements is not too important so long as the indications are not misleading to the operation. However, when a new design is considered the question quickly comes up. It was considered important to develop a VSWR meter that would be at least as accurate as devices in current use since these have proved to have adequate accuracy for tuning purposes. Since there seems to be very little written on the subject, the matter is detailed here for those who have an interest. What follows applies specifically to VSWR indicators that use two diode detectors to provide dc output voltages that are proportional to the forward and reflected traveling-wave amplitudes on the transmission line. Whether the ratio of the voltages is derived by manually adjusting a sensitivity control to "full-scale forward" and then reading VSWR by observing "reflected" or by automatic ratio computing as in this design, the accuracy considerations are the same. In either case the reflection coefficient, k, is computed and the indicator is calibrated to read VSWR.

It comes as no surprise that the main source of error is in the diode detectors that provide the input voltages to system. The detectors are lightly coupled to the line and the rf-line-voltage-to-dc-detector-output-voltage conversion is given by:

$$V\,dc = C\,V\,rf \qquad \text{(Eq. a1.)}$$

C is the rf-to-dc voltage-conversion-loss factor. The problem is that C is not a constant over the entire range of rf voltages that are of interest. Fig. 1A shows how C departs from the ideal over a 150-watt power range. Notice that C is quite constant at 0.011 for rf voltages exceeding 70 volts rms (94 watts in a 52-ohm line) but at lower line voltages the "constant" falls rapidly as line voltage decreases. If the detectors are matched, each detector output has this characteristic. Assuming matched detectors, k, the *computed* reflection coefficient is:

$$k = \frac{C1}{C2}\,\frac{Vr}{Vf} \qquad \text{(Eq. a2.)}$$

and for accuracy purposes this must be compared with the *true* reflection coefficient

$$K = \frac{Vr}{Vf} \qquad \text{(Eq. a3.)}$$

Since C1 and C2 are not necessarily equal they do not cancel in equation a2. The following example will clarify this.

Assume:

1) Vf = 70 V rms (94 watts)
2) Vrf = 10 V fms (1.92 watts)

from this K is calculated to be

$$K = \frac{10}{70} = 0.143$$

corresponding to a VSWR of 1.33. In contrast to this the data in Fig. A1 and equation a2 give a computed reflection coefficient of,

$$k = \frac{(0.0036)\ (10)}{(0.0107)\ (70)} = 0.048$$

which gives a VSWR = 1.10. On an accuracy basis this represents a reflection-coefficient error in excess of 66 percent and the errors can be expected to increase even more at lower reflected power levels. Notice that this particular type of error tends to give readings in the "optimistic" direction which will lead the operator to believe that the VSWR is better than it really is. Similar calculations at higher k values show great accuracy improvement if the detectors are closely matched. As it turns out in terms of VSWR, our major interest, the accuracy is neither as bad nor as good as an inspection of Fig. A1 would indicate. The

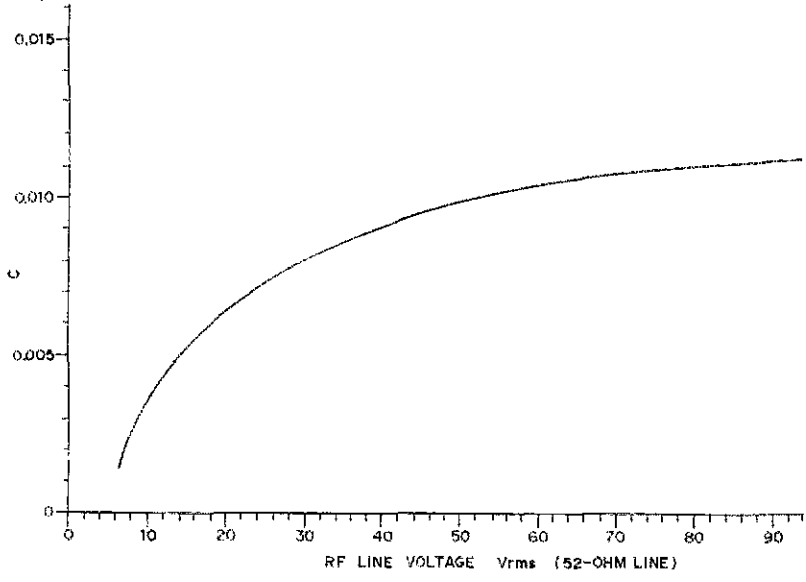


Fig. A1.

expression for VSWR is

$$VSWR = \frac{1+k}{1-k} \qquad \text{(Eq. a4.)}$$

And errors in k produce errors in VSWR that depend on the magnitude of k. The relationship is:

percent error (VSWR) =

$$\frac{2k}{(1-k)(1-d+k)} \times 100\,d$$

where d, the error in k is $\frac{(K-k)}{K}$

This can be rewritten as:

percent error in (VSWR) = M X percent error in (k)

where M is an error multiplier. A plot of M versus k for various values of percentage errors in k is shown in Fig. A2. Notice that for small values of k (M less than 1), the effect of the errors in k on VSWR accuracy are diminished, while for large values of k (M greater than 1) the effects are greatly amplified. Thus, the variations in diode constant are somewhat attenuated and in our example the error in VSWR is a modest 20 percent for a 66-percent error in k. On the other hand, for high VSWR values the factor M increases very rapidly and unless the diodes are closely matched, great errors in VSWR will result. This is because the percent error in k will have to be very small which means the ratio of C1/C2 must be close to 1.

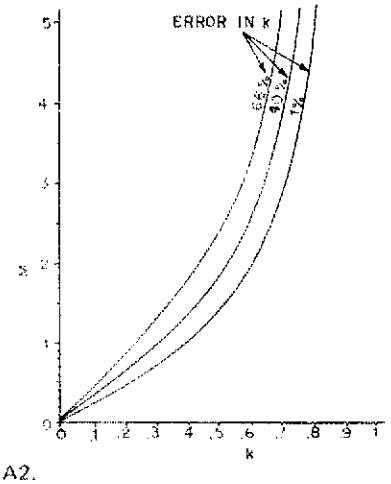


Fig. A2.

In summary, despite the nonlinear action of the diodes and the difficulties in matching them we can expect quite usable but slightly optimistic VSWR indications at low VSWR levels. Above VSWR readings of 2.4 (assuming relatively low errors in k) the indications become increasingly inaccurate and probably unusable even for tuning purposes above a VSWR of ten. The conclusion is that the accuracy requirement for the automatic ratio computer is not too great. It was decided that a 5-percent ratio computing error would yield acceptable VSWR for most purposes. QST

Parts

(Continued from page 15)

construction manual includes a parts list and the prices of the components. Such components can be ordered directly from the home office.

Substituting Parts Values

Most newcomers have a mortal fear that if they don't use the *exact* part and value specified in a construction article, the piece of equipment won't work. This is usually a needless fear. For example, most of the resistors and capacitors used in equipment have a tolerance of as much as 20 percent. Let's say that you buy a 10,000-ohm resistor. The normal garden variety of resistor could be as low as 8,000 ohms or as high as 12,000 ohms. It is true that there are resistors made with a much closer tolerance. However, if an *exact* value is required in the unit you can be sure the designer or writer of the article will be careful to specify that a special value is needed. Using the 20-percent figure, you can feel pretty secure in using any value in that range. Hams are supposed to be experimenters, so don't be afraid to experiment. QST

Strays

During the Sunbury, Pennsylvania Bi-Centennial Celebration, two members of the Central Pennsylvania Amateur Radio Club, WA3ONG and WA3ONH, operated a message booth for ten hours, passing traffic and demonstrating amateur radio. The operators were assisted and fed by W3AVJ.

A Practical Approach to Two-Meter Frequency Synthesis

Part II†

BY PETER J. BERTINI,* K1ZJH AND RICHARD VAN HOOFT,** WB2MBI

THE HETERODYNE OSCILLATOR AND QUADRUPLER. The heterodyne oscillator with its associated buffer and quadrupler circuit is shown in detail in Fig. 6 and is straightforward in design. The heterodyne crystals used were International CS-1s, cut for a series capacitive load of 32 pF. The frequency-netting capacitors can be temperature-compensating types chosen to negate any thermal drift occurring in the crystals. The approach used by Hoff is well worth researching if the ultimate in stability is desired.[5] The final accuracy and stability of the synthesizer rests on that of the heterodyne oscillator.

*20 Patsun Rd., Somers, CT 06071.
**41 Tryon Ct., Albany, NY 12203.
†Part I of this article appeared in *QST* for June, 1973.

[5] Hoff, "The Mainline FS-1 Secondary Frequency Standard," *QST*, November, 1968.

The 5.83333-MHz transmit crystal frequency was determined from the formula:

$$\frac{140}{24}$$

and the required receive crystal must be determined from the formula:

$$\frac{140 - I\text{-}F}{24}$$

where the i-f is expressed in megahertz. For a 10.7-MHz i-f the receive crystal frequency is 5.3875 MHz. The appropriate crystal is diode switched into the oscillator — more about this switching later. The oscillator output is buffered by an emitter follower, Q11, and from there is capacitively coupled into the quadrupler, Q12. The

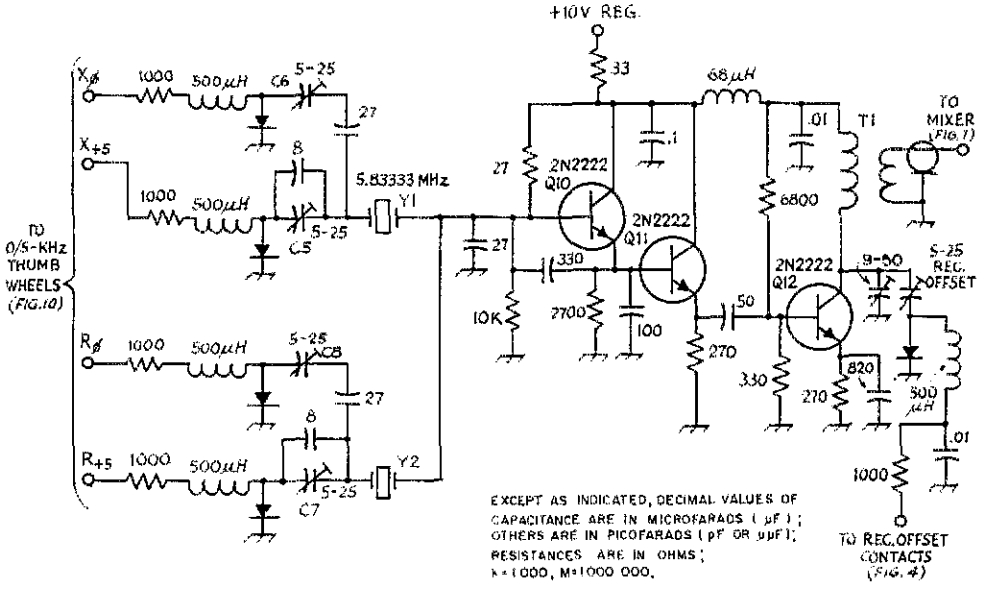


Fig. 6 — Heterodyne oscillator and quadrupler. All diodes are silicon, such as type 1N914 or equiv.
C5, C6 — For text reference.
T1 — Toroidal transformer wound on Amidon T-50-6 or similar core; primary, 18 turns No. 24 enam. wire; secondary, 3-turn link of No. 22 wire.
Y1, Y2 — See text.

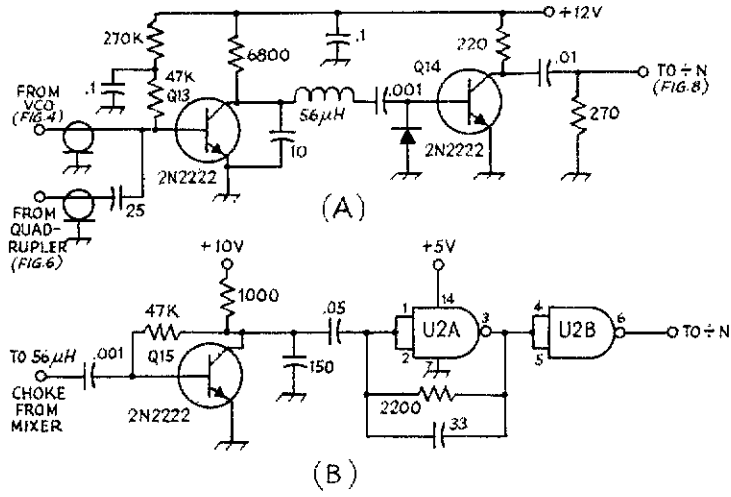


Fig. 7 — At A, the mixer and squarer circuits, and at B, an alternative squarer circuit for that included at A. The alternative circuit is suggested to provide a better wave form to drive the divide-by-N circuits. All diodes are silicon, such as type 1N914 or equiv.
U2 — 7400 DIP IC; two sections unused.

quadrupler collector tank circuit has additional capacitance switched in by a diode to permit resonance at the lower frequency which is present during reception.

THE MIXER AND SQUARER CIRCUITS. The quadrupler output is heterodyned in the mixer stage with the VCO output, which is somewhat higher in frequency (see Fig. 7). The values of capacitors for mixer injection may be changed to correct for input variations and to obtain proper input amplitude ratios. The crystal-frequency relationships are such that the resultant mixer i-f output will be from 667 to 1333 kHz when receiving or transmitting in the two-meter band. A low-pass filter comprised of a 56-μH choke and 10-pF capacitor follow the mixer to reduce the undesired mixer products to an acceptable level. The i-f output is then shaped into a square wave by the squarer circuit before going to the programmable divide-by-*N* circuit. This squaring is necessary to assure reliable divide operations from the edge-triggered 74192 ICs!

PROGRAMMABLE DIVIDE-BY-N CIRCUIT. The divide-by-*N* circuit is presented in Fig. 8. The chain of dividers can be programmed to divide by any integer from 1 to 999. Because a division by zero is not defined mathematically, the 74192 IC is disabled when programmed to do so. The BCD inputs for programming these chips are all qualified low by 270-ohm resistors connected to ground, and programming is accomplished by returning the related BCD inputs to a +5-volt logic-high condition. Programming is done with two banks of thumb-wheel switches which have BCD coded outputs, Fig. 9A. The common return of the thumb-wheel group in use is tied to the +5-volt supply, and the BCD thumb-wheel outputs go to the BCD inputs of the related counter chips. Since

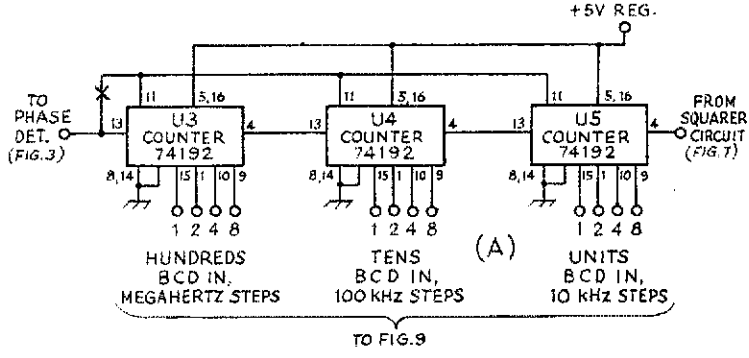
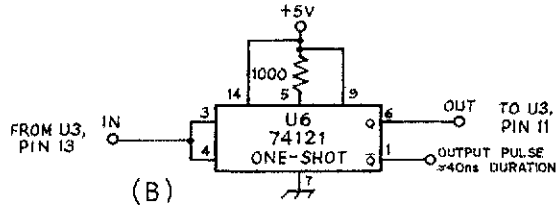


Fig. 8 — At A, programmable divide-by-N counter. At B, optional wave-shaping circuit to be connected between pins 11 and 13 of U3, shown as X.
U3,U4,U5, — Synchronous decade up/down counter with preset inputs.
U6 —Monostable multivibrator.



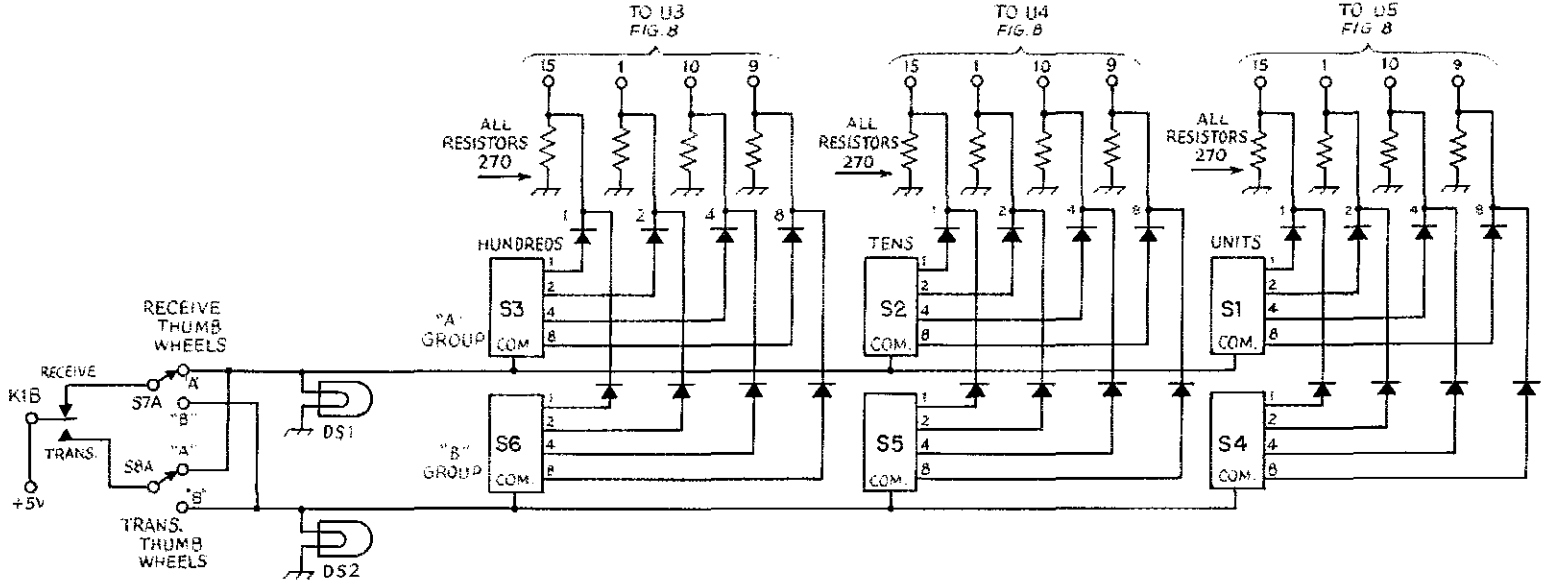
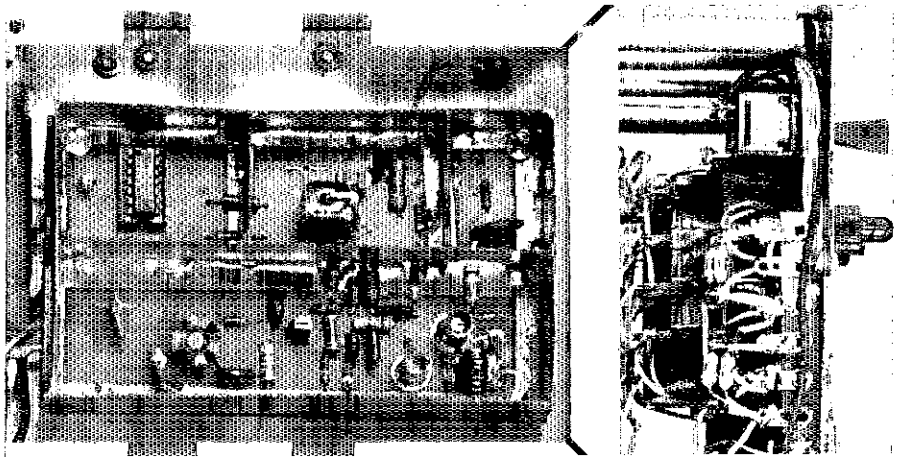


Fig. 9 — Thumb-wheel-switch circuitry for programming the divide-by-N counter. All diodes are silicon, such as type 1N914 or equivalent.
DS1, DS2 — Indicator lamp, 5 or 6.3 volts, low current.
K1B — Part of transmit-receive relay.
S1-S6, incl. — Thumb-wheel switches. See text and Table I, Part I of this article.
S7, S8 — Dpdt toggle; the B sections of these switches are shown in Fig. 10.



This underside view of the synthesizer section of the assembly shows the VCO and phase detector circuit board. Shielding has been added through the use of copper flashing, formed to make compartments for the various parts of the circuit.

the two thumb-wheel groups are in parallel, diode isolation is provided on all of the BCD outputs to prevent interaction between the two switch arrays.

Switching arrangements are shown that can provide automatic transfer from one thumb-wheel group to the other when going from receive to transmit. Either group, A or B, may be used for receive or transmit and the user may, at his option, operate simplex on either thumb-wheel setting or reverse the transmit and receive groups. A typical thumb-wheel setting of 634 would indicate a division of 634 and corresponds to the 146.34-MHz fm channel. Thumb-wheel blanks for the numbers 1 and 4 may be purchased (as well as for the decimal point) to produce thumb-wheel bays that will give a complete frequency display and impart a professional appearance to the synthesizer. Pin stops may be purchased and installed in most thumb wheels. Such stops could be placed in the first thumb wheel of each group to prevent a number other than 4, 5, 6, or 7 from being dialed up, to avoid accidental out-of-band operation. Another idea prompted by a recent article by WA2DHA [6] would be to monitor the first 74192 divide-by-*N* BCD 4 input to prevent out-of-band operation. Because of the nature of BCD coding, the 4 input is high only when the chip is programmed in the two-meter band and is low for a 1, 2, 3, 8 or 9 setting. A simple TTL gating circuit could readily detect an out-of-band condition by monitoring this input and in turn disable the transmitter or flash a warning light. The circuit could be disabled to allow operation on nearby MARS or CAP channels within the range of the synthesizer.

During construction of the synthesizer, it would be advisable to use sockets at least for the 74192 integrated circuits in the divide-by-*N* chain. Often it is necessary to interchange the 74192s or to swap them with others to obtain reliable divide-by-*N* counting. This is the one and only drawback of the synthesizer and occurred in all of the units that have been built. Care should be taken to assure that as pure a square wave as possible is fed into the divide-by-*N* circuit from the squarer. A Schmitt trigger, such as the 7413, might be used after the squarer to improve the wave form if needed, or a one-shot multivibrator may be employed. A one-shot MV connected between pins 11 and 13 of the hundreds 74192 counter in Fig. 8A has been successful in recently built synthesizers in eliminating erratic counting of the divide-by-*N* counters. This one-shot circuit is shown in Fig. 8B. Another approach would be to use the Motorola MC4016 programmable divider in place of the 74192s. The ICs are not directly interchangable as both the pin connections and input programming differ. Builders familiar with integrated circuit logic should be able to utilize the MC4016 with little difficulty, and may refer to a recent synthesizer article by WA2DHA which employs the

6 Stevens, "A 4000-Channel Two-Meter Synthesizer," *QST*, September, 1972, p. 17.

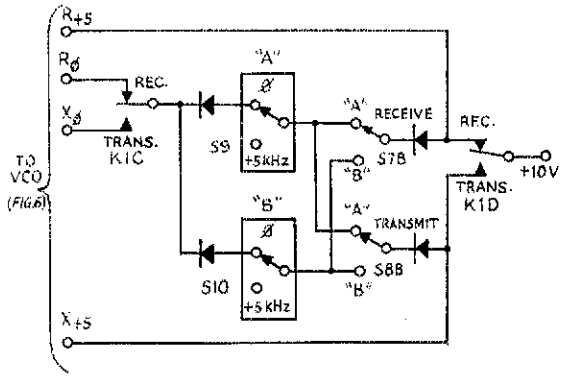
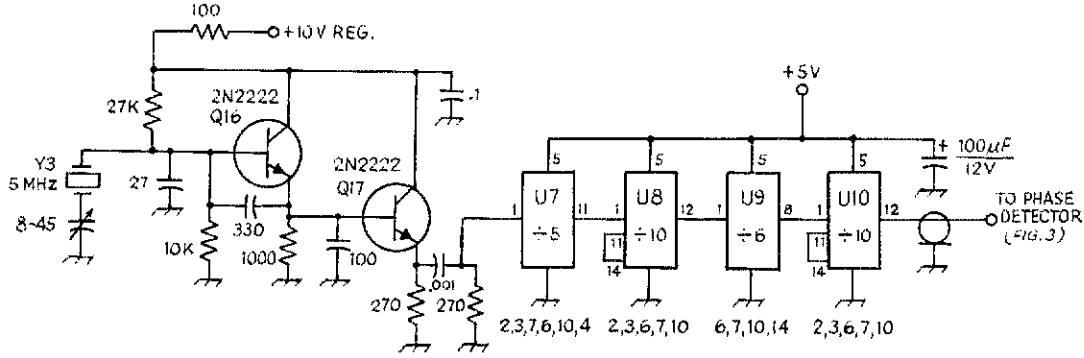


Fig. 10 — Thumb-wheel-switch circuitry for 0/5-kHz frequency offset. All diodes are silicon, such as 1N914 or equiv.
K1C, K1D — Part of transmit-receive relay.
S7, S8 — Dpdt toggle; the A sections of these switches are shown in Fig. 9.
S9, S10 — Thumb-wheel switches. See text and Table I, Part I of this article.



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. 11 — 5-MHz reference oscillator and divide-by-3000 chain.
U7, U8, U10 — 7490 IC.
U9 — 7492 IC.

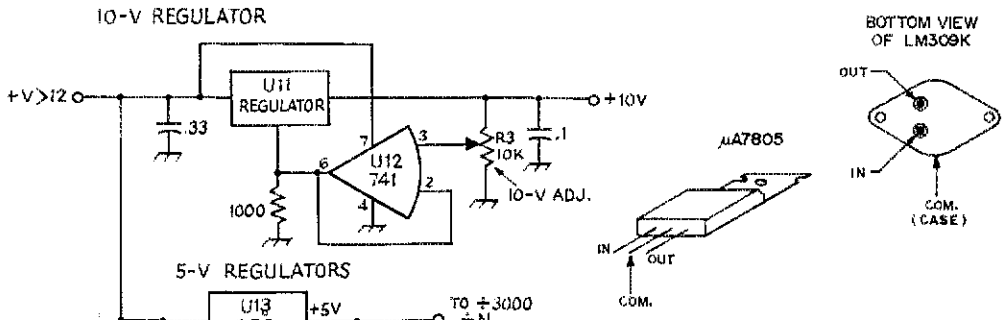


Fig. 12 – Power supply regulators. Resistances are in ohms, k = 1000. All capacitances are in microfarads.
R3 – Linear-taper control.
U11,U13,U14 – Fairchild, μA7805 or National LM309K.
U12 – 741 op amp, 8-pin DIP or TO-5 case.

Motorola devices.[7] While the MC4016 may be a cure-all for the divide-by-*N* difficulties encountered with some 74192s, the MC4016 price is more than $6 apiece as compared to the 74192 which is available surplus for less than $2.

THE 5-KHZ OFFSET SWITCHING. Since the reference frequency of 1.66667 kHz does not permit channel steps of less than 10 kHz, the 0- to 5-kHz offsets do not enter into the programming of the divide-by-*N* chain. Instead, the 5-kHz offset steps for receive or transmit are obtained by "pulling" or shifting the related heterodyne crystal frequency. The 0/5-kHz thumb-wheel switches control preset trimmer capacitors which are diode switched across the frequency-netting capacitors of the heterodyne crystals, as needed (see Fig. 10 and Fig. 6). A 5-kHz offset would remove the offset capacitor from across the related crystal, raising the oscillation frequency of the crystal the required amount for the 5-kHz offset. The actual shift of the crystal frequency is only a few hundred hertz and is well within the tolerance of the crystals. If the last thumb wheel of a group was set for a 5-kHz offset, either the receive or transmit heterodyne crystal would be offset automatically. A thumb-wheel reading of 6895 would correspond to the 146.895-MHz fm channel.

THE REFERENCE OSCILLATOR AND DIVIDE-BY-3000 CHAIN. The 5-MHz oscillator in Fig. 11 is similar to that used in the heterodyne oscillator. The oscillator output is buffered by an emitter follower before being fed into the divide-by-3000 chain. The divider chain is comprised of four ICs. The resulting 1666.667-Hz reference is fed to the proper phase detector input through a 330-ohm series resistor (Fig. 3). A recent Motorola applications note suggests that a one-shot be used to supply a pulse input to the MC4044 phase detector at the reference frequency. A marked reduction in the 1666.7-Hz leakage through the MC4044 has been noted when this suggestion was followed. The circuit of Fig. 8B can be used with the output of the 74121 taken from pin 1 instead of pin 6. If used, the one-shot is inserted in place of the 330-ohm resistor in Fig. 3.

POWER SUPPLY REGULATORS. The power supply regulators of Fig. 12 make use of prepackaged assemblies and are self-explanatory. The five-volt regulators may be either the National Semiconductor LM309K or the Fairchild μA7805. One of the five-volt regulators may be eliminated, but the more fastidious constructor will opt to use a separate one to supply the +Vcc to the MC4044 phase detector.

The 10-volt supply makes use of a circuit described by Fairchild[8] and is built around the μA7805. The supply is adjustable and it is imperative to run the output 2 to 3 volts less than the input voltage to assure proper regulation; the synthesizer will not work otherwise. The VCO, loop filter, and oscillators are voltage sensitive and are powered by the 10-volt supply. The mixer, output buffers, quadrupler, and transistor squarer circuits may be run directly from a clean 12 to 14 volt source.

All +Vcc runs should be well bypassed and shielded, and 0.1 μF bypasses should be sprinkled liberally throughout the unit to assure good decoupling. The divide-by-3000 and programmable-divider ICs should be isolated from the remaining circuitry as a large amount of broad-band rf hash is generated by these devices.

THE OUTPUT FREQUENCY DIVIDERS. The output of the VCO is fed into the MC3062P dual flip-flop, where it is divided by a factor of 2 or 4 to produce the common output frequencies (see Fig. 13). To avoid loading down the MC3062, the outputs are not taken directly from the IC. Rather, two buffers, one each for the receiver and transmitter, are tied to the desired outputs of the MC3062 or to the VCO output. It is possible that

[7] See footnote 6.

[8] *Linear IC Data Catalog*,, Fairchild, November, 1971, p. 202.

some rigs will require both buffers to come from a common output, such as the Motorola Motran series, and in these instances the buffers will also serve to isolate the receiver and transmitter circuitry. The buffers shown in Fig. 13 are two-stage devices, an amplifier followed by an emitter follower, and are designed to feed a low-impedance load. An SN7400 IC may be used instead of the transistor buffers shown and will work equally well.

Since oscillator requirements vary greatly from rig to rig, only a general description for interfacing the synthesizer can be supplied. The low-impedance output of the buffers will work quite well into most solid-state rigs, but those employing tube oscillators will require an impedance transformation network to raise the injection voltage to a usable level. A simple matching circuit suitable for coupling into high impedance loads from the synthesizer output was covered by K2DHA.[9] Tube-type Pierce oscillators in which the crystal is connected between the control grid and screen grid elements of the oscillator tube should be modified so that the screen grid is rf bypassed to ground and the injection voltage is fed into the control grid. Solid-state rigs using Colpitts oscillators will typically be unstable when driven directly from a low-impedance source and will have a tendency to squeg. Squegging may be eliminated by driving the rig through a series resistor or choke.

Synthesizer Alignment

While the actual set-up and adjustment of the completed synthesizer is basically a simple step-by-step procedure, the prospect of doing it may represent a formidable barrier to those unfamiliar with the device. For that reason, it is best to approach all alignment or trouble-shooting on a step-by-step basis. Following the basic procedure outlined below will successfully align a correctly working unit.

1) Proper divide-by-*N* operation can be checked with a function generator and counter, and is recommended. Feed a square wave of approximately 1 MHz into the divide-by-*N* input and count the ÷ *N* output going to the phase detector for proper division throughout the thumb-wheel range.

2) Set the 5-MHz oscillator to frequency by checking it against WWV, and check the divide-by-3000 output with a counter for the 1.6667-Hz reference.

3) The quadrupler tank trimmer can be peaked for maximum output while in the transmit mode using an rf voltmeter or wavemeter. The receiver offset trimmer should likewise be peaked while in the receive mode. Repeat the procedure to cancel out any interaction between the two settings.

4) For initial VCO alignment, remove the 1-megohm resistor from the loop filter output and connect it to a regulated +9-V source. With no voltage applied to the VCO offset input, set the trimmer capacitor (C2 of Fig. 4) so that the VCO frequency is slightly above 24.666 MHz. Apply 10

[9] See footnote 6.

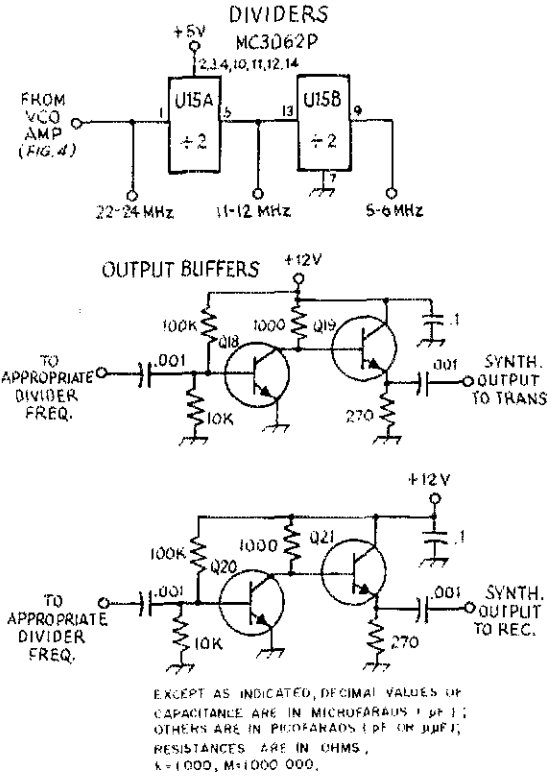


Fig. 13 — Output frequency dividers and buffers. Two sections of a single SN7400 IC may be used in place of the two buffer sections shown.
Q18-Q22, incl. — 2N2222 or equiv.
U15 — Motorola MC3062P IC.

V to the rec. offset terminal and adjust the rec. offset trimmer, C2, so that the VCO frequency is again slightly above the maximum frequency ($\frac{148 - I.F.}{6}$). There will be a goodly amount of interaction between these two adjustments and both settings will have to be alternately set several times. Once completed, reconnect the 1-megohm resistor to the loop filter. At this point the synthesizer should be operational, and the VCO phase locked. The VCO trimmers should be repeaked once lockup is achieved to assure operation over the desired range for both the receive and transmit frequencies. Final frequency calibration is done with the trimmer capacitors connected in series with the heterodyne-oscillator crystals. The 5-kHz trimmers (C5 and C7 of Fig. 6) are set first on a 5-kHz channel, and then the 10-kHz trimmers (C6 and C8) on an even channel. There is, again, a certain amount of interaction, and the procedure will have to be repeated several times.

Credit is deserved by Al Miner, WA1CZG, and Ray Rouillard, WA1BWF, for contributions in improving the circuitry and the final proving out of the design with the construction of their prototype units. Thanks for assistance also go to Judd Snyder, K2CBA, and Woodie Weiss, K1UAX. QST

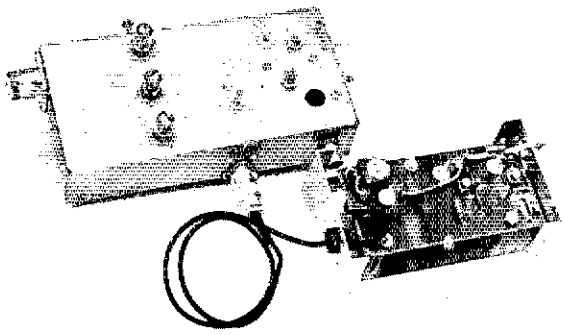


Fig. 1 — The K6UQH 1296-MHz converter, with its separate oscillator-multiplier injection system. In the latter, shown with its cover removed, three transistor stages generate power at 211 MHz to drive a diode multiplier to 1268 MHz, built into the converter unit.

1296 REVISITED

Improvements in a Much-Used Converter for UHF Service

BY WILLIAM O. TROETSCHEL,* K6UQH

THE TURNING POINT in the state of the art for uhf enthusiasts seems to have come in the 1950s. Before then few parts and pieces available to hams could be made to work well above about 200 MHz. Then solid-state technology really took off, first with the parametric amplifier, and more recently with the varactor multiplier and uhf transistors.

Being attracted to the bright lights and glitter, the author and Jim Heuer, KH6CYI, now WB6TXN, decided to produce a workable and reproducible parametric amplifier for 1296 MHz.[1] The obvious problem was to design the paramp, but the real problem was what to run the paramp into, after you build one. A search showed the best thing available to be a converter design by K6-AXN.[2] He used grounded-end half-wave lines as resonant elements, an excellent feature. Once you figure out that the high-voltage point for rf is at the middle of the line, instead of at one end, the rest is easy, if you can get energy into and out of them without losing your shirt, or the signal!

Trough-Line Design Factors

Close attention must be paid to the rf conductivity of trough lines, especially in solder seams at high-current points, as at the grounded ends. Silver soldering and/or silver plating can improve the *Q* over that of lower-temperature solder and bare metal. The difference in performance may be difficult to measure when the equipment is new, but the silver work should stand up better. Silver plating is not an absolute requirement, however.

The actual physical length of the trough lines is a design tradeoff. Limit the capacitive adjustment range by using a tuning device having no greater range than necessary, typically a No. 10 screw and nut. Be sure that the trough-line resonance range will not encompass many oscillator harmonics, by using the highest input frequency to the multiplier trough that you can generate reasonably. A frequency in the range of 200 to 300 MHz is recommended, as adjacent harmonics will then be well outside the circuit's tuning range, and will be attenuated markedly. Input to the last multiplier in the converter described here is 211.33 MHz, for a 28-MHz i-f.

Coupling from one trough to another is very important. Conventional links also couple capacitively, which is not desired. Link inductance and capacitance values generally represent complex impedances, which may not be proper loads at these frequencies. Capacitive-probe coupling is equally complicated, in terms of knowing what you really have. Aperture coupling in the trough walls is an excellent method. Slots can be made adjustable, but once the design geometry for near critical coupling is established, reasonable departures therefrom will not degrade performance seriously, as there will be variation only from slight over-coupling to slight under-coupling.

Line loading must be considered, if the physical line length is to be reasonably close to the electrical half-wavelength. The capacitive part of

* 16615 Bohlman Road, Saratoga, CA 95070

[1] Troetschel and Heuer, "Parametric Amplifier for 1296 Mc.," January, 1961, *QST*.

[2] Krivohlavek, "1296-Mc. Converter Without Complications," March, 1961, *QST*. Repeated in *The Radio Amateur's Handbook*, 1962 - 1968.

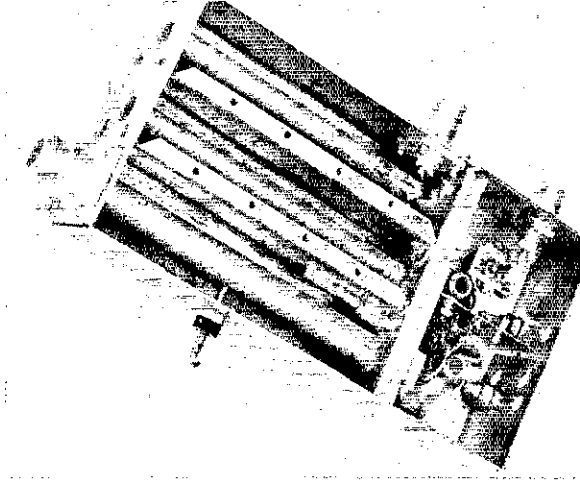


Fig. 2 — Bottom view of the 1296-MHz converter, with the diode multiplier to 1268 MHz shown in the top trough. The diode mixer is mounted in an aperture at the inner end of the lower of the two long partitions. The screw in the side wall is a matching adjustment for the signal trough.

the load impedance will shorten the resonant physical length of high-impedance lines drastically. Good design impedances, to minimize this effect, are 40 to 100 ohms. For the sizes used in the signal tank of this converter, the line impedance is close to 53 ohms. Those of the multiplier and filter troughs are slightly higher. With these low impedances and small tuning capacitances, tunable lines 10 cm long are usable at 1296 MHz, compared with an electrical unloaded length of 11.5 cm. The trough lines should have a cover plate to complete the rectangular enclosure, not so much because of serious change in line impedance, but, more importantly, to reduce stray pickup and responses.

Thus the 1296-MHz converter described in *QST* by one early builder, and used extensively in other ARRL publications,[3] was developed. After the 1296-MHz paramp was designed and published, several additional converters were produced, to try to improve performance. More recently a solid-state injection string using inexpensive Motorola HEP transistors replaced the tubes formerly used. A scaled-up version has been built for 2300 MHz, to be used for the closed-circuit TV monitor in a Bay Area fm repeater.

A major improvement in the converter described here is the method of assembly and matching in the signal tank, replacing the hard-to-optimize loop coupling of earlier models. Signal input is by means of the Type N fitting, seen at the left end of all photographs. Its tip is soldered to the inner conductor of a small coaxial line, L8, mounted inside the bottom trough, as seen in the interior views, Figs. 2 and 3. The other ends of both conductors are grounded to the trough. Matching is achieved with a No. 6 screw, the end of which represents a variable capacitance to the inner conductor of the coaxial line, which it "sees" through a small hole in the outer sleeve. This is shown schematically as C6 in Fig. 4.

The tuning capacitors, C3, C4 and C5 in Fig. 4, are visible only in the top view, Fig. 1. No attempt was made to show C5 in Fig. 5, in the interest of clarity. It and C3 and C4 are No. 10 screws, with nuts at the inner ends making variable capacitance to the lines. These screws run through brass nuts soldered in place on the top surface of the assembly, and each has a lock nut added.

Brass tubing for the lines is available from hobby shops. Outside dimensions are given, but the stock is thin-wall, so the OD figure can be used for figuring line impedances from formula. Construction is similar to earlier converters,[3] except that dimensions are 2.6 × 2.6 × 10 cm (1 × 1 × 3-15/16 inches). Add 2 inches for the i-f amplifier section.

People seem to like circuit board stock for work of this kind, but sheet brass is preferred for this application. Brass is easy to work with, and it has advantages where aperture coupling is involved.

[3] Meyer, "Crystal-Controlled 1296-Mc. Converter," September, 1962, *QST* Repeated in the *Handbook*, 1969 - 1972, and the *VHF Manual*, 1965 and 1968 editions. Solid-state multiplier chain added by Nelson, December, 1969, *QST*, and in *Handbook* editions thereafter.

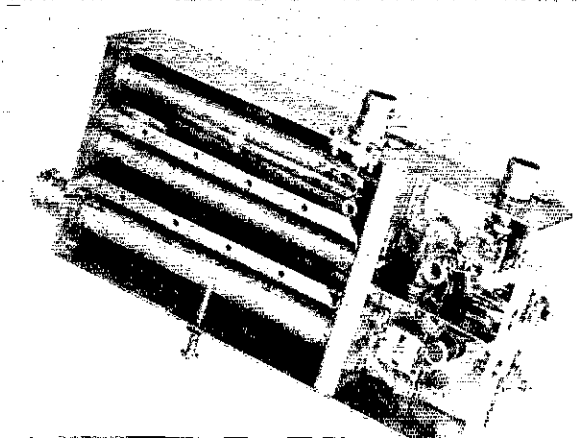


Fig. 3 — Interior of the converter similar to Fig. 2, but tilted for better view of the 28-MHz i-f amplifier built into the right end.

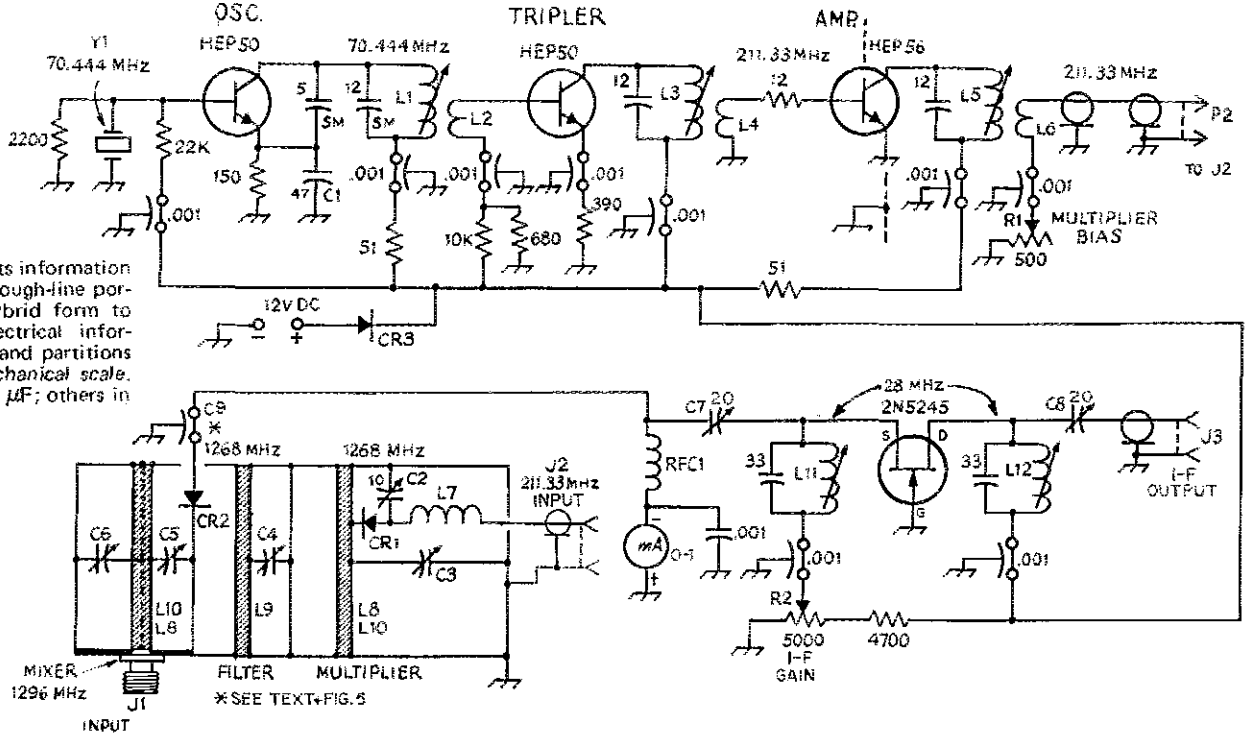


Fig. 4 — Schematic diagram and parts information for the 1296-MHz converter. The trough-line portion, lower left, is shown in a hybrid form to convey mechanical as well as electrical information. Heavy black lines are walls and partitions *of the trough assembly. Not in mechanical scale.* Decimal values of capacitance are in μF; others in pF.

C1 — Silver-mica to have Xc of 50 ohms at crystal frequency; about 47 pF for 70 MHz.
C2 — 10-pF piston trimmer. Minimum 0.5 pF.
C3, C4, C5 — No. 10 brass screw, with nut at end; see text.
C6 — No. 6 brass screw; see text and Fig. 2.
C7, C8 — 20-pF miniature mica trimmer (Arco 402) modified for metal mounting; see text.
CR1 — 1N914A diode. Tap on L8 at 1.5 cm from end.
CR2 — Hot-carrier diode in cartridge; see text and Fig. 5.
CR3 — Any diode, 50 mA or more rating.
J1 — N-type receptacle.
J2, J3 — BNC receptacle.
L1 — 6 turns No. 26 enam., spaced wire diam. on .205-inch iron-slug form (Miller 4300 or 60A022, blue slug).
L2 — 2 turns small insulated wire over B-plus end of L1.
L3 — 2 turns No. 20 spaced 1/8 inch. Form like L1.
L4 — 2 turns like L2, over first turn of L3.
L5 — Same as L3.
L6 — 1 turn like L2, adjacent to L5.
L7 — 4 turns No. 26 enam., 1/16-inch ID, spaced wire diam.
L8, L9 — 5/16-inch brass tubing, 4 inches long.
L10 — Coaxial line, 7/16-inch outer, 3/16-inch inner conductor, 4 inches long; see text.
L11 — 10 turns No. 26 enam. on 1/4-inch iron-slug form. Nominal L 0.7 μH.
R1 — 500-ohm control. Adjust for best mixer noise figure.
R2 — 5000-ohm control. Adjust for amplifier drain current of 3 to 5 mA.
RFC1 — 28-MHz rf choke.

For such coupling to work properly the partition must be thin. Double-sided board is too thick, and it puts a lossy dielectric sandwich in the aperture. The coupling apertures are 2.0 cm in the long dimension, faired smoothly to 1.0 cm wide at the end of the partition (13/16 and 3/8 inch, respectively). As already mentioned, these dimensions are not particularly critical.

The combination of 3/16- and 7/16-inch tubing in the signal line, L8, is for 50-ohm input. For 75-ohm input, use a 1/8-inch inner conductor. The capacitive loading by the matching device may make it necessary to shorten the signal line by about 1/8 inch. This is done with a brass plate inserted in the input end of the line. If brass this thick is not available, a suitable substitute can be bent up from the trough material, or the signal trough can be made 1/8 inch shorter originally. The filter and multiplier lines, L9 and L10, are of 5/16-inch brass tubing.

Mixer and I-F Amplifier

The mixer arrangement is similar to that in previous models of the converter, except for use of a hot carrier or Schottky barrier diode for CR2, in place of the point-contact diode in earlier versions. These diodes are usually packaged in glass, with thin wire leads, not well adapted to aperture mounting in the manner shown in Fig. 5. Schottky barrier diodes in 1N21-series cartridge are listed by Alpha Industries, Woburn, Mass., as types D5910, D5910A, D5910B, and D5910C, in order of descending noise figure (and presumably in order of increasing price). Hewlett-Packard types 2353, 2366, and 2403 are similarly listed. If these cannot be found, any hot carrier or Schottky barrier diode can be installed in a housing salvaged from a burned-out 1N21-series diode, with a little ingenuity and care. Use low-temperature solder.

Diodes of the desired characteristics are also available in double-ended form (reversible) which can be adapted to aperture mounting in the manner shown in Fig. 5. A brass sleeve for contacting the diode tip is soldered to the wall of the trough. This is the same for either diode. See Fig. 5C. The plate and sleeve for the end of the diode that projects through the wall will depend on the type of diode housing used. The 1N21 type, Fig. 5B, requires a collar just long enough to prevent the brass portion of the diode housing from projecting into the trough aperture. The reversible diode takes a sleeve of smaller diameter, which will have to be adjusted in length for the diode used, since there are various diode housings of the reversible type. The sleeve should project into the aperture to provide a low-inductance connection from the tip to the diode plate. See Fig. 5D. The brass diode plate is insulated from the trough by a sheet of Mylar, Teflon, or mica, 0.005 inch thick, in either case. The assembly is held in place with Nylon screws. Be sure that the hole in the end of the trough is large enough so that the diode sleeve will not short to the trough after assembly.

The i-f amplifier is seen at the right end of Figs. 2 and 3. The circuit is given in Fig. 4. The TI 2N5245 was recommended to me by WB6NMT. It is low in cost, and its performance is adequate for this application. The grounded-gate configuration gives somewhat lower gain than is possible with grounded-source, but it does not require neutralization. Simple shielding provides complete stability. The coil information given is for the 28-MHz range. Frequencies up through the 2-meter band should be usable, with suitable modification of the circuits and oscillator-multiplier chain.

The Arco mica trimmers used for C7 and C8 can be mounted on metal brackets grounded to the chassis, if the compression washer under the adjusting screw is changed from metal to insulating material. The small ears on the bracket on the underside of the trimmer can then be soldered to the mounting bracket.

The Oscillator-Multiplier

I strongly recommend the highest-frequency crystal that you can afford in the oscillator-multiplier chain. Many signals not in the desired frequency range can be beaten into the i-f amplifier by unwanted harmonics of a low crystal frequency. The selectivity of the filter trough (middle section of the main converter assembly) helps in this, but if the crystal frequency is too low there may be harmonics too close to the trough frequency to be rejected. Energy on unwanted harmonics also tends to raise the mixer noise figure, with no beneficial effects.

The oscillator and multiplier stages preceding the diode multiplier to 1268 MHz use readily available Motorola HEP transistors, as crystal oscillator, tripler, and 211-MHz amplifier. This lineup generates enough output to drive the diode multiplier adequately, while operating with the stability necessary for weak-signal cw and ssb reception. It is possible to get nearly 1 mA of mixer diode current, though between 0.3 and 0.7 mA should provide the best noise figure. Adjustment is by means of the 500-ohm bias control in the multiplier *diode return to ground through L6. See Fig. 4.* Slight variations in diodes or layout may require adjustment of turn spacing in L7.

Don't put anything in the troughs that is not necessary. The diode multiplier section is the top portion of the converter, as seen in Figs. 2 and 3. It contains only the multiplier diode, CR1, the 211-MHz circuit, L7-C2, and the BNC fitting, J2. The 1N914A diode is inexpensive and fine for multiplier use. It is tapped on the multiplier line, L8, at about 1.5 cm (5/8 inch) from the inner end. Tapping too far up the line will lower the Q of the trough drastically, and affect both the circuit selectivity and the mixer injection level adversely.

The vhf portion of the oscillator-multiplier system is built on a circuit board mounted inside a 1-1/4 by 2-1/4 by 4-1/8-inch Minibox. Full constructional details are not given, as the unit is of conventional design and layout is not critical. It is shown, with cover removed, along with the main

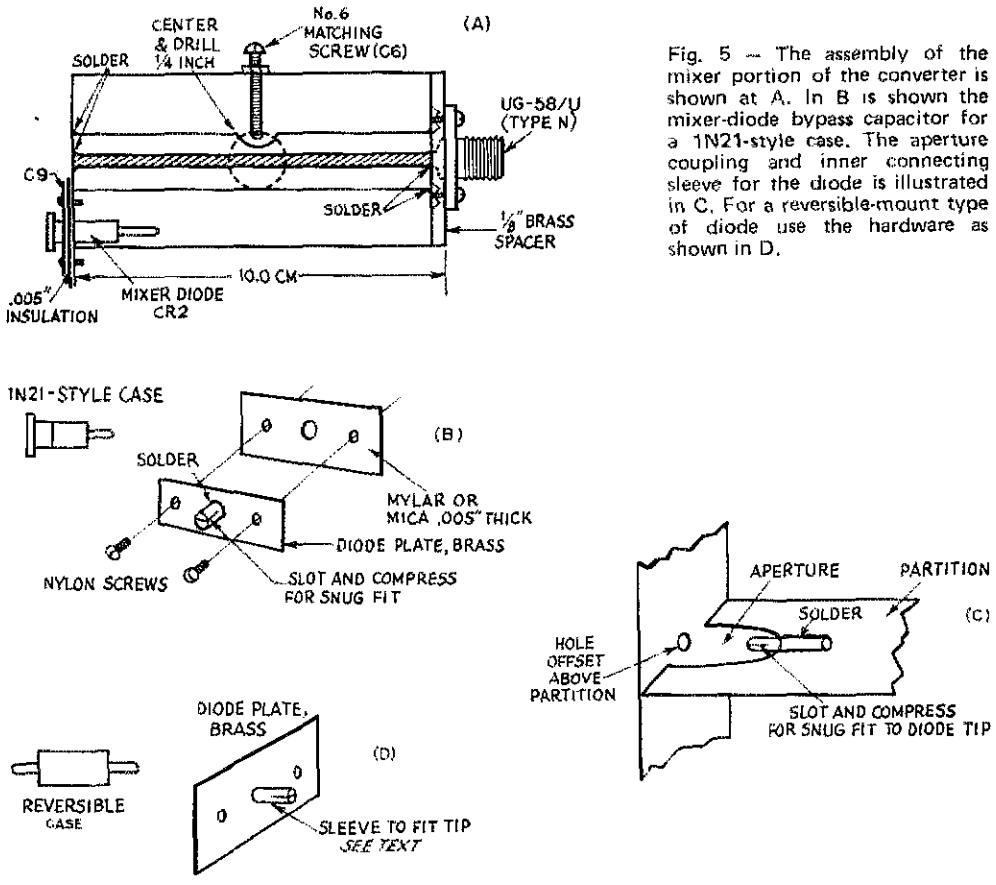


Fig. 5 — The assembly of the mixer portion of the converter is shown at A. In B is shown the mixer-diode bypass capacitor for a 1N21-style case. The aperture coupling and inner connecting sleeve for the diode is illustrated in C. For a reversible-mount type of diode use the hardware as shown in D.

converter assembly in Fig. 1. Frequencies given in Fig. 4 are for 1296-MHz reception at 28 MHz on the communications receiver. In the writer's converter 26 MHz is used for 1296-MHz reception, using a crystal at 70.555 MHz. Only a small tuning range is needed ordinarily, as most crystal-controlled operation is close to 1296 MHz currently.

Adjustment and Use

There is nothing unusual about setting up the oscillator and multiplier stages. Frequencies can be checked with a dipper or wavemeter, to be sure that the right harmonics are being generated and amplified, and to assure that the stages are tuned for maximum output. The mixer diode current will be a reliable indication of proper tuning of the diode multiplier, once the desired frequencies are verified. Attaining adequate drive to the diode may be simplified if the coaxial line between L6 and J2 is an electrical half-wavelength at the frequency concerned, in this case 211 MHz.

In tuning up the trough circuits the objective should be maximum response to a 1296-MHz signal source. The harmonic of a 144- or 432-MHz transmitter may be used, if you are sure that you have the right harmonic.

There will be some interaction between the matching screw and the tuning screw in the signal input tank. Just tune them for maximum signal. The mixer diode current should be adjusted by means of the 500-ohm control for best reception of a weak 1296-MHz signal with respect to noise, rather than just maximum signal strength, if there is a difference.

If the system as described is adjusted with care its noise figure should be low enough to provide quite good 1296-MHz reception, even without an rf amplifier. As low as 7 dB is possible, with the best available diodes in the mixer. Then, if you want to see system sensitivity similar to the best usually available at 144 MHz, put a preamplifier such as the one described by WA2VTR[4] ahead of the trough system. I have built a similar unit using a Hewlett-Packard 821E transistor. It produces a system noise figure around 3.5 dB at 1296 MHz. My paramp is now retired. A two-stage amplifier built by W6KQG, entirely of circuit-board design, has also been used very effectively. This may be described in a future issue of *QST*. QST

4 Villardi, "Low-Noise 1296-MHz Preamplifier," *Ham Radio*, June, 1971. Early version in December, 1968, *QST*, and in *Handbook* and *VHF Manual* thereafter.

Technical Correspondence

REPETITIVE ORBITS OF OSCAR 6

Technical Editor, *QST*:

A few interesting parameters not previously published have been observed while developing an autocommand system for Oscar 6. The most significant information is that the equator crossing point follows almost exactly (five significant figures) a repeating period of 263 orbits. This just also happens to be a period of 21 days. Stations which are tracking az/el, or elevation only, can now make up a simple card file of satellite "on" day orbits over a period of three weeks and then just refer back to a reference orbit table. Note the repeating occurs on the same weekday, 21 days later.

A reference orbit table can be made for a few months with a small calculator. However, a time-shared computer can grind out a table for 2600 orbits in a half hour at 100 wpm. A very simple program (Table I) in the basic language run twice a year should meet even the most demanding needs. The program run was terminated after a few orbits and is only intended as a sample of the program output. – *Larry Kayser, VE3QB, 59 Westfield Cres., Ottawa, ON K2G ϕT6.*

```
100 LET A=2288
110 LET B=263
120 FOR I=1TO263
130 PRINT A;A+B;A+2*B;A+3*B;A+4*B;A+5*B;A+6*B;A+7*B;A+8*B;A+9*B
140 LET A=A+1
150 NEXT I
160 END

READY

.

RUN

 2288   2471   2734   2997   3260   3523   3786   4049   4312   4575
 2289   2472   2735   2998   3261   3524   3787   4050   4313   4576
 2290   2473   2736   2999   3262   3525   3788   4051   4314   4577
 2291   2474   2737   3000   3263   3526   3789   4052   4315   4578
 2292   2475   2738   3001   3264   3527   3790   4053   4316   4579
```

Table I – Simple program written in the basic language for a reference orbit table for Oscar 6. Column 1 may be used to make reference cards. Columns 2 through 10 indicate repeating orbit numbers.

OSCILLATIONS IN POWER SUPPLY REGULATORS

Technical Editor, *QST*:

Recently while troubleshooting a simple regulated 5-volt supply it was noted that the regulation was worse than ±10 percent. A quick check with a VOM indicated that the dc input voltage to the integrated-circuit regulator was sufficient for proper operation. Looking at the ±5-volt output with a high-frequency oscilloscope revealed a hefty two-volt peak-to-peak 2.5-MHz oscillation. The LM309K voltage regulator was suspected since the power supply was designed according to the manufacturer's data sheet and contained only six major components, i.e., the power transformer, rectifier, filter capacitor, the LM309K, a fuse, and a small .01-μF bypass capacitor.

I found that removing the .01-μF bypass *capacitor stopped the oscillations. When I replaced* the capacitor with a different type of the same value there were still no oscillations. Without a good high-frequency oscilloscope and a good hunch the problem might not have been solved. For those not lucky enough to have the above, the following points are made:

1) Even though IC voltage regulators are required to operate at dc or low-frequency ripple voltages, internally these circuits contain amplifiers and transistors capable of amplifying, and hence oscillating, at frequencies of several megahertz.

2) Some capacitors don't always act like capacitors at higher frequencies. Be especially careful of ceramic capacitors that offer high capacitance in small volume. Use a good high-frequency disk ceramic, mica or tubular capacitor for bypassing.

3) Use good high-frequency wiring techniques. Use short leads of larger wire than may be required by the direct currents. Use single-point grounds. And use bypassing where necessary.

Following the above criteria the builder may prevent serious damage to circuits from a defective power supply. – *Albert D. Helfrick, K2BLA, RD1, Box 87, Boonton, NJ 07005.*

CLOCK PULSES IN THE TTL MICRO-TO KEYER

Technical Editor, *QST*:

While trying to correct erratic operation in the micro-TO keyer unit built with TTL ICs,[1] I discovered that the clock signals to the *J-K* flip-flop need to be inverted before the unit will operate correctly. A modified version of the keyer is being used as the character generator for a keyboard Morse unit I am building up. In making the conversion from the RTL IC's used in the original TO keyer WA7RLL correctly inverted the *J* and *K* inputs, but apparently overlooked the fact *that the clock signals should also be inverted.*

The clock signal to pin 5 of the 7473 (which should be labeled *C* instead of $\overline{C}$) can be inverted with a single 2N4123 stage as shown in Fig. 1. The clock signals to pin 1 are inverted by strapping it to the Q output of the first flip-flop, pin 9, instead of connecting it to pin 8, the $\overline{Q}$ output. The manufacturer's specs for the 7473 state that the unit requires a high clock signal and that the input signals to the flip-flop should not change during the time the clock signal is high.

I also experienced difficulty in getting the generator to start reliably, apparently because of a bit of leakage in the Q2 stage which controls the operation of the generator. This was cured by changing the 47k-ohm resistor in the base lead to 10k and adding a 5100-ohm resistor between the base and ground, as shown in Fig. 1. – *Don E. Compton, K4FS, 1712 Merritt Park Dr., Orlando, FL 32803.*

[1] Aldridge, "The Micro-TO Keyer with TTL ICs," Technical Correspondence, *QST* for September, 1972, page 57.

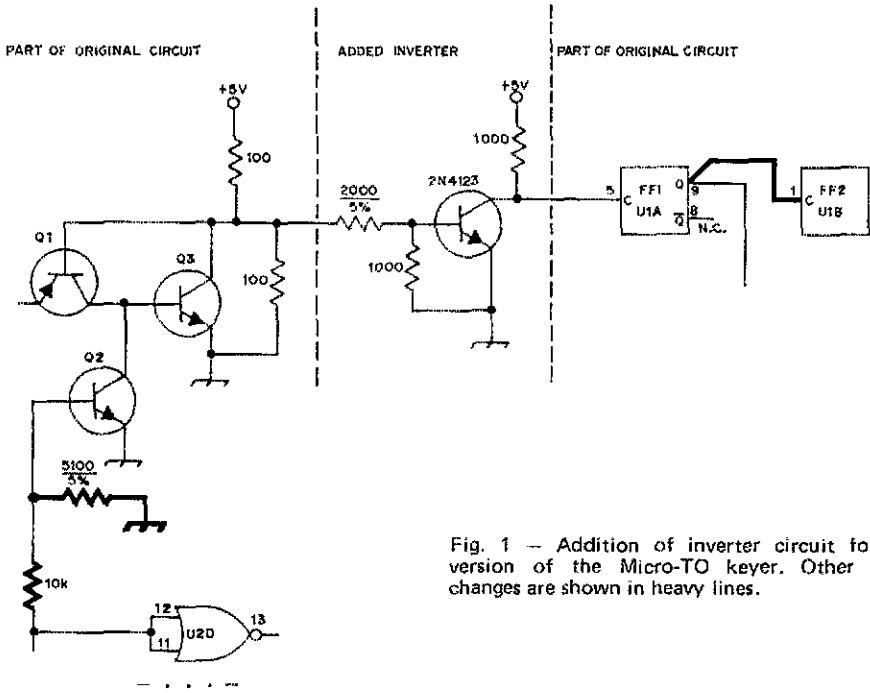


Fig. 1 — Addition of inverter circuit for TTL version of the Micro-TO keyer. Other circuit changes are shown in heavy lines.

Technical Editor, *QST*:

I refer to the letter by WA7RLL in the September 1972 issue of *QST* on the TTL mod. to the Micro-TO keyer.[2] I, too, desired a change to this RTL keyer in the *Handbook*. So about 9 months ago K1OZS and I got our heads together and got one going. The circuit was nearly identical to the one published in *QST*.

Striving for the best in state of the art, I went a little further. Instead of using the three transistors and other components in the clock circuit, I used one more IC. One 7400 or equivalent works just as good or better, and in less space. The cost is less, too. C1 may be changed to suit the user's speed requirements. Fig. 2 is a diagram of the hookup. — *Richard L. Swain, K8AIT/5, 5626 Gwenda Lea, San Antonio, TX 78242.*

[2] See footnote 1.

HIGH-DENSITY PC BOARDS MADE EASY

Technical Editor, *QST*:

The recent interest in transistorized equipment and the many fine circuits in *QST* have developed a small "boom" for the do-it-yourself approach to pc-board construction. A recent *QST* article for a complete cw transceiver in a very small case stirred my imagination, so I set out to maximize the "performance per cubic inch" inside the cabinet. Obviously, the use of high-density pc boards is the only practical way to do so. The following notes are offered to ease the construction of such boards.

The first step is to breadboard each circuit and get it working properly. Then using those individual components that you know will work, plan the layout of the pc board. The general

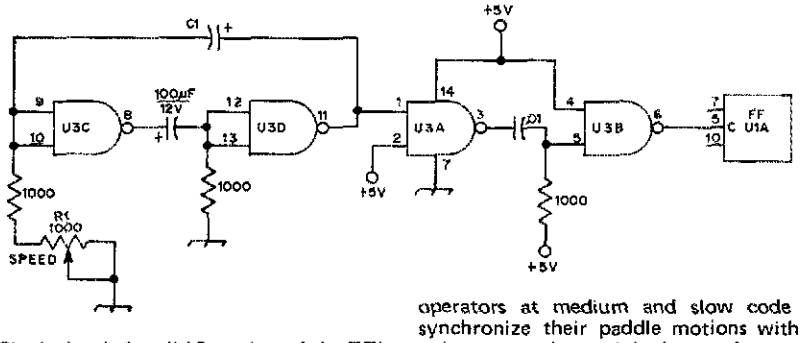


Fig. 2 — Clock circuit for all-IC version of the TTL Micro-TO keyer. The output is of the proper polarity, as described above by Compton. [EDITOR'S NOTE: This circuit is a free-running clock, rather than one which is gated by the dots and dashes being formed, and thus might be best suited for use with a keyer having dot and dash memories. Otherwise, it may be difficult for some operators at medium and slow code speeds to synchronize their paddle motions with the clock pulse rate, as it won't be known for sure just when the pulses are occurring.] All capacitances are in microfarads, and all resistances in ohms.

C1 — Electrolytic, 12-V rating or greater. Typical value, 15 to 30 µF. See text.
R1 — Linear-taper control.
U1 — Part of original keyer
U3 — 7400 IC, dual in-line package.

location of the input, output, supply voltage, and control terminals to each board should be planned to match corresponding terminals of adjacent boards to minimize interconnection lengths between boards. (On a complex project, it may be better to plan on the use of a few boards, rather than one large board. Since there's always one portion of the project that just won't work properly the first time, even though it's been previously breadboarded, it's much easier to take the building-block approach.) High-density packaging should consider the following:

1) Resistors and small axial electrolytics can be mounted on end.

2) Sockets for transistors are not necessary, but use only a low-wattage soldering pencil.[3]

3) Miniature trimmers, such as Calectro A1-246 (4-40 pF), are but half the physical size of regular trimmers, and can be mounted directly on the board by drilling a center hole large enough to clear the trimming screw, cutting off the end tabs, and soldering a short wire through each end rivet to the foil side.

4) Use miniature 50-V bypass capacitors (up to 0.1 μF).

5) Toroids are used to decrease the physical size of a coil and minimize the electromagnetic field external to the coil.

6) Wherever possible, use multifunction devices instead of discrete individual components. For example, the W7ZOI keyer[4] uses two μA741C op amps. Poly Paks sells a dual 741C in a TO-5 case for $1.

7) Check your junkbox for those "5-for-a-dollar" surplus computer boards – small components such as micro-chokes and small electrolytics often make the board more valuable than many unmarked transistors.

Now that you have the pc-board layout designed with pencil and paper, check it carefully against the circuit schematic. Then recheck it again, starting from the opposite end. If everything still looks okay, cut out the paper pattern and prepare a piece of copper-clad circuit board as follows:

1) Using a hacksaw, saw the board (with the foil side up) to the proper size and file the rough edges.

2) Scotch tape the paper pattern to the foil side and lay the board on a hard surface. Now gently tap a small dent into the foil side where each component lead is to be placed. Use a sharp counterpunch and light tack hammer. These dents will simplify the drawing of the pattern and later drilling.

3) Before removing the paper pattern, check to see that all the desired dents have been made, including the four corner holes for the support screws.

4) Remove the paper pattern and tape it to a separate sheet. Label the inputs and outputs for future reference.

5) Using inexpensive copper cleaner for kitchen pans, polish the foil side to remove all dirt and oil.

6) With an artist's brush and ordinary house enamel for etchant resist, paint the electrical circuit outline on the foil, making a slightly larger spot over each dent.

7) Check and recheck the paint outline against the paper pattern outline. Then be sure to paint around the edges of the foil to ensure a good ground connection at and between each corner hole.

8) Allow the enamel to harden for one or two hours until tacky. Using a sharp point or jeweler's screwdriver, correct any mistakes. Ensure at least 1/32-inch separation for those lines you don't want touching.

9) Immerse the board in the etchant bath. I use ferric chloride (carefully!) in a plastic tub with a locking top (even the fumes from ferric chloride can ruin clothes if left exposed for long periods of time). I have not found that I need a heated bath or a method for agitating the bath, but I do put the board in on its edge to keep the "circuit" out of any sludge or sediment that may accumulate in the bath. After about 45 minutes to an hour (for a temperature of 65°F) remove the board with a small plastic rod (or rubber gloves) and wash it and your hands thoroughly. If it needs more etching, do so, rotating the board if necessary.

10) When etching is completed, wash it again and pat dry with a paper towel. The enamel will still be tacky and removes very easily with turpentine and a paper towel. Wash with soapy water and dry.

11) Using a No. 63 or 64 drill bit (most hobby stores have them – get 2 or 3!) drill out each dent and smooth with steel wool. Enlarge only those holes necessary, such as the four corner mounting holes.

12) Components are now added. Resistors and capacitors first, then coils and finally, the transistors, diodes and ICs. If insulated-gate MOSFETs are used, mount them last, as a dc return path to ground is mandatory for protection of the device. If the pc-board ground, soldering pencil tip, heat sink for the MOSFET lead to be soldered (hemostats do nicely) *and your forearms* are all connected electrically, the MOSFET can be handled with impunity while soldering it to the pc board. Once in the board, the device cannot be harmed by handling, but it should not be removed unless it is defective.

13) Use very fine rosin-core solder when soldering to pc boards.

As the final step, the completed circuit boards are mounted within the cabinet and interconnected as previously planned. Front and rear panel connections are then made.

The above, is, of course only one of the many ways to prepare circuit boards, but I have found it to be quick, flexible, inexpensive, and most satisfactory. The dry etchant resist transfer method works, but is more expensive and time-consuming than painting. Although the painting method is perhaps not as attractive aesthetically, I remind myself that it doesn't matter to the electron.

There is one consideration, however, in the design of equipments using high-density pc boards. It's all too easy to pack the boards so full that a larger cabinet is required just for panel space to mount the necessary controls! Even with miniature concentric pots and switches, a point of diminishing returns is approached when there's not enough room to manipulate all the controls comfortably! – *Howard F. Batie, W7BBX/4, 2912 Johnson Rd., Falls Church, VA 22042.*

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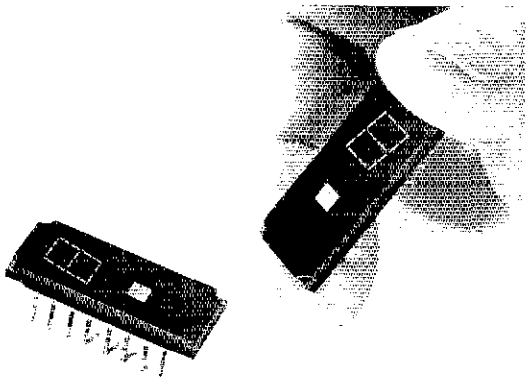
[3] [EDITOR'S NOTE: Some experienced builders prefer a medium-wattage iron, 40 to 60 watts, with a small diameter tip. This gives an adequate heat reserve to avoid cold-solder joints, but the small tip inhibits the rapid flow of heat and prevents overheating of the components.]

[4] Hayward, "An Integrated-Circuit QRP Keyer," *QST* for November, 1971, p. 38.



A TTL MSI counter chip and an LED readout integrated into a single 16-pin package. The chip and the display are mounted on a substrate and the assembly is then cast within a clear electrically nonconductive transparent plastic compound. The chip contains a BCD counter, a 4-bit latch, and a decoder-driver for the 7-segment display. *(Photo courtesy of Dialight Corp.)*

Additional Notes on the Amateur Station Counter

BY JOSEF SCHRABAL,* WA2USS

THIS IS a supplement and updating of an article of similar title published in June, 1972, *QST*, where a commercially manufactured readout was used and shopping for some of the IC bargains was suggested.[1] These bargains are only relative. You can modernize your counter by replacing two RTL ICs (resistor-transistor-logic) with one TTL (transistor-transistor-logic) 7490 decade counter, incorporate a 7475 latch and replace your decoder with driving transistors by a 7447, all at a cost of about a dollar per IC, for which you would have paid about $16 apiece only a couple of years ago.[2] A complete single-digit subassembly, including printed board, incandescent display and the three ICs, will cost you about $9.

Make sure that the reputation of your bargain supplier is good. Some of the nameless bargains work but there is a reason why the manufacturer was hesitant to put his name on it. Good brand-name devices will outperform the standard specifications. For example we are using several 7490 decade counters, specified for up to 18 MHz, and they work well up to 30 MHz. We tested several Fairchild ECL-9528s specified up to 160 MHz and found none which wouldn't work well over 175 MHz.

There are several methods for gating, latching and resetting the counter and they will not be discussed here. Just remember that many ICs can be purchased in different versions. For example, quad 2-input NAND gates come in normal (7400), low power (74L00 or 8480), high speed (74H00, 8H16), and peripheral driver (75450, dual, containing two gates and two power driving transistors).

* 549 Riverside Drive, New York, NY 10027.

[1] Blakeslee, "Notes on the Amateur Station Counter," *QST* for June, 1972, p. 31.

[2] [EDITOR'S NOTE: In addition, it would be necessary to change the 3.6-V power supply to one delivering 5 V.]

Counter ICs

If you are asking for a reason for some of the bargains, there is one: increased production and departure of main consumers to newer devices. Perhaps it would be to your advantage also to consider these new devices in updating your frequency counter. All four basic functions (counter, latch gate, decoder, and driver) can be purchased completely wired in a single package. There is a choice of either the Motorola MC4350L 16-pin dual in-line ceramic, or the MC4050 16-pin plastic package (single-unit retail price $10.60). This complex device is a monolithic MSI integrated circuit combining the functions of a counter having a toggle frequency of 35 MHz, four-bit latch, seven-segment decoder and drivers providing up to 40-mA drive capacity for the display segments. The serial output is high driving the ninth count, allowing synchronous or asynchronous counter operation when used in conjunction with the enable input and some external gating. The counter reset places it in a state which turns off the output driver transistors when transferred through the latch and decoded. This feature gives automatic suppression of leading zeros in the display. Additional features include a lamp test for all seven segments and lamp blanking for intensity modulation. Total power dissipation is 450 mW.

Displays

Exciting news is contained in a release by Dialight Corp. (60 Steward Ave., Brooklyn, NY 11237) of their newest 745 series. For example, No. 745-0009 (retail single for $22) is a 0.270-inch solid-state LED (light-emitting-diode) numeric display together with TTL MSI chip, all internally wired in one IC package which can be plugged into a standard 16-pin socket (or use Molex pins). See photograph. The chip consisting of an 18-MHz decade counter, latch, decoder and driver has

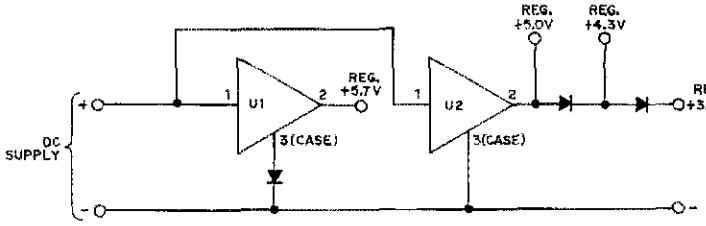


Fig. 1 – Dynamic voltage regulation for up to 1 ampere of power supply current using an LM309K 5-volt regulator with silicon diodes. Available output voltages are indicated in the diagram.

features similar to the Motorola 4050 described above. An additional feature is constant-current drive of the LEDs, eliminating bulky resistors necessary with standard LED displays. A left decimal point is also included within the chip and the display. The latch has BCD outputs readily accessible to drive printers or logic processors simultaneously with the display.

If you need faster count than 18 MHz for the display you can use No. 745-0008 (retail $18 singly). This is identical to the previously described device except without the decade counter. For frequencies to 50 MHz you can select a 74196 decade counter. Should you contemplate using your counter for a receiver where frequencies are heterodyned (both added and subtracted) you can use up/down counter 74192 (to 30 MHz) in front of each 745-0008. Even though the cost is a little higher, the custom construction is quite simple and very compact.

Frequency Coverage

An excellent design for a 300-MHz prescaler was recently published in *QST*[3] but the need for high-speed counting should not be confused. Do you really need it? The frequency for transmitters, even on 2 meters, aviation, and commercial segments of vhf are generated on low mode and multiplied. You do not have to measure the resulting frequency, but can count any one of the lower multiplying stages, making a 20-MHz instrument quite adequate.

As for counting a very low frequency, we find the suggestion for 10 second (20-second cycle) counting unpractical. A better method is to reverse the process and use the instrument as a ratio counter. Use the unknown low frequency for the time base and count the instrument's precision oscillator. If such provision is incorporated within the instrument, it acts as a stop watch, and in addition to measuring the low frequency, can be used for the measuring time duration of any short event such as camera shutter speeds, duration of an electronic flash, tick-tock of your watch, speed of a bullet, and so on.

Counter Accuracy

It will become obvious that more important than the speed of the counter is the accuracy with which it can measure. Precision of the time base is the most important feature of the instrument. Using a general-purpose crystal for the time reference will result in an instrument which can be set to the accuracy of a commercial-type crystal in the oven of your fm gear. Reverse from what you intended.

Your attention is called to high-accuracy crystals with a tolerance of .0005 percent at −10 to +60°C if compensated (about $9.50). International Crystal Mfg. Co, Inc., (10 N. Lee, Oklahoma City, OK 73102) has introduced a new device, a complete crystal oscillator circuit in a 14-pin dual-in-line package. This circuit is fully compensated, ready to plug into a standard socket. This is International Crystal's MOE series. Oscillators can be ordered in the frequency range from 6000 kHz to 60 MHz. Operating voltage is 3 to 6 V dc (RTL and TTL compatible) and accuracy at −10 to +60°C is .002 percent (MOE-5 for $35) or .0005 percent (MOE-10 for $50).

Power Supplies

Any well-filtered low-voltage power supply will do if you use one of the new operational amplifiers for a regulator. Such a device as the LM309K (about $2) is rated at 1 ampere, but it will deliver more than that, if an adequate heat sink is used, to power the entire counter. Remember that this type of device can supply regulated voltage only to a resistive load. An internal surge/short-protection feature will shut the device down on a capacitive load. No more than .01 μF should be used for transient bypass.

If you need different voltages than a 5-V dc supply delivers (such as when using some RTL ICS with 3.6 V dc), the forward bias (voltage drop) of silicon junction diodes can be used as a dynamic voltage reducer for 0.7 volt up to about 1 A. Using two in series will reduce the voltage to 3.6 V dc, as shown in Fig. 1. Inserting the diode in the base leg of an LM309K will result in a 5.7-V dc regulated supply.

Filtering is very important. You will need a capacitor rated in thousands of microfarads, which will be quite bulky. It could be larger than your entire instrument. The tendency in commercially designed instruments is to replace the filter capacitor with batteries and make the instrument portable. A properly selected charging transformer (tapping off at 5.5 volts) can be left on constantly during laboratory use.

Power Consumption

In a portable instrument you will notice that the power consumed by the entire instrument is negligible except for the actual display, which is the big power spender. If the battery operation is

[3] See footnote 1.

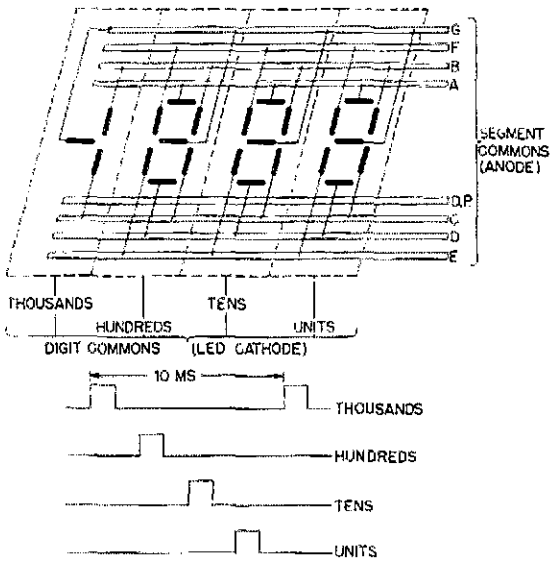


Fig. 2 – Strobe display principle used in the 4440 Weston multimeter and the Mostek MK-5005 4-digit counter/latch/decoder.

to be greatly extended the consumption of the display must be reduced.

A very functional LED display is used in the Weston 4440 portable multimeter. Five units of display (three full 7-segment digits, a 2-segment ONE and a minus sign) are located on a single epoxy board. All identical segments (a, b, c, d, e, f, and g – see Fig. 2) are connected together and fitted into a 12-pin socket. The display digits are sequentially energized about 100 times per second by digit-select strobing logic. An additional advantage to this simplicity of the advanced synchronous LSI circuit is that segments are energized on a 10-percent duty cycle to enhance the LED display efficiency.

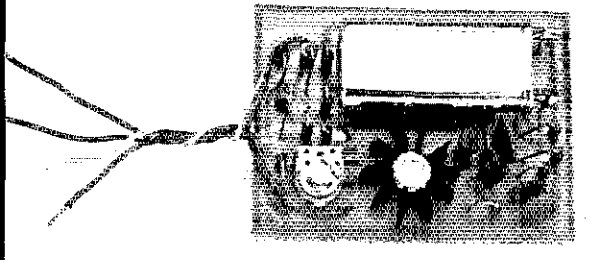
Using this strobe-display principle, Mostek Corp. (1215 W. Crosby Rd., Carrollton, TX 75006) designed specially for a counter their MOS integrated circuit MK-5005 (retail $22 singly, $13 *in quantity*). *It is a* 4-digit counter/latch/decoder for 7-segment displays. This is a single chip which features, in addition to four decade counters and five latches (the fifth is for overflow), four decoders with blanking, lamp test, leading-zero suppression, decimal point input, and a synchronously driven scanning oscillator rate which is determined by an external capacitor (0.1 μF). To drive the LED display one should use high-gain Darlington transistors. The frequency of this 4-digit display is only up to 250 kHz but with scaling the display can be used for counting any frequency.

Mostek's MK-5009 time base was designed as a companion for above, but it can be used as a time base with any counter. The '5009 will replace an active device used as an oscillator, a Schmitt trigger, plus six 7490's to give the proper output timing interval (retail $15 singly, $9 in quantity). An internal clock operates at dc to 2 MHz from either an external signal, an external *RC* network, or an external crystal. An oscillator output is also provided to drive FET or other MOS circuitry.

The main feature of this display is economy: economy in power by consuming only 100 mA at 6 V dc (much less when using NiCads for portable operation with reduced LED display brightness), and economy in cost. This complete 4-digit display, including all parts and drilled board, can be built for about $35, and the above time-base added for about $30 more. QST

• *New Apparatus*

CRYSTAL-CONTROLLED SUBAUDIO TONE GENERATOR



As the number of repeaters grows it becomes increasingly difficult for the amateur operator to access only *one* repeater each time he transmits. Because of this problem, in some of the more densely populated areas of the country, a number of repeaters are going to a controlled-access system. One system is called CTCSS (continuous tone-controlled squelch system).

Avcom has developed a crystal-controlled device that will replace the difficult-to-come-by reeds that are normally used. The Avcom circuit uses decade counters to divide a crystal-controlled oscillator by a factor of 1000. If a subaudible tone of 110.9 Hz is desired, then a crystal which will oscillate at 110.900 kHz is used. Any error in the crystal frequency would be divided by 1000 also, which assures a highly accurate tone.

Avcom makes the PL100 units available in three choices, all minus the crystal: ready built ($25 class), a kit with all parts ($18 class), or just the printed circuit board, and the builder supplies all other parts ($6 class). The entire unit will fit into a space that measures 2-1/2 × 1-3/4 × 5/8 inches. The units are available from Avcom, P.O. Box 29153, Columbus, OH 43229. *WINTH*

F L A S H ! !

New Class E Citizens' Radio Service Proposed by FCC

Creation of a new Class E Citizens' Radio Service in the 220-225 MHz band has been proposed by the FCC in a combined Inquiry and Rulemaking Notice (RM-1633,1656,1747, 1761, 1793 and 1841). The new service would provide additional frequencies to meet the requirements of the general public for improved radio communications and relieve some of the heavy concentration of stations on channels available to the Class D service.

The action would amend Section 2.106 (Table of Frequency Allocations) of the Rules. Petitions from various individuals and organizations had requested assignment of a portion of the 220-225 MHz band for Citizens' Radio use. The frequencies are currently allocated internationally in Region 2 to the Amateur and Radiolocation Services on a co-equal basis.

Nationally, radio location is the primary service and is mainly used by Government agencies. The Office of Telecommunications Policy, however, has advised the Commission that sharing to accommodate additional operations of a disciplined 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

Amateur operations are not now permitted 5:00 a.m. and 6:00 p.m., Monday through Friday in an area in Texas and New Mexico centered on the White Sands Missile Range. The same time restrictions would be placed on Citizens' Band operations in the areas around the White Sands Missile Range, and would be extended to Franklin and Gulf counties in northwest Florida. The proposed use of a portion of the 220-225 MHz band for Class E radio services would not be in accord with the International Table of Frequency Allocations. The Commission noted that objections from Canada and Mexico might require prohibition against any other operations in some border areas. Until that matter is resolved, mobile stations would not be permitted to operate within 10 miles of the border, and base stations within 25 miles of the border.

The Citizens' Radio Service was established in 1945 as a radio communications service of Fixed, Land, and Mobile stations for short-distance personal or business communications, and for radio signaling and control of remote devices by radio. In 1958 a Class D Citizens' Service was established in the 27-MHz region to permit voice communications of a general or business nature. The number of licensees increased from 49,000 in 1959 to 868,013 in 1971.

As the number of licensees increased, however, the number of complaints about abuses of the Class D service also increased. Proposals for reducing widespread rule violations will be the subject of further inquiries and proceedings concerned with Class D enforcement problems. The present action, however, deals only with the proposed creation of a new Class E service.

The Commission proposed to divide the 224-225 MHz band into 40 channels at 25 kHz spacing. Eligibility would be similar to that for the present Class D service – any person 18 years or older who meets the basic criteria for licensing. In order to avoid the abuses of its Class D rules and associated enforcement problems, the Commission said it would establish enforcement procedures before the service is permitted to begin operation.

The Commission invited comments on specific services and types of operations to be provided: economic, sociological and other public interest benefits to be derived; effect on Class D Citizens' Band operation at 27 MHz; nature and probable impact of operational limitations imposed because of interagency and international objections; detailed technical requirements which should be adopted; feasibility of automatic transmission of station identification as an aid to enforcement; measures for achieving efficient channel utilization and enforcement followup; feasibility of phasing out either personal or business use of Class D service in conjunction with the establishment of the new Class E service; and the feasibility of Commission confiscation of illegally-operated equipment. The Commission invited comments as to the probable administrative and enforcement workload that would be generated by this proposal and procedures which should be adopted to minimize this burden. It also requested information on estimates of licensees along with the assumptions and methods used to arrive at these estimates.

Comments are invited by September 20th, 1973, and replies by October 22nd, 1973.

Action by the Commission June 6, 1973 by Notice of Inquiry and Notice of Proposed Rulemaking.

[The foregoing is a telephoned transcript of an FCC Public Notice and, because of last-minute receipt well past normal press deadline, without opportunity for proofreading, may contain minor inaccuracies.]

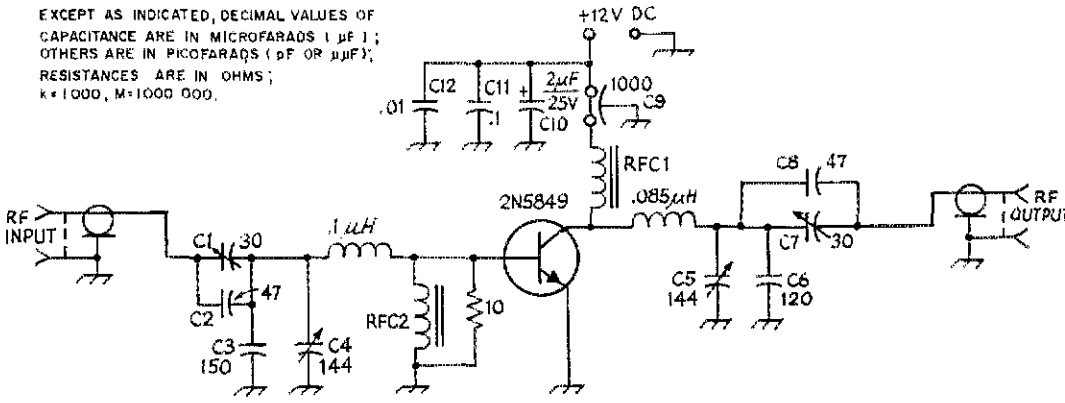


Fig. 1 — Circuit diagram for the 10-meter power amplifier. RFC1 and RFC2 are Ferroxcube part number VK-200-10/3B. L1 and L2 are Miniductor stock cut to the inductance values given above. Both coils are made from Barker and Williamson 3009 stock. Provision for "dropping" the amplifier out of the line to the antenna during receiving periods is necessary.

Mini-Powerhouse On Wheels

BY CHARLES A. RANKIN,* WA2HMM

TEN-METER MOBILE operation can be lots of fun when the band is open since it offers the thrill of DX QSOs as well as reasonably good ground-wave conditions for local contacts. Presented here is a solid-state power amplifier which will provide more than 40 watts of output power on ten meters. The major advantage of a solid-state amplifier for mobile use is its ability to *operate directly from 12 volts dc, thus eliminating* the need for a high-voltage supply. The total cost for parts to build the device can be kept under $50 if the builder is a prudent shopper.

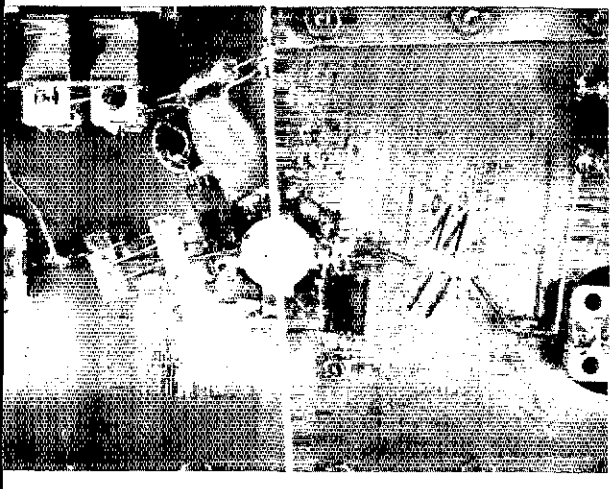
* 8 Corral Lane, East Northport, NY 11731.

The Circuit

This single-stage rf power amplifier uses a balanced-emitter transistor biased for Class B operation. No collector current flows when there is no drive, and therefore the supply voltage may be left on continuously. A small ferrite choke is used *in the base return lead to assure electrical stability.* The manufacturer's type described in Fig. 1 is recommended.

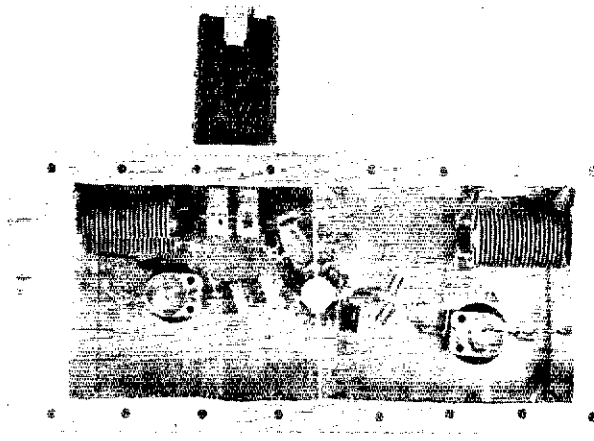
Construction and Tune-up

Layout for the amplifier is straightforward. A few precautions are necessary, however. The con-



Close-up view of the 10-meter amplifier. RFC1 and RFC2 are mounted next to the power-amplifier transistor. The leads should be kept as short as possible.

Overall view of the amplifier. The output circuit is shown at the left. A section of unetched circuit board is used to shield the input from the output components.



nections to ground should be made as short as possible. Shielding the input from the output circuit is necessary. A small piece of copper-clad board is used here. The heat sink is three inches wide, slightly more than four inches long, and is manufactured by Thermalloy.

C1, C7, C4 and C5 should be adjusted for maximum power output. Laboratory measurements indicate the second harmonic is more than 44 dB below the fundamental signal level. Drive required for the amplifier is approximately three watts. QST

Silent Keys

IT IS with deep regret that we record the passing of these amateurs:

W1AAE, Charles M. Campbell, Stoneham, MA
W1BYR, Ralph H. Bowers, Woolwich, ME
W1CJC, Paul J. Hitchen, Somerset, MA
W1JKR, Nathaniel M. Dominy, Rockland, MA
W1JND, Elmer A. Capwell, Coventry, RI
W1KQY, Edmund R. Fraser, Madison, CT
WN1LGJ, Harold S. Johnson, West Hartford, CT
W2DCT, Walter Roberts, Jr., Manhasset, NY
W2FEB, Keith H. Lewis, Middleport, NY
WN2FUU, Bernard Dolinko, Bronx, NY
K2GSP, Helen M. Van Patten, Schenectady, NY
WB2ORM, Raymond L. Lopau, Central Islip, NY
W2UFF, Fred D. Rutherford, Kenmore, NY
W2VMZ, Milton Unger, Brooklyn, NY
W3BOZ, Raymond M. Rapp, Warren, PA
WA3HGV, Michael A. Lintner, Wilmington, DE
K3HOP, Robert G. Dettery, Lansdale, PA
W3RKP, Edward C. Vetter, Phoenixville, PA
WA3SYH, Joseph F. Roller, Philadelphia, PA
W4AVR, Wilbur Jackson, Chatsworth, GA
WA4DHQ, John J. Evans, Huntsville, AL
WB4FFR, Cecil B. Brion, Pensacola, FL
W4FQZ, Calvin S. Bryant, Miami Shores, FL
W4HVO, Bennett L. Bowers, Salisbury, NC
WA4JGN, Ellis O. Turner, Pensacola, FL
W4LSK, Harold L. McLane, W. Palm Beach, FL
W4OAR, Lewis M. Hewitt, Hapeville, GA
K4PKX, Marvin Hartwell, Memphis, TN
K4QO, Rudolph J. Jamross, Vero Beach, FL
WB4RCD, Johnie Hale, Lexington, KY
W4RGZ, Norman L. Barnes, Norfolk, VA
W4VWF, James E. Staples, Huntsville, AL
WN4WAL, Glenn O. Hoon, Bradenton, FL
WA4YVF, Jack P. Teal, Wadesboro, NC
K4ZFW, Allan C. Jackson, Tallahassee, FL
WN5BGX, Amos Watson, Beaumont, TX
W5HSB, Mac Ray, Ft. Worth, TX
WN5HTB, Frank B. Ford, San Antonio, TX
W5KRZ, Philip H. Woodard, Hubbard, TX
W5PE, John P. Allen, Galveston, TX
W5QZ, William O. McCord, Jr., Albuquerque, NM
K5WYN, Robert C. Vierling, Galveston, TX
W5YOZ, Jack M. Martin, Ocean Springs, MS
W6BHO, Fay W. Harwood, Seal Beach, CA
W6DGT, Carlos N. Critchlow, Glendale, CA
W6DIY, Lester W. Johnson, Turlock, CA
WB6FYC, Terry Molder, Sanger, CA
WB6JPM, Arthur G. Clarke, San Diego, CA
W6ODH Ex-WA6OQY, David R. Howard, Carlsbad, CA
W6PLG, Clement D. Medler, Sunnyvale, CA
K6TP, Theodore J. Palik, So. San Francisco, CA
W7DJS, Donald V. Reid, Seattle, WA
W7GPM, Roy W. Waxbom, Nampa, ID
W7PRF, Byron F. Thomas, Spokane, WA
WA7PRP, Charles V. Litton, Carson City, NV
K7RRT, Dorland S. Garratt, Spokane, WA
WA7UFK/VS6DC, Simeon Baldwin, Kirkland, WA
W8FWT, Truman P. Oliver, Detroit, MI
W8HNC, Sidney M. Bernard, Jr., Bluefield, WV
W8KA, Edward S. Etelamaki, Negaunee, MI
W8NYR, Van T. Norton, Lodi, OH
W8PNR, Bernard F. Clark, Charleston, WV
Ex-W8SF, Robert H. Bechtold, Rochester, NY
W8TEL, Benjamin F. Lee, Wilberforce, OH
Ex-W9DCZ, Carl O. Samuelson, Newman Grove, NE
K9EWB, Carl W. Ruoff, LaCrosse, WI
K9GOO, Nathan Rine, Jr., Champaign, IL
W9HMG, Justin R. Jellings, Madison, WI
W9MKO, Michael A. Amelianovich, Franklin Park, IL
KØAOB, Carl I. Rouland, Garnett, KS
WØDVN, Bill D. Tagan, Prairie Village, KS
WØLZ, H. C. Swanson, Cedar Rapids, IA
WØNTJ, Myron S. "Stan" Zimmerman, Des Moines, IA
WØZUA, Albert L. Leatherman, Pratt, KS
VE3AB, G. K. Tomlinson, Lindsay, ON
VE3AG, Richard R. Trustham, Midland, ON
VE3BAR, David E. Evans, Downsview, ON
VE5WE, Weldon C. Graham, Wolseley, SK
KP4BM, L. K. "Sam" Boyd, Bayamon, PR
Ex-K4JE, Joaquin Agusty, San Juan, PR
HB9FE, Marcel Chasset, Friboug, Switzerland
VK7RM, R. M. "Rupe" Barker, Tasmania, Australia
VO1AY, Harold D. Wells, St. Johns, NF
VO1IF, J. Gordon Fitzpatrick, St. Johns, NF

Hints and Kinks For the Experimenter

CIRCUIT-BOARD LAYOUT AID

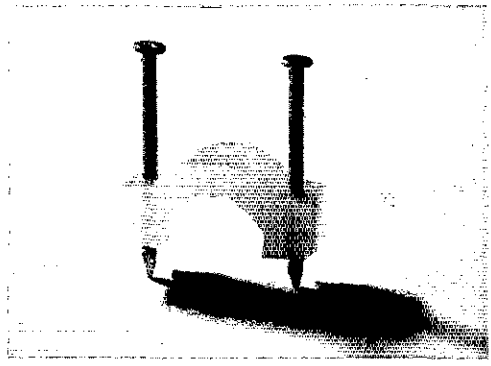
The method I use simplifies matters somewhat by using the actual components in a mock-up version of the circuit board. Material required is a piece of cardboard cut large enough for all of the components and a piece of Styrofoam two inches thick by one foot square.

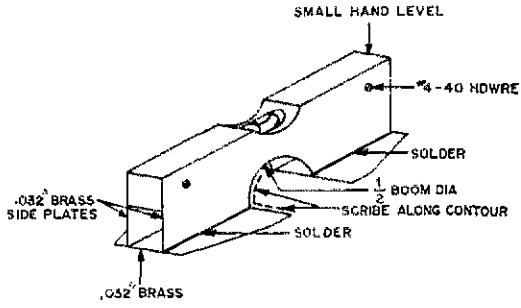
The cardboard is placed on top of the Styrofoam. Then using a number 60 drill, holes are drilled through the cardboard for each component. After the holes for a particular component are drilled, it is inserted into its place and the Styrofoam will keep the component from falling off. Each component is interconnected graphically on the cardboard at the time of insertion. After the layout has been completed, the components are removed and the cardboard is cut down to the desired size of the circuit board. In order to keep the component locations in their respective positions, the cardboard jig is taped to the circuit on the nonmetallic side. This prevents possible movement when the holes are drilled. *Herbert Lott, W3CLG*

A SOURCE FOR FEEDER SPREADERS

The plastic staples that are used to fasten electrical cables (such as Romex, BX, and UF) to the wooden interior parts of a building can also be used as feeder spreaders. The staple shown is made by the Madison Equipment Co., and costs 66 cents for a package of 50.

A very low-loss line with a characteristic impedance of 375 ohms can be made using the staples and No. 14 wire. Remove the nails that come with the staples and slide the staples over the wires. Since the fit is tight enough to prevent further movement once the staples are in place, no other means of fastening is required. – *Joseph Kilgore, W2EIF*





Precision alignment jig. Clamp boom so as not to rotate. Assembly rests on boom in desired position and should be adjusted with the level so that scribe-mark centers are in a straight line.

PRECISION ALIGNMENT ELEMENT-HOLE MARKING JIG

I recently ran into difficulty when trying to position holes in boom material for uhf beams. The attached sketch shows a jig which was built to accurately scribe marks on the boom. Constructed of .032-inch brass sheet, it can be made with hand tools. The two side plates are made together for accuracy and bolted to the small aluminum hand level. Then the horizontal bottom plates are soldered in place. A small long spring can be attached to the jig going under the boom which helps keep the jig in place.

First the boom is secured so as not to rotate. Scribe marks are then placed where the elements are to be located. Then the jig is placed on the boom and vertical and horizontal scribe marks are made. Accurately center punch each side of the boom where the scribe lines intersect. Working up in drill sizes to the desired hole diameter will result in a cleaner, rounder hole. Drill each side hole separately and do not drill completely through the boom. That is the cause of most misalignment problems. *E. R. Angle, WA6GUY*

LOW-VOLTAGE OPERATION OF VACUUM TUBES

In *QST* for August, 1959, an article of mine was published explaining the conversion of Command receivers to a triple-superhet configuration. What many hams may be surprised to learn is that this gear (and indeed most vacuum-tube receiving equipment) will work fine on very low plate voltages. I have converted this receiver so that it is powered by two 12-volt car batteries in series. The tubes are arranged three to a string instead of two, so that they have 8 volts on the heater instead of

12. B+ is 18 volts regulated. With these plate and heater voltages the tubes give promise of lasting forever. Temperature rise is less and thermal stability, always good, is even better. Of course, one cannot get either much audio power or good avc action from such an arrangement. This problem is easily solved by adding an IC such as the Motorola HEP C6010 to get some audio gain, and one of the innumerable 1-watt transistor amplifiers one can get to drive the speaker and an audio-avc system.

The receiver draws approximately 400 mA, which is not bad for a tube rig! With the matching Command transmitter and a transistorized high-voltage supply, an ideal emergency-powered station was assembled. The transmitter here can run between 20 and 30 watts with this setup. – *Frank Guy, VE3DPC*

TRANSMISSION-LINE MEASUREMENTS AND LINE LOSS

Quite often it is necessary to know conditions at the antenna end of a transmission line, but the relative ease of making measurements at the transmitter make the latter method attractive. The usual assumption is that such factors as SWR will be the same at both ends of the line. How valid this assumption is can best be illustrated by the following examples.

The voltage reflection coefficient at the *antenna* can be expressed in terms of the forward power (*Pf*) and the reflected power (*Pr*), *measured at the transmitter*, by the formula:

$$\rho = \sqrt{Pr/Pf}\ antilog\ \frac{(line\ loss\ in\ dB)}{10}$$

(Also, the relation

$$\sqrt{\frac{Pr}{Pf}} = \frac{SWR - 1}{SWR + 1}$$

can be used if the meter is only calibrated in SWR.) For the calculator buffs, the antilog of a number, x, is 10^x. Once the reflection coefficient is calculated, the SWR at the antenna is given by:

$$SWR = \frac{1 + \rho}{1 - \rho}$$

Notice that if the line loss is zero, the reflection coefficient is the same at both ends of the line and since the formula for SWR is a general one, the SWR values will also be the same. Assume that the line loss is 1 dB and that the forward and reflected powers measured at the transmitter are such that computations indicate an SWR of 2:1. The actual SWR at the antenna will be 2.45:1. Incidentally, it is the latter SWR value that must be used with graphs that give the additional loss because of SWR such as those shown in Fig. 20-8 in recent editions of *The Radio Amateur's Handbook*. It can be seen by examining that graph that using the 2:1 SWR value would result in little error in overall system loss computations. On the other hand, suppose that the line loss was 4.5 dB and that the measured SWR was still 2:1. This would mean that the SWR at the antenna was greater than 32:1 and instead of 0.45 dB, the additional line loss because of SWR would be greater than 7 dB! In fact, if the line loss were 4.5 dB and if the antenna terminals were shorted, the measured SWR at the transmitter would only be 2.1:1.

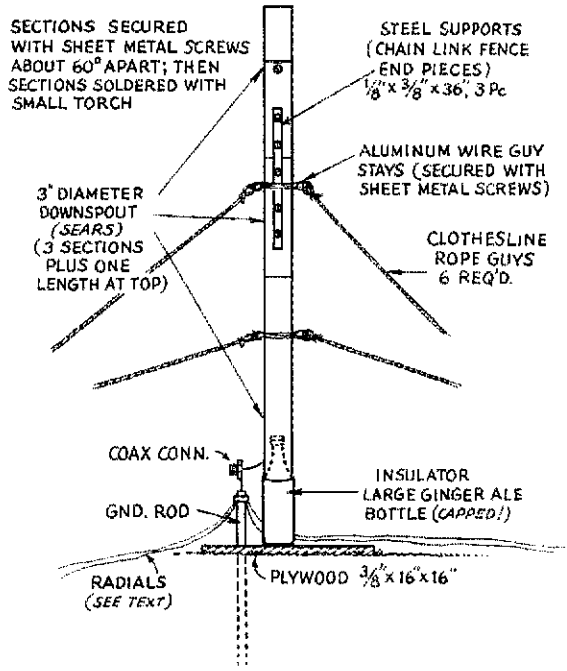
Unless the line loss is known accurately, little can be said about conditions at the antenna from measurements made at the transmitter. Some other means should be used to verify or negate the results of SWR measurements made at the transmitter should a faulty antenna system be suspected. – *W1YNC*

THE $15 VERTICAL ANTENNA FOR FORTY METERS

The antenna is made from 3-inch diameter downspout, purchased from Sears, with a ground system made of aluminum clothesline as radials (as many as possible). The insulator is a large empty soft drink bottle (with a cap on!) set on a piece of plywood to hold grass and weeds down. The guy wires are cotton clothesline, tied to homemade aluminum wire "eyes." The latter are attached to the antenna by means of sheet-metal screws.

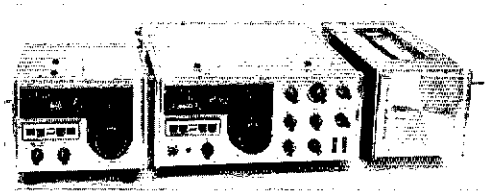
The antenna can be fed with 50-ohm coaxial cable, and the SWR with the one shown is less than 1.5:1 (7.0 to 7.3 MHz). The length of the antenna can be calculated from the formula, *Length* (feet) = 246/*f* (MHz).

The antenna has withstood two years of use, and works fine on "long hauls." – *Bob Ropes, W9JU.*



Recent Equipment

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



The Henry Radio TS-900

SEVERAL MONTHS AGO, the TS-511 Kenwood transceiver was described in detail.[1] A more expensive model from Kenwood, called the TS-900, is now available from Henry Radio. In terms of operation, a very striking resemblance exists between this unit and the model described earlier. The TS-900, however, is completely different mechanically and electrically, and offers several unusual features which this writer has never encountered.

The Similarities

Many of the TS-900 characteristics are identical to those of the TS-511 and the earlier review should be consulted for detailed descriptions. Below is a list of the similarities.

1) The basic frequency range.
2) The method used for calibrating one VFO against the other.
3) RIT (receiver incremental tuning) controls for both the transceiver VFO and the external VFO console.
4) The tune-up procedure.
5) The VFO circuit.
6) The noise blanker.
7) Fan cooling for the final-amplifier compartment.
8) Crystal calibrator for 25-kHz markers. (The TS-900 has an additional output for 100 kHz, which may be selected from the front panel.)
9) The final-amplifier circuit (and tubes).

Although these '900 features are similar in nature to those of the '511, they are electrically designed quite differently in the more expensive model.

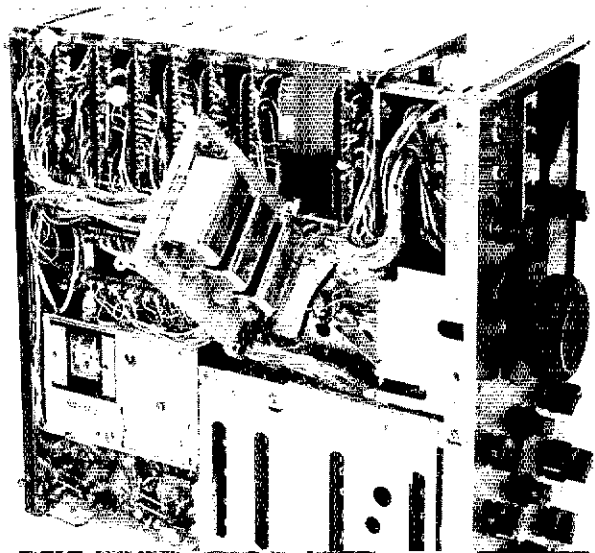
[1] Recent Equipment for May, *QST*, 1973.

Contrasts

The reader is cautioned against viewing the TS-900 as an updated version of the TS-511. It is not. The '900 was apparently designed from scratch and includes many nifty gadgets which will be described in detail. These gimmicks are what makes operating the '900 loads of fun!

At first glance, some of the mechanical features are obvious. The right-hand side of the cabinet contains a heavy-duty leather carrying handle which makes it convenient to transport this somewhat heavy transceiver (for its size) from place to place. On the left side are four plastic feet to protect the finish when the equipment is temporarily set down. Since the unit is placed on its side for almost any type of maintenance, these feet make scratching the cabinet unlikely. The top lid has two lips at the back and two snap-type connectors at the front. When this lid is closed it stays that way, no matter what the position of the cabinet. The power supply comes with a leather handle mounted on top. The VFO console, however, is small and needs no handle.

Frequency readout with the '900 is simple. The dial drive is smooth and is calibrated directly in one-kilohertz increments from zero to 500. The 100-kilohertz figures "pop up" in a window beside



Bottom view of the TS-900. The circuit-board sockets may be rotated out from the chassis to allow insertion of the associated board.

each ten-kilohertz marker. The tuning mechanism dial drag may be set for smooth or stiff operation to suit the operator's taste.

The transceiver comes ready for operation on ssb, cw, or RTTY. Frequency can be controlled by the internally mounted VFO, one of two crystals (optional), or the external VFO (which also has provisions for five more crystals). Receiver frequency offset during cw operation may be set by the adjustment of a control located under the top lid. The range of the shift adjustment is from 400 Hz to nearly 1500 Hz. This feature allows the operator to select the tone at which signals peak when using the sharp cw filter. Another refinement built into the '900 is an rf attenuator for the receiver front end. It consists of an 11-position switch and suitable resistors which reduce the input signal level by approximately six dB per step.

Three tubes (one for the driver, two for the amplifier) are used in the transmitter lineup. A front-panel rocker switch may be used to disable the tube filaments should there be a need to conserve power during receiving periods. An indicator lamp gives visual indication when the transmitter filaments are shut off. A TUNE position of the MODE switch allows for adjustment of the driver and final amplifier at reduced power input. The meter may be used to monitor alc voltage, plate current, relative-output power, or high voltage. The meter provides relative signal-strength readings of S-1 to 40 dB over S-9 when the transceiver is in the receive mode.

The power output of the transmitter is somewhat lower than that of the 'S11. Power-output measurements are given in Table I. The TS-900 has plenty of drive for most of the commercially manufactured grounded-grid amplifiers on the market today.

The VFO Console

The external VFO connects to the transceiver through one cable. This multiconductor harness handles all of the VFO interswitching and dial-pointer indications. The power supply is built in and has its own line cord (two conductor, no ground). The dial is identical to the transceiver tuning mechanism including the dual-drag drive feature. A row of five lever switches is used to select any of the following functions:

1) Ac power on or off.
2) VFO or crystal operation.
3) RIT on or off.
4) Calibrate (one VFO to the other).
5) Calibrate tone volume (three levels).

Five crystal sockets are located under the lid of the console. Any one of these may be selected by a front-panel-mounted switch. The RIT control gives a tuning range of plus or minus three kilohertz when the VFO is controlling the receiver. The FUNCTION switch performs in the same manner as the one described for the TS-511.

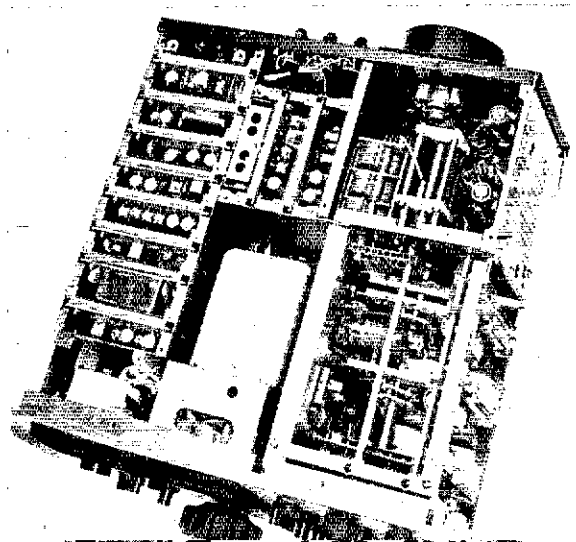
Table I — Power Output at an Input of 210 Watts

3.5 MHz	140 watts
7.0 MHz	140 watts
14.0 MHz	135 watts
21.0 MHz	120 watts
28.0 MHz	90 watts
28.5 MHz	90 watts
29.0 MHz	95 watts

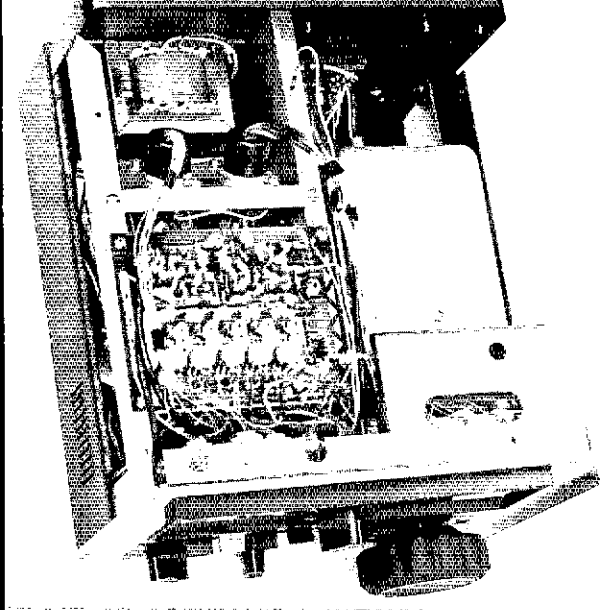
The operator can tell at a glance which VFO is controlling the transmitter or the receiver by observing the group of six colored lamps on the panel. The top row is for the receiver (bright green!) and the bottom group is for the transmitter (reddish-orange).

One of the most clever circuits this writer has come across lately is the one used for calibrating one VFO against the other. When the CAL lever switch is actuated and the dial of one VFO is rotated in the direction of the frequency indicated on the other VFO, a tone, becoming lower in pitch as zero beat is approached, is emitted by a small speaker mounted in the console. The dial pointer lamp illumination becomes progressively dimmer until zero beat is achieved. Then the speaker becomes quiet and the dial pointer lights up brilliantly! If there is just a few hertz difference between VFOs, the beating can be observed visually as well as aurally.

Three lamps positioned behind lettering on the dial face indicate if the VFO is being operated as a crystal oscillator, if the RIT is turned on, or when the operator makes any one of three operational mistakes. If one forgets to plug in the interconnecting VFO-to-transceiver cable, improperly sets a switch on the rear panel of the TS-900, or attempts to transmit with the transmitter filaments



Top view of the Kenwood trahsceiver. Most of the plug-in circuit boards are mounted vertically along the left-hand side of the chassis frame.



Top view of the VFO console. A row of five sockets is located on top of the circuit board, should crystal control of either the transmitter or receiver be desired. This accessory has its own power supply built in.

turned off, a green-colored lamp (marked ERROR!) blinks. It's hard to explain the feeling one gets when the transceiver points out that an operational error took place!

The Circuit

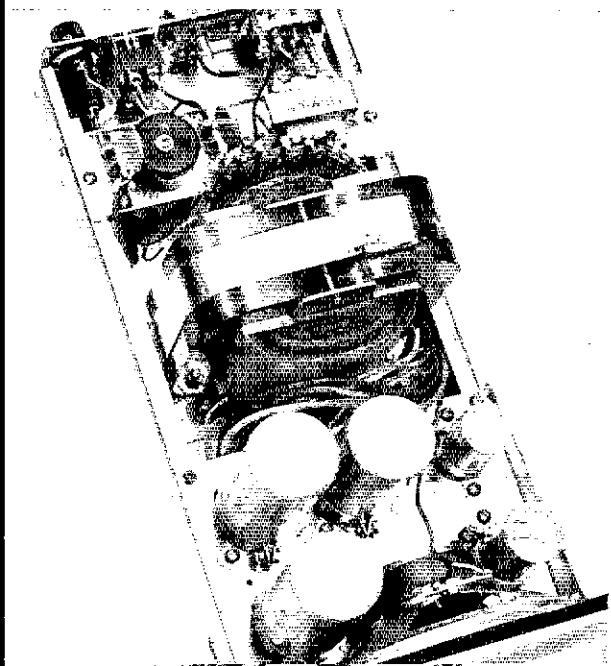
With the exception of the three transmitter tubes (one is a driver), the entire circuit is solid state. A total of 57 transistors, 70 diodes, 16 FETs, and three integrated circuits are used. Ssb selection is somewhat unconventional in that two filters are required – one for usb (3393.5 kHz), and one for lsb (3396.5 kHz). The i-f signal is mixed with the VFO output (5.5 to 5.0 MHz) to produce a second transmitting i-f of 8.895 to 8.395 MHz. The signal is then converted to the operating frequency.

The receiver operates in a reverse fashion, but includes a separate filter (500-Hz bandwidth) for cw operation. This arrangement allows a single 3.395-MHz oscillator to be used for both usb and lsb. A 3.394-MHz oscillator is used during cw receiving periods; its frequency is adjustable allowing the operator to select the BFO offset. During transmitting periods on cw the ssb carrier oscillator is activated (3.395 MHz) and the signal passes through the cw crystal filter (centered at 3.395 MHz) unattenuated. See Fig. 1. When the optional cw filter is not installed in the transceiver, the usb filter is employed.

Installing the optional filter is easy. Remove the crystal-filter circuit board, place the filter in the proper position, and solder the two pins extending from the filter to the foil on the board. Provisions must be made to use a different carrier oscillator for the BFO during cw receive conditions to give the proper passband characteristics. But does Kenwood let you do the work? No! A multiple-pin plug and socket are tucked away under the chassis. Just pull the plug and socket apart, rotate one of them 180 degrees, and reinsert the two. That operation changes all of the internal connections necessary for sharp-filter cw use. Total time required to install the filter is about ten minutes (if one deducts the time spent marveling at the innards while the transceiver is out of the case!).

Overload Indicator

Ever wonder if some station is actually overloading your receiver? No question when operating the TS-900; there is a circuit built in which detects the presence of a signal too large for the receiver front end to handle, even if it is off frequency. A little green sign comes on, which is marked RF AGC. When this lamp glows there is a strong signal somewhere in the operating band, which may be desensing the receiver or "pumping" the age. The simple cure is to increase the rf attenuation by one step (actually reduce the setting of the attenuator control). Lab tests indicate that a 50,000-μV signal (better than 40 dB over S-9 on the S meter) is needed to activate the indicator. Not many signals reach that level. There were two occasions when the overload light came on during tests. One was



Top view of the power supply. The speaker is located in the front of this cabinet.

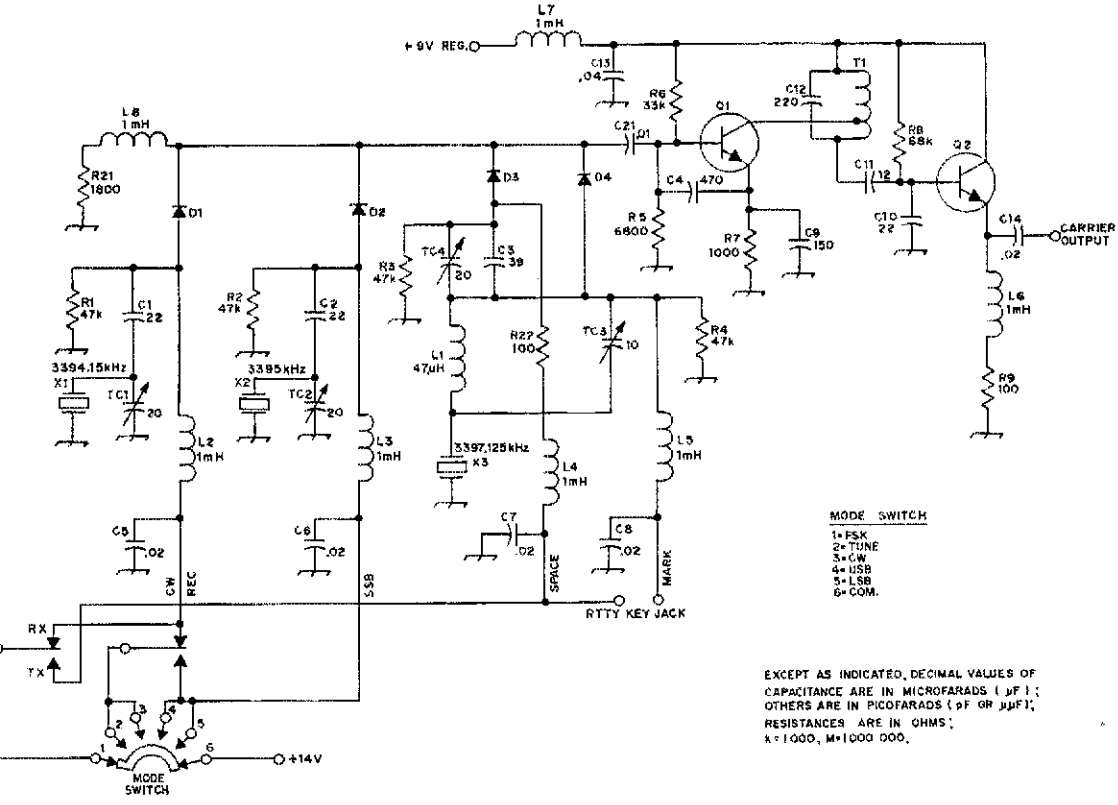


Fig. 1 — Circuit diagram for the crystal switching scheme used with the TS-900 transceiver. Component designations are those of the manufacturer.

when a line-of-sight local station (K1JHX) pointed his three-element quad at the front side of the author's three-element Yagi. The other case happened during a winter evening when 40-meter band conditions were extremely good to Europe. Some broadcast stations in western and central Europe would cause the lamp to flicker during the early evening hours.

It should be pointed out, however, that overload conditions causing a flicker of the indicator do not necessarily impair copy of signals. In fact, the signal from K1JHX was the only one to cause some difficulty during several months of contest operating. The TS-900 was also used at W1YK in a multioperator phone DX contest. No signs of cross-modulation interference were noticed even though all of the W1YK antennas are mounted on the top of one building. Truly remarkable for a solid-state receiver.

Modular Circuit Construction

Sometimes when inspecting a piece of amateur gear, one is left with the impression that the mechanical engineer never met the electronics designer. Not so with the Kenwood. The two engineers (or engineering departments!) must have worked in perfect consort. Eleven circuit boards are vertically mounted within the cabinet; each one

Table II — Hertz drift from a cold start

Time (minutes)	*TS-900* (hertz)*	*Ext. VFO* (hertz)*
0	869	452
1	884	443
2	894	436
3	897	429
4	901	422
5	904	416
6	907	410
7	909	405
8	911	399
9	913	394
10	916	389
15	928	363
20	939	342
25	948	315
30	957	288
35	965	267
40	973	249
45	982	232
50	989	216
55	995	204
60	000	193

* Actual frequency in hertz to be added to 4.999 MHz for the transceiver and external VFOs.

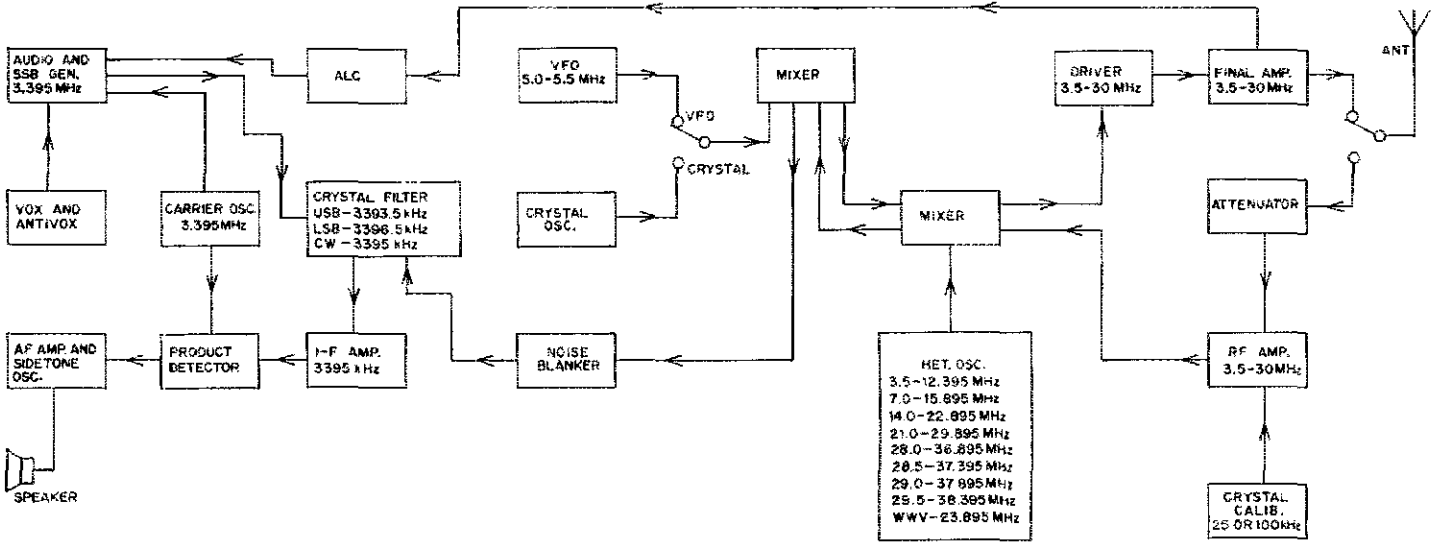


Fig. 2 — Block diagram of the TS-900 transceiver.

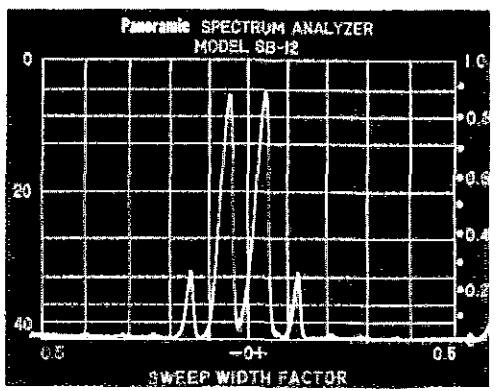


Fig. 3 — Spectrum-analyzer display of the output of the Kenwood TS-900 transceiver with a two-tone 300-watt PEP input. The horizontal axis of the display represents frequency, and the vertical axis amplitude. Each "pip" represents a single-frequency component of the rf output. The display is adjusted so the amplitude of each component may be read from the scale at the 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 29 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.

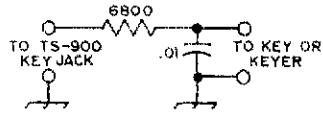


Fig. 4 — Key click filter.

contains the components to handle a specific function or series of related functions. A block diagram is given in Fig. 2. Each circuit board plugs into a socket mounted on the transceiver frame. If maintenance is required, the circuit-board socket may be rotated out from under the chassis frame, allowing the board to be inserted in such a way as to permit access to components and test points. The photograph shows a board in the "out" position. The only portions of the circuit which may not be unplugged from the chassis are the driver, amplifier, and VFO stages.

Miscellaneous Particulars

The TS-900 survived all of our lab tests. Power output, stability, and sensitivity measurements are given in Tables I, II, and III. Fig. 3 displays the results of IMD tests.

A few minor problems developed in the unit during the testing phase of our evaluation. None of them are considered even the least bit serious. The first item discovered was the extremely hard keying wave form on cw. A resistor-capacitor combination connected at the key jack solves the key-click problem nicely. The circuit used with the test model is given in Fig. 4. Henry Radio indicates they are currently working with the manufacturer to make a minor change to the circuit.

The VOX in the cw mode of operation is designed to drop out between words at speeds of 25 wpm and higher. At lower speeds the relay drops out between some letters. The VOX delay is adjustable for ssb operation, but it is defeated when the mode switch is rotated to the cw position. To include the delay circuitry a jumper wire must be connected from one point on the VOX board to the ground foil. Simple modification — it takes less than five minutes.

One day, the '900 suddenly developed a propensity for blowing fuses. The problem was traced to a cracked final-amplifier tube which had lost its vacuum. This is the only malfunction experienced in several hundred hours of operation. The broken tube was no doubt a result of rough handling by the shipping company. Incidentally, the amplifier tubes which came with this imported transceiver were stamped RCA on the side!

A product review is never complete without mentioning the instruction manual. This writer has looked over most of the "imported" booklets recently. While some of the earlier productions were informative, they were more entertaining in nature. It was fun to read the transliteration reprints of a book written for another language. The instruction guide which comes with the TS-900, however, is in a class by itself. The manual contains 49 pages of diagrams, explanations, and service information written in what might be considered perfect English. Every control (both internal and external) is clearly identified and explained. Circuit-board schematic diagrams are presented beside the board photographs, with the components identified. The last diagram in the book (measuring 9 × 13 inches when folded out) is a drawing of the main chassis wiring harness, giving number designations to each wire in the transceiver. A competent technician could, without any difficulty, trace out the entire circuit of this instrument.

For the amateur who appreciates (and enjoys) operating fancy circuitry and nifty gadgetry, the TS-900 will more than fill the need. As one Hq. staffer said, "This device has to be the pace setter for the '70s." — *WIFBY*

*Table III — Receiver sensitivity**

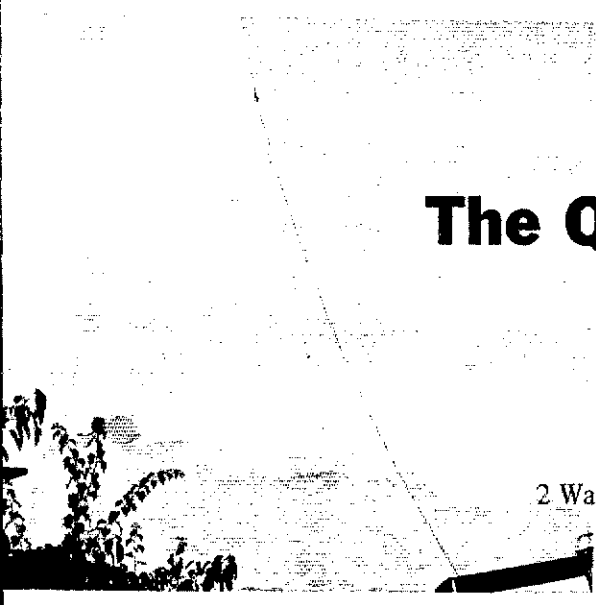
3.5 MHz	0.1 μV
7.0 MHz	0.1 μV
14.0 MHz	0.1 μV
21.0 MHz	0.1 μV
28.0 MHz	0.14 μV
28.5 MHz	0.12 μV
29.0 MHz	0.11 μV

* Measurements are made for 10 dB signal-plus-noise to noise ratio as measured at the receiver output terminals.

The Henry Radio
Kenwood TS-900 Transceiver

Frequency range (MHz): 3.5-4.0, 7.0-7.5, 14.0-14.5, 21.0-21.5, 28.0-28.5, 28.5-29.0, 29.0-29.5, 29.5-30.0, plus WWV at 15.0 MHz.
Modes of operation: Lsb, usb, cw, RTTY.
Maximum input power: 300 watts PEP for ssb service, 200 watts for cw.
Sensitivity: See Table III.*
Stability: See Table II.*
Selectivity (at 6 dB points): 2.4 kHz for ssb, 0.5 kHz with optional cw filter installed.*
Audio output: 1 watt.
Audio-output impedance: Speaker and headphones both 8 ohms.
Amplifier tubes (rf): 6LQ6 (2).
Power requirements: 117 V ac at 410 watts (PS-900 power supply).
Dimensions (HWD) and Weight: 6 × 14 × 15 inches, 26-1/2 pounds.*
Price class: Transceiver, $745; external VFO, $195; ac power supply, $120; cw filter, $50.
Color: Black and brushed aluminum.
U.S. Distributor: Henry Radio, 11240 Olympic Blvd., Los Angeles, CA 90064.

* Measurements made in the ARRL lab.



An antenna over salt water is hard to beat. Our 20-meter dipole did a fine job despite regular soakings from the breaking surf.

The QRP Challenge—

Barbados Style

2 Watts, a Dipole, and 2000 Miles from Home

BY DOUG DEMAW,* W1CER

INCREDIBLE! It started two weeks earlier as a friendly jest over lunch. Now, here we were making our approach at Seawell International Airport, Barbados, West Indies. W1KLK, mainly an ssb operator who prefers QRO (high power), taunted me by saying, "If low-power cw operation is as great as you've been saying all of these years, why not take your QRP gear to a location where you have to span *significant* distances? Working from Connecticut to surrounding states is no challenge!" What caused my response may forever remain a mystery, but I mumbled something like, "When do we leave? I'll go, but you have to accompany me!" The die was cast. We had called one another's bluffs and now on December 15th we were looking down on Barbados with its azure waters and lush tropical vegetation. The landing gear on our 707 was rumbling into an extended position. We'd be on the runway shortly.

It was no trick to talk my XYL, Jean (W1CKK), into going along. She had just finished shoveling the snow from our driveway when I explained the bad case of "foot-in-mouth disease" I had contracted while having lunch with W1KLK (also named Doug). We had a week of vacation time to wash out before the end of the year, so some kind of trip was in order. Doug's wife, Judy, had a teacher's vacation coming up, so convincing her was not a monumental exercise in persuasiveness on his part.

Some Problems

What we didn't know when we landed was that the HW-7 QRP transceiver, 20-meter hookup-wire doublet, its 40 feet of subminiature coax (RG-174/U), the hand tools, soldering iron, and VOM would be missing when we collected our baggage. All of the necessary items, plus log book, writing paper, and film for the cameras, had been stowed in a typewriter case and checked through from JFK. Doug and Judy's luggage, would also be painfully obtrusive by its absence. There was some light-hearted conversation about the costume of the day those two would be wearing for the remainder of the week, while I gnawed my nails and contemplated the missing ham gear.

We checked in at the Coconut Creek Club, located on the western shore of the 14- by 25-mile island, and part way up the coast from the southern tip of the land mass. We were on the proper side of the island for having a clear shot at the USA. Since this was not a DXpedition, the stakes weren't high . . . other than my need to save face by proving that QRP can work, even at the 2-watt rf-output level. Having a good location on the ocean shore would certainly help the cause!

Because we arrived on Saturday, nothing could be done until Monday with respect to obtaining operator's licenses from the Barbadian Electrical Inspector in Bridgetown.[1] This would afford us the opportunity to rest up, check out the site for our antenna installation, obtain permission (hopefully) from our hosts, the Ellisons, to operate the ham station, and to track down the missing baggage. Luckily, our hostess knew what ham radio was, and had actually met a couple of those "strange" chaps in the past. I uncrossed my fingers after she smiled and said, "I hope you will have fun with your radio station."

A vertical dipole, mounted almost entirely over salt water looked like a good possibility. Our quarters were some 30 feet from the ocean shore, and roughly 25 feet above it on a coral cliff. A palm-roofed shelter was situated on a flat spot that had been hewed in the rock on the edge of the cliff, and in front of our motel units. Nirvana! The

*Technical Editor, *QST*.

[1] Those wishing to obtain Barbadian amateur licenses should contact Mr. Johnson at the Old Hospital Building, Bridgetown, Electrical Inspector's Office.

perfect operating position. This place must have been tailor made for the occasion! I could almost hear those cw signals blending with the roar of the incoming surf (which later proved to be a handicap, as the noise tended to blot out the sound of the side-tone monitor -- even with phones on). We concluded that the antenna could be strung between the balcony roof and a large coral boulder on the seashore below. The feed line would reach nicely to the shelter.

Obtaining Licenses

We picked up our Barbadian tickets on Tuesday morning (we had to leave our American licenses with the inspector the previous day). We were given privileges on 80 through 10 meters, 500 watts maximum, ssb, a-m, mcw, and cw. The fee per head was $6 "bih-wee" (British West Indies money, or B. W. I.). That amounts to $3 American. I emerged as 8P6EU and W1KLK became 8P6EV.

Meanwhile, much to our relief, Pan-Am had located the missing luggage -- on Trinidad! The airline people delivered the cases to our motel, and in short order we had the luggage opened and were sifting through our belongings to make certain that all was present and accounted for. The rig seemed o.k., but the main power supply had its front bent in, and the three terminal posts were no longer at right angles to the panel. The on-off switch for the standby power supply was smashed and pushed inside the case. A quick checkout indicated that all conditions were "go" with regard to the HW-7 and its built-in W7ZOI QRP keyer.[2] The side-mounted JFET preamp was working properly too. The main power supply worked fine, despite its appearance.

Zero Hour, at Last!

December 19, 1528 Zulu. The antenna was in place, the equipment was working, and straws had been drawn to see who would call the first CQ. The 20-meter band was alive with signals from the U.S. and Europe. "CQ, CQ, CQ de 8P6EU" (try that one on for size when you're used to having only *one* numeral in your call, and when you're excited). Finally, the standby. There it was, loud and clear, "8P6EU, 8P6EU, 8P6EU de WB9KXQ." I stumbled through my newly assigned call (I wanted to blame the keyer or the paddle) and responded. Our report came back as RST 579, and we carried on a 12-minute QSO. Our next CQ brought a reply from VE3CYL. We chatted for 15 minutes. Doug heard none of this because I was wearing the phones. He was convinced that I was instituting the hoax of the year as I filled in the log book. "I may be the *QRP freak* you have been calling me all week, but I *am* honest! Here, put on the phones and see who you can raise."

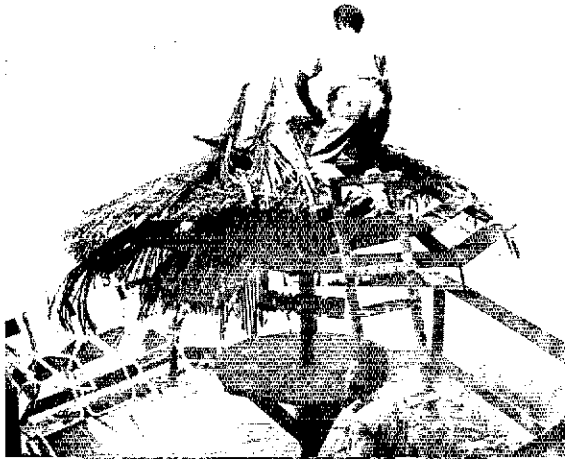
I thought he would never stop tuning back and forth across the band. He wore a skeptic's smirk on his face as he continued to search the spectrum. I could not help but feel inner satisfaction as I saw him wince when he tried to send 8P6EV with that keyer. Both of us were programmed for W1 calls, and he was having trouble too! Doug stayed with it from 1605 to 1631Z. He said nothing as he logged in W3JAK/R2, W1AJK, and DL3SA. All reports received were RST 559 or better.

During the four days that followed I could see W1KLK's enthusiasm for QRP grow as we took turns operating the station. The approach was totally casual. We ragchewed with anyone wishing to do so, answered all who called (provided they were readable), and gave many hams their first QSOs with an 8P6 station. There were interesting pileups each day at roughly 1100 and 2200 hours. At those times the band seemed to peak for contacts into the USA, and we learned what DX operators had been going through all of these years. Who would guess that a 2-watt signal could cause bedlam of that kind!

I would be gilding the lily if I implied that we worked any *real* DX, for we didn't. The limit seemed to be the 6000 miles to Europe, where reports ran in the 559 to 579 range. Also, we had been forewarned that having a DX-type call would automatically assure an extra 25 dB of signal from our rig! Whatever the truth, we couldn't break the 10,000-mile barrier to JA, ZL, and VK land, try as we might. Those countries were well represented with fairly strong signals at 0800 Z each day, but we couldn't raise them.

We worried about the lizards and birds that kept walking up and down on our tiny coaxial feed line. That, plus the surf breaking over the lower end of the dipole, made for uneasy operating at times. However, in 18 hours and 33 minutes of logged time we worked 105 stations. Our worst report was RST 339. We were given many RST 599 reports during peak band conditions. Two U.S. stations stubbornly refused to believe that we were running only 2 watts. One chap from Wisconsin actually said, "You're a charlatan, my friend. If that's a QRP signal I'm hearing, I'll eat my hand key." Perhaps that magical 25 dB of additional signal was manifesting itself, but I would prefer to think that the vertical dipole over salt water was the common denominator when it came to getting out well. And, things did get better from an operating point of view as we became used to sending (and recognizing) our 8P6 calls.

[2] Hayward, "An Integrated-Circuit QRP Keyer," *QST* for November, 1971, page 38.



We thought we would lose our operating position when the men decided to replace the palm-branch roof of the shelter. Things happen slowly on the island, so we envisioned a few soakings from the rain showers that were a frequent occurence. Happily, the job took only three hours.

We managed 105 contacts during the four days of casual operating. QSO periods were sandwiched between sightseeing trips, swimming, and visiting with local amateurs on the island. W1KLK/8P6EV is at the controls. W1CER/8P6EU updates the log book.

Succeeding with QRP

It became apparent during my five years of QRP-only operation from the U.S. that a great many questions exist in the minds of the amateurs who haven't tried low-power work. We were asked many of those questions while operating from Barbados. Here are some typical queries and their answers:

Q — What power level constitutes QRP?

A — Some say 100 watts or less. I say 5 watts or less. No specific figure has been set.

Q — What is the lowest power practical?

A — Many QRP operators have worked coast to coast with milliwatt rigs. It depends on the band used, the condition of the band, and the antenna system.

Q — Which hf bands are most effective for QRP work?

A — It all depends on how one defines DX and "effectiveness." You can work coast to coast, and into Europe on any hf band if you use a good antenna and choose the right operating times. I prefer 20 and 40 meters for my 2-watt work, mainly because those two bands provide round-the-clock openings, and seem to be fairly stable as compared to 10 and 15 meters.

Q — Can I work 20, 15, and 10 without a beam?

A — By all means! Dipoles, end-fed wires, and vertical antennas are used by many QRP enthusiasts.

Q — Are there any special operating techniques you would recommend?

A — Definitely! Don't waste time with crystal control on QRP. A VFO is your best tool. Don't call faraway stations whose signals are nearly unreadable. Chances are that they aren't QRPing, and if their more powerful output is hard to copy, then your low-power signal may not even be heard. You will get more replies by calling other stations than by calling CQ. Remember, a good receiver is as important to QRP work as it is when running QRO. Stability and selectivity should be as good as you can manage.

Q — How can I try QRP without investing in a low-power rig, or building one?

A — Simple. If you have a ssb/cw transceiver, merely turn the power (audio gain) down until you reach the QRP level. This can be done with most commercial transceivers. Power output can be measured with an rf probe and VTVM across a 50-ohm load. The rms reading can be readily converted to watts by means of Ohm's law.

Many operators ask whether or not commercial gear is preferred over homemade kinds. Well, this is purely a matter of economics, technical aptitude, and personal pride. The same rules are applied when deciding on any kind of amateur gear. It's the amateur's choice. However, there are many circuits published in *QST* and the *Handbook* for those who prefer to build their own QRP stations. The thrill is always greater when you work QRP DX with something you built yourself.

Crow Feathers and Home Again

The ham station was hand-carried back to the States. It didn't deserve a return trip to Trinidad after the fun it had provided. On board the plane I watched W1KLK sketching what appeared to be circuits for solid-state QRP gear, and I swear I detected the tips of crow feathers protruding from his mouth. He told me later that he had been eating licorice. I'll never know for certain, but I think he knows now that a great deal can be done with low power. It doesn't hurt the ethereal ecology either!

We left behind a great experience, some wonderful people, and a vacation spot that anyone would enjoy tremendously. Anyone for QRP . . . Barbados style? QST

Strays

While operating as KG4CS I worked towards 5BWAS and found the first 249 QSOs without too much difficulty, but Montana on 40 meters was my nemesis. I finally resorted to skedding K7ABV for number 250 after 18 months work. Now, having moved to Illinois, I put up some dipoles and got on the air. Who was my first contact? K7ABV! Where? 40 meters, of course! — *K4CSY/9*

FEEDBACK

We have received a number of requests for the address of some firm which sells pc boards for the January 1973 *QST* 40-meter receiver. Through special arrangements with MFJ Enterprises we now have a supplier for those boards. A complete set of drilled boards is available for $7.95. Write to MFJ Enterprises, Box 494, Mississippi State, MS 39762. — *WICER*

OSCAR NEWS

The fact that Oscar 6 "ground" terminals are not limited to earthbound stations was demonstrated on April 27 by W6OAL, who contacted K7BBO through the satellite while operating aeronautical mobile west of Hawaii at an altitude of 7,000 feet.

Other reports from the Pacific show that Oscar activity is not confined to North America and Europe. KH6IJ won the first Satellite DX Achievement Award from Oceania, working KH6, KL7, W, VE, and JA in the process. Nose says, "Equipment here is purposely kept simple to see how much DX I can work without elaborate equipment. It is a Marker Luxury ML2 with crossed 11 element yagi antenna on an azimuth and elevation mount. Keying is done by pressing the microphone button (not by regular key). Ten watt maximum power is used at all times." (Tnx *VERON Vhf Bulletin*) Nose has worked as far east as VE6.

OSCAR 6 TWO-WAYS

	Stations worked	*States*	*Countries*
DU1EJ	9	—	3
JA1ATL	63	3	9
JA1JRK	—	3	12
JA8DJJ	18	2	9
4X4MH	156*	—	20
K1HTV	420	45	36
W1JSM	240	32	15
W1WM	119	16	14
WB2VKZ	227	43	20
K2QBW/3	101	31	7
W3BWU	67	26	7
W3TMZ	352	47	27
WA4JID	255	—	18
WB4RUA	98	35	10
W5PZ	170*	31	3
W6BGJ	162	43	3
W7JQ	148	34	5
W7ZC	163*	27	2
WA8UUY	43	25	3

*total contacts

From the Philippines comes an activity report by Edgar, DU1EJ, who mentions that the first Oscar contact from that country was made by DU1POL with JA1JRK on March 24. Since then, DU1EJ has worked several JAs, VK6HK, VK2NN, and DU1POL. Edgar uses Collins equipment and is busy building a crossed yagi for 10 meters with 4 elements in each plane, so we should be hearing more from him!

KX6HK has worked VK, ZL, JA, and KL7, and hopes to work KH6, KG6 and DU1 before long. From the Marshall Islands, Bill is often the only station using the satellite; he will have to do some "missionary work" in order to contact his own country!

In other DX news, CT2BJ has been active from the Azores. This still counts as Europe, though it is only a few hundred miles from EA8, CR4, and CT3, all of which count as Africa. Probably these islands are the best bets for an Oscar contact between North America and Africa.

As we have mentioned several times before, it is entirely possible for an antenna to have too much gain to be useful for Oscar. List to K7GWE: "The equipment here includes a homebrew 5894 transverter and a Cushcraft crossed Yagi. At first I was using the whole 10 elements (vertical and horizontal) phased for circular, but I found that this was too directional. I was spending all of my time running the rotators and had no time left to operate. Sooo . . . I sawed off six of the original 10 elements and things improved 1000%. I am now using four elements (vertical and horizontal) phased circular for two meters."

With vacation season now upon us, perhaps there will be increasing numbers of expeditions to rare states for Oscar work. Vermont, Kentucky, Louisiana, Nebraska, and Wyoming would be especially good targets. Why not bring along your Oscar 6 ground station when you go on vacation this year? – *K1ZND*

Recent Satellite DX Achievement Award Winners

K3JTE, GW3FSP, SM6OH, HB9WB, SP9AI, F8DO, JA9BOH, KH6IJ, 4X4MH, W7JQ, G6RH, WA4JID, F8XT, WA8UUY.

Certificates have been issued to 89 stations in 17 countries and 4 continents.

Helping to keep Nevada on the Oscar 6 map is WA7LUN of Dayton. Oscar interest in La Neil's family is shared with her OM – WA7LRU/W6UF, chairman of the Amateur Satellite Service Committee!

The Sixth Amateur Satellite—

While numerous articles have appeared in amateur journals concerning the operational details of the Oscar 6 satellite, little technical information concerning the spacecraft subsystems has been published. This article is an effort to satisfy this need as well as to familiarize many amateurs with techniques used to develop unattended electronic systems which are required to operate from very limited power sources. It is hoped that amateurs reading this article will have a better feeling for terms such as reliability, redundancy, and efficiency as they apply to space systems. Perhaps these techniques may provide ideas for improving many amateur's terrestrial equipment designs.

PART I

OSCAR 6, the first in a planned series of long-lifetime amateur spacecraft, is simplistic in design; however, it does contain the basic electronic building blocks used in far more elaborate and costly spacecraft. For this reason Oscar 6 is an excellent educational aid for those not familiar with spacecraft; thus I have chosen to describe the satellite subsystem by subsystem rather than give a general overview of Oscar 6.

Power Subsystem

To listeners and communicators, one of the least obvious systems within the spacecraft, the power subsystem, is critical to the eventual lifetime of Oscar 6. The primary components of the power system are the solar arrays, the Nickel-Cadmium battery, and a switching regulator used to provide regulated voltages for the remainder of the spacecraft's electronics.

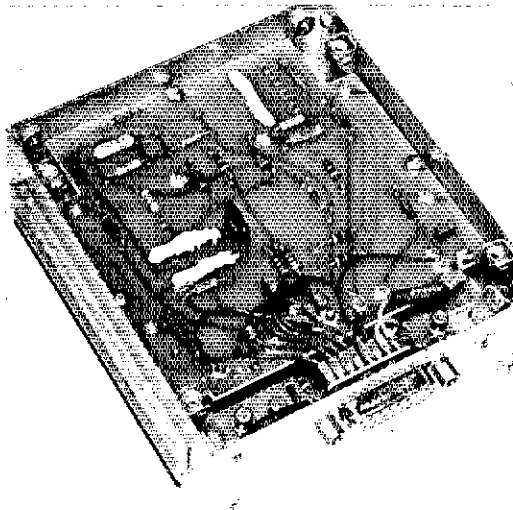
The proper operation of the satellite is entirely dependent upon the ability of the solar arrays to convert energy received from the sun in the form of photons into useful electrical power.

The silicon solar cells which cover greater than 50% of the surface of the spacecraft are 1 cm × 2 cm wafers soldered together so that 80 cells are in each series string. These strings are then wired in parallel by placing a diode in each series string to prevent the possibility of reverse current flow from one string through another. For the cells used on the Oscar 6 mission, each series string produces 52 mA of current when fully illuminated and properly loaded while the open circuit voltage is nearly 40 V. This gives an open circuit voltage for a single cell of roughly 0.5 V. Each cell, then, is producing 26 mW of power when the sun's rays are perpendicular to its surface. Yet this rather large amount of power is only 9% of total solar energy incident on each cell. It is a most unfortunate fact of nature that silicon photo-voltaic devices, one of the most efficient means so far developed for converting the sun's energy in space, fall far short of being truly efficient sources of power. In order to protect the cells from the sun's high energy protons and electrons trapped and stored in the earth's magnetic field, a special glass cover slide has been placed over each cell. These .006-inch thick slides do not completely stop damage of the cells but do retard it greatly. The solar arrays on Oscar 6 are expected to produce 25% less power after six months in orbit than at the time of launch. Degradation after six months is, however, much slower so that after two years the cell output will be down by 50%.

Solar arrays can best be considered as relatively high impedance constant current generators. The current from each string is summed together to provide a charging current for the battery or is delivered directly to the spacecraft loads. When the array is open circuited no current will flow but a voltage of 40 V will result when the panel is illuminated. As a load is applied across the array, current begins to flow in the load but the voltage produced by the cells starts to decrease. As the load impedance continues to decrease, the current increases and then reaches a saturation value. Now, for increasing loads the voltage continues to drop but the current maintains a near constant value even when the short circuit condition is reached. Since power from the array is the product of the array's loaded voltage and the net current flow from the array, the most efficient operating point for the array is the "knee" of the I-V curve at 32 V.

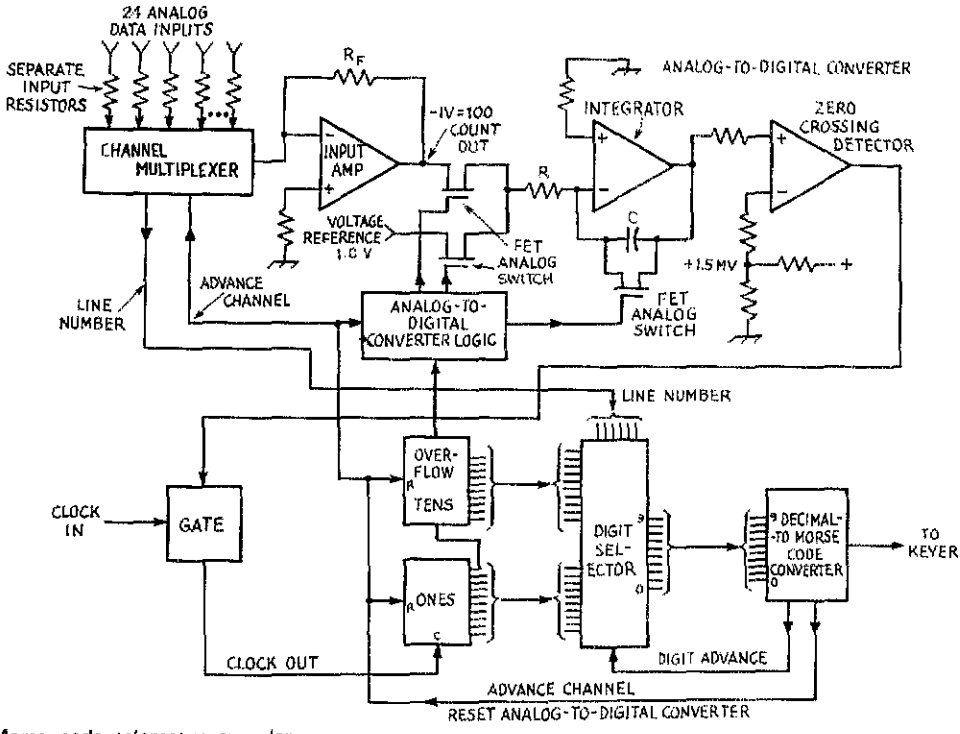
The spacecraft battery consists of eighteen NiCd cells each with a capacity of 6 ampere-hours. Aerospace cells like the group in Oscar 6 are

* Project Manager, Amsat, PO Box 27, Washington, DC 20044.

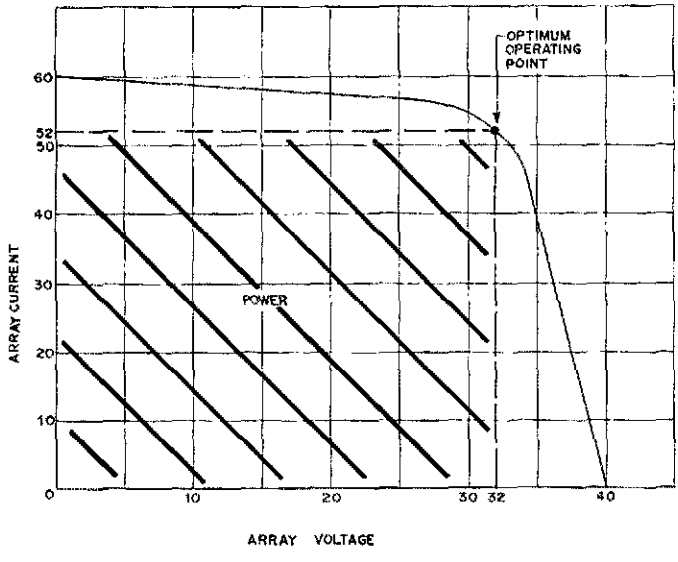


A Technical Report

BY JAN A. KING,* W3GEY



Morse code telemetry encoder.



Shown left is the Oscar 6 switching regulator module. The diagram at right is the solar cell voltage-current characteristic curve (see text).

configured in rectangular metal cans and are very carefully hermetically sealed. Few of us understand the great care required to obtain a reliable energy storage system of this type. The 18 cells for Oscar 6 were selected from three lots containing over 100 cells. Each cell from these lots underwent stringent testing. The cells were checked for leaks and then assembled into various series groups or batteries. After assembly, the cells were placed in environmental chambers and tested and retested for charge capacity, charge retention, self-discharge, overcharge characteristics, high discharge rate characteristics, and charge efficiency at various charge and discharge rates and at different temperatures. The flight cells were then picked by making use of this data yielding the best matched cells. The open circuit voltage of the flight cells when fully charged are identical within $\pm$ 5 mV. In all, more than 2000 hours of testing were required over a five-month period to prepare the Oscar 6 battery.

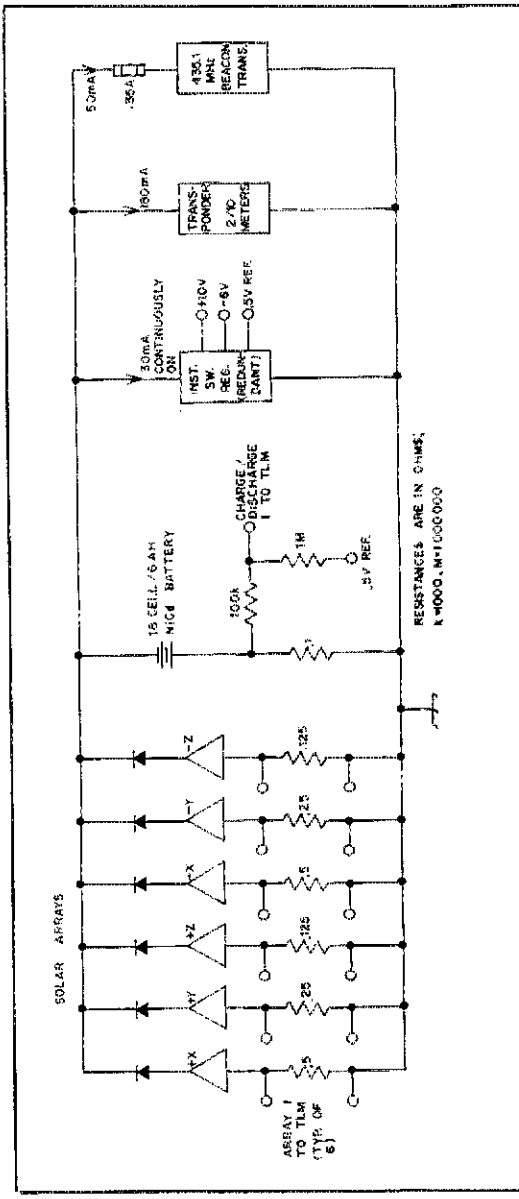
The fully charged voltage of the battery at 25° C and under load is 24.15 V (1.35 V/cell) and after 6 ampere hours have been drained from the cells the voltage drops to approximately 20 V (or 1.1 V per cell). In order to assure that the battery will operate for long periods without degradation, it is necessary in practice to assure that the depth of drain of the battery does not exceed about 70% (4.2 Ah discharge for a 6 Ah battery). This corresponds to a cell voltage of about 1.2 volts/cell. Therefore, when operating the spacecraft it would be unsafe to allow the battery voltage to decrease below 21.6 V. Similarly, when charging the battery, an indication of 24.2 V would be a general indication that the battery is fully charged. It is true, however, that voltage is not a good indicator of the state of charge of a NiCd system since the voltage can also vary with temperature, loading and battery age as well as charge state. In a simple spacecraft such as Oscar 6, however, where more sophisticated techniques are difficult to implement, it was found necessary to rely on voltage as the charge indicator.

Since the solar arrays are much higher impedance than the spacecraft battery, the arrays will be loaded to the battery potential during all periods when the satellite is in the sun. During eclipse periods each array represents a passive impedance producing very little voltage or current. Reverse current flow from the battery into the arrays is prevented by the diodes in each series string of solar cells.

It was mentioned that the optimum operating voltage for the arrays was 32 V, considerably above the battery voltage of 24 V. Rechargeable cells, such as NiCd, require a charging potential 15 to 20% in excess of the fully charged state of the battery in order to assure that the cells reach their maximally charged condition. An additional voltage factor has been included in the design of Oscar 6 since the arrays degrade in voltage as well as current due to radiation damage which occurs in the space environment. This safety margin should allow the battery to be charged to its full capacity even after a one-year lifetime in orbit.

The logic elements within the spacecraft such as the command and telemetry systems require regulated voltages for their proper operation. To meet these requirements the satellite contains a redundant switching regulator which converts the unregulated 24 V from the battery to +10 V, −6 V, and +0.5 V. All outputs are regulated — some to a greater extent than others.

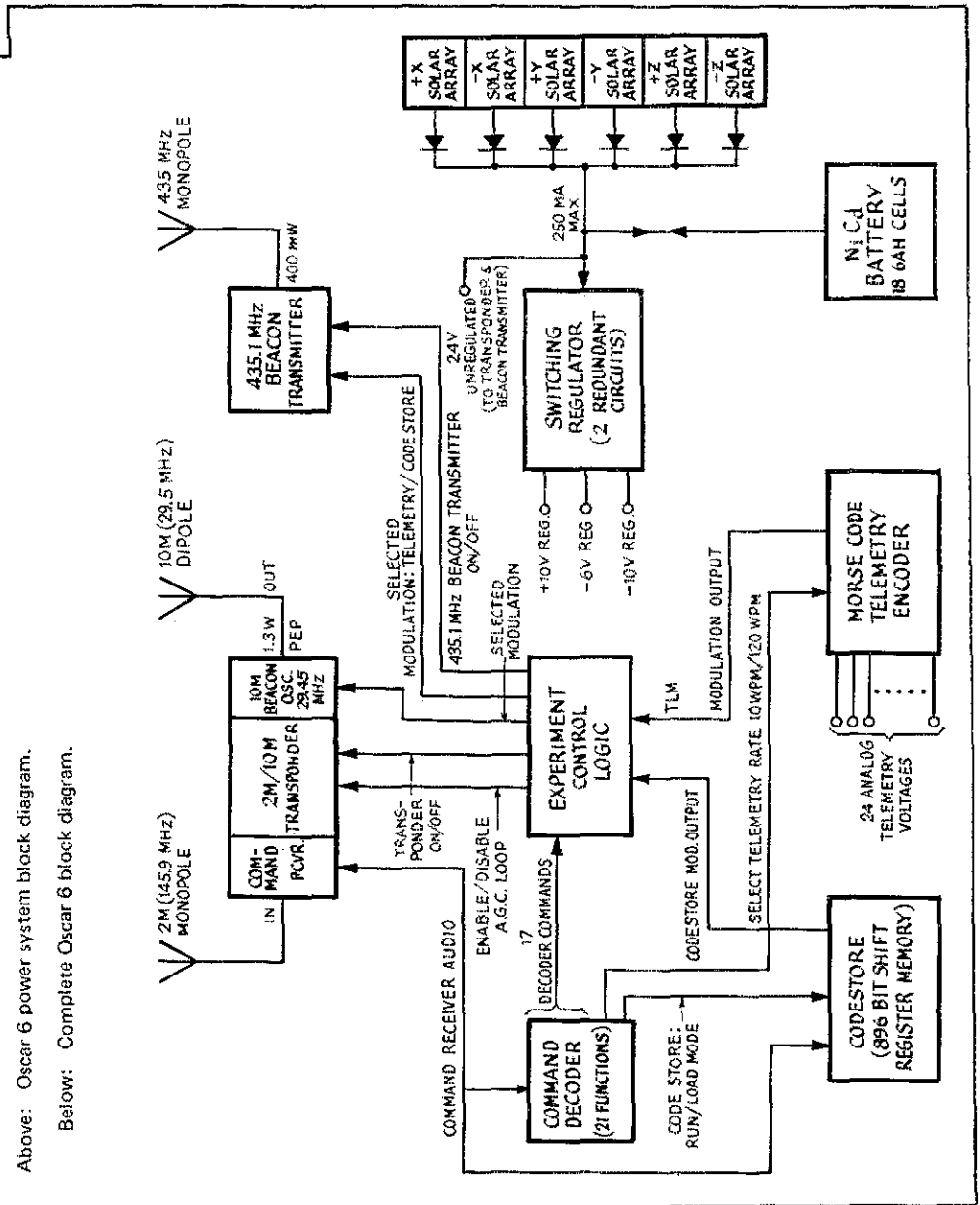
The +10 V supply delivers a well-regulated voltage to the experiment control logic, the command decoder, the telemetry encoder, the Codestore system and the command receiver portion of the repeater. The line regulation of this supply is within 1% while the load regulation is approximately 5%. The −6 V is used as a source voltage to a reference zener diode within the telemetry encoder. Thus, very little current is required from this supply. Its line regulation is the same as the +10 V supply, but the load regulation is poorer since it is not designed to supply more than a few milliamperes of current. The 0.5 V supply is a precision reference voltage used to provide a fixed known voltage to all spacecraft thermistors and the telemetry calibration channel. This supply used as its input the +10 V output from the regulator, which is further regulated by a very low temperature coefficient zener reference diode. This regulated output is divided down to 0.5



V and supplied to an operational amplifier which maintains a 0.500 V output independent of the load impedance.

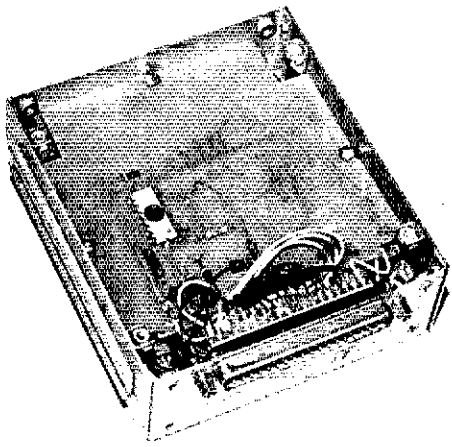
Since power is a very precious commodity aboard Oscar 6, it cannot be wasted in heating resistors and transistors which do not make effective use of this power. Resistor dividers, zener regulation or series transistor regulation are all very inefficient means of producing lower regulated voltages from higher unregulated ones. In this instance a switching regulator was used to provide the required efficiency.

A switching oscillator chops the input voltage so that for some part of the oscillation period, the output of the oscillator is high (i.e., 24 V) and for the remainder of the oscillation period the output is 0 V. The duty factor of the switching circuit is controlled by a difference amplifier which measures the difference voltage between a fixed reference and a sample of the output voltage. The difference signal is supplied to the switching oscillator such that when the output is higher than the reference, the duty factor will be low and as the difference decreases the duty cycle and oscillator frequency increase. When this chopped signal is filtered, it is found that the average voltage (since the output filtering is simply an averaging device) is a constant independent of the input voltage. The ability for the regulator to perform its task ceases if the input voltage is less than the output voltage. This is because even if the switch were on 100% of each duty cycle the average



Above: Oscar 6 power system block diagram.

Below: Complete Oscar 6 block diagram.



Experiment control logic module.

voltage cannot maintain the desired output voltage. Under such a condition the output simply follows the input minus the losses in the switch which simply remains in its "on" condition. Operating at an output current of approximately 30 mA (that required by the entire spacecraft at +10 V), the regulator is about 70% efficient. At currents this low, even switching regulators are not highly efficient but are still superior in performance to series regulation.

Since a failure of this regulator would be catastrophic resulting in a 100% loss of all spacecraft functions, a second regulator identical to the first is included in the same module for redundancy, and is diode summed with the output of the first. Both are fused so that if one fails open or short the second will continue the job of supplying the +10 V. A similar regulator is also cotained in the repeater but is set to provide +9.0 V to the transmitter stages of this system. The repeater is turned on and off by turning on or off a transistor placed across the reference zener of this regulator.

The switching regulator was constructed on two small printed circuit boards and assembled in one of the small standard modules used in the spacecraft.

Experiment Control Logic

The experiment control logic (ECL) module in Oscar 6 is responsible for accepting decoded pulsed commands from the command decoder and converting them to level commands which turn on and off the two-to-ten meter repeater and the 435.1 MHz beacon transmitter. Similarly, the ECL converts pulse commands to change the modulation modes of the beacon transmitters. Either the Morse code telemetry system or the Codestore system can be commanded to key the 29.45 MHz or the 435.1 MHz beacons. The modulation control for each beacon is separate so that, for example, the Morse code telemetry encoder can be commanded to key the 435.1 MHz beacon while the 29.45 MHz beacon is being keyed by the Codestore message storage system. An additional feature was added for the 29.45 MHz beacon so that a 15-minute timer (part of the ECL) switches the modulating source for this beacon alternately between the telemetry encoder and Codestore. The repeater's agc loop may also be influenced by the ECL. When instructed to do so by ground command, the ECL enables or disables the agc voltage controlling the gain of the 3.5 MHz i-f amplifier. Set-Reset flip-flops or latches made from cross-coupled NOR gates convert the pulses from the command decoder to level commands. These flip-flops "store" the desired command state until further modified by ground command. In many cases this level is used to directly control devices in the spacecraft such as the repeater and the 435.1 MHz beacon ON/OFF controls. In some cases these levels enable gates which select the desired modulation source (Codestore or the telemetry encoder). Since the beacon modulators require some current (2 to 3 mA) from the input keying signal, a driver transistor was added at the output lines of the ECL to the modulators. This was required due to the low drive current available from the COS-MOS logic devices. The experiment control logic was constructed on three small logic boards and the boards were stacked and assembled in one of the small standard module housings.

Morse Code Telemetry Encoder

The need to provide a greater number of telemetry parameters than in past Oscars was evident if some assurance of a prolonged lifetime for the spacecraft were to be possible. In order to properly operate the spacecraft, information about the charge and discharge rate of the battery, its voltage and temperature, and several parameters relating to the repeater and switching regulators were required. In addition to the number of parameters telemetered, Amsat members felt the format of the telemetry could be simplified by making use of recent developments in digital logic and requiring the spacecraft to do most of the work in making measurements. A simplified format such as the transmission of the data as Morse code numbers requires no ground decoding equipment except pencil and paper and the required calibration information. Therefore, students not previously familiar with telemetry can participate in the decoding of spacecraft data by simply memorizing ten logically organized elements.

The telemetry system designed for Oscar 6 contains all of the characteristics of the encoders used in complex space telemetry systems and for this reason is particularly instructional for individuals not familiar with telemetry coding. The fundamental components of the Morse code telemetry encoder are shown on page 2 of this article.

It was decided that 24 input channels were sufficient for telemetering the satellite's most important parameters. Since there is no easy way to make this many measurements at one time, they are made in a fixed order one after another or in a *serial* fashion. To accomplish this, an analog multiplexer or channel selector is used which utilizes a set of 24 FET switches (spst), only one of which is activated at any given instant. Since the signal voltages range from 24 V to 50 mV, some must be amplified and others attenuated in order to provide a 0 to 1 V normalized amplitude to the analog-to-digital converter. If this were not done voltages well under 1 V would not be making use of the full dynamic range of the system, while voltages over this value would over-range the analog-to-digital converter. This amplitude adjustment or scaling function is achieved by an

operational amplifier whose feedback resistance R_f is fixed at 1 Meg. The output voltage of the op-amp is given by:

$$V_o = V_{in} \frac{R_f}{R_{in}}$$

so that the gain for each channel can be set by the appropriate resistance ahead of the multiplex switch. The R_{in} resistors are typically in the range from 100 k to 1 Meg.

The analog-to-digital converter (ADC) circuit is a means of converting the analog parameters to quantized digital values. Quantization means the signal can only take on discrete levels without intermediate values. In this case the analog value is converted to a number between 0 and 99. Values such as 77.5 and 0.4 are not possible and would be represented by perhaps 78 and 00.

What actually occurs in the ADC is that the normalized analog voltage is changed to a series of short pulses which are counted in decade counters. The number of pulses (0 to 99) counted during the sample interval corresponds linearly to the analog value. This is done electronically in this encoder by a scheme known as up-down integration. At the instant the multiplexer switch first closes, a capacitor begins to be linearly charged by the analog signal. The capacitor continues to charge for a preset period determined by a clock in the encoder. Then the capacitor is discharged at a linear rate determined by a reference voltage of the opposite polarity until it reaches 0 V again where it began. At the same instant in time a gate closes allowing the clock pulses to flow to the two decade counters. A zero crossing detector opens the gate inhibiting the continued flow of pulses to the counters. The time that has passed while the gate was open, known as the sample window, is proportional to the analog value, and since the pulses are spaced at regular intervals in time the number of pulses counted is also proportional to the analog voltage. The up-down integration scheme tends to cancel many of the errors present in a simpler scheme which requires that the capacitor be charged only in one direction. Oscar 6 is the first amateur satellite to use a quantized digital output requiring an ADC circuit.

After the analog-to-digital conversion is complete, the counted pulses are stored in the counter while they are converted to the proper coded value. Up to this point the telemetry encoder is representative of nearly all satellite encoders. The next step taken in such encoders is to convert the stored digitized information into a coded format which will then be converted back to the original data on the ground. Some codes are elaborate ones which make use of redundant features to allow detection and even correction of errors during periods of low signal-to-noise ratio.

Most NASA spacecraft use some form of pulse code modulation (PCM) which has these features. The Oscar 6 encoder is unique in its adoption of the international Morse code numbers as the coding scheme.[1] A format which has considerable redundancy was utilized to assist in copying data during weak signal conditions. It was decided to arrange the 24 analog parameters in a matrix containing 6 lines with 4 parameters per line. Each parameter or telemetry *word* consists of three Morse code digits. The first digit of each word indicates the row or line number while the second and third are the actual data values ranging from 00 through 99.

A completed matrix or *frame* of data is signalled by the Morse letters "HI" repeated twice which act as a frame or synchronization signal and identify the source of the Oscar rf emissions – an eleven-year-old tradition in the amateur space program. The HI frame sync and the repeated line number provide redundancy features so that there is no ambiguity in the data (even if only portions of a frame are copied).

The Morse code rate can be changed at will by ground command so that data is transmitted at 10 or 20 wpm. The slower speed feature was included so that the satellite's telemetry could be demonstrated to students and others not generally familiar with Morse code.

The data-to-code generator and timing/forming functions will not be described in detail here but are discussed in other places.[2] The code conversion logic takes advantage of the logical organization of Morse numerals to simplify the circuit design. For example: each number has exactly 5 elements which can be counted to sense the end of the number. Within each number, a single unique transition from dots to dashes or from dashes to dots occurs; each number has a complement (e.g., [0, 5] or [2, 7]) which simplifies the encoding task by reducing the required number of synthesized elements.

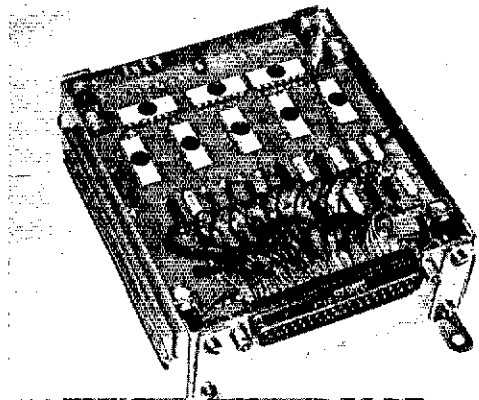
The timing and forming circuitry is the "bookkeeping" system in the encoder. It must place the encoder in the proper speed (10 or 20 wpm) and maintain the proper spacing between each telemetry word. It must also keep track of which line number is transmitted in each word and which analog gate is being sampled by the multiplexer. It also determines the end of a frame, inserts HI HI at the proper moment, and at the proper instant resets the decade counters after each code conversion is complete, preparing the ADC for the next measurement.

The Morse code telemetry encoder contains 35 integrated circuits and was built on four small logic boards which are assembled into a single standard small module measuring 4.25" × 3.82" × 1.50" (10.8 cm × 9.7 cm × 3.8 cm). The entire encoder

[1] King, Jan A., "Interpreting AOC Telemetry Information," *Amsat Newsletter*, Vol. IV, No. 2, June 1972, pages 5-8.

[2] Klein, Perry I., et al, "Spacecraft Telemetry Systems for the Developing Nations," 1971 IEEE *National Telemetering Conference Record*, April 1971, pages 118-129.

(Continued on page 101)



Morse code telemetry encoder module.

The SET of '73

REPORTED BY WILLIAM MANN,* WA1FCM

BACK IN the cold of January, Amateur Radio Emergency Corps members, National Traffic System participants, Radio Amateur Civil Emergency Service groups and other groups were providing communications for the Red Cross, c.d., mayors, hospitals, police and fire departments, etc., required as a result of numerous hurricanes, earthquakes, blizzards, tornadoes and other assorted natural and man-made disasters. This activity took place on the weekend of January 27-28, 1973. Why were those dates such a hub for emergency communications? That was the weekend of the 26th ARRL Simulated Emergency Test.

Each year, public-service oriented amateurs, in conjunction with other interested amateurs, join in an all-out effort to test their emergency communications capabilities, just as the service might be needed in time of a real disaster. Meetings are held, plans developed, prospective participants are given pointers and reminders. Then, on *the* weekend, SET plans begin to unfold. The alert EC has devised an interesting but realistic "program" for his group. Net managers announce surprise emergency-power-only sessions. Those deeply involved are treated to an engrossing, though perhaps arduous, task of overcoming many of the snags incurred when an emergency situation develops. The occasional participant has had an opportunity to brush up on emergency and message handling procedures which he thought he had down pat. The overall objective: to simulate realistic disaster conditions which can benefit from amateur radio communications, and strive to provide the needed communications to the best of our abilities.

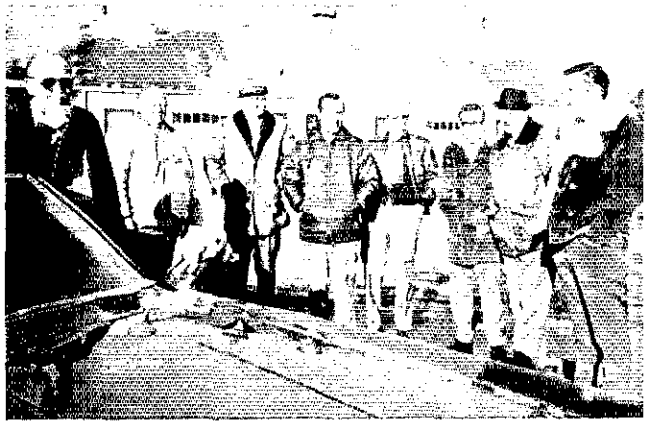
How'd we do this year? Well, we rang up another record-breaking year. AREC/RACES participation reached a new high of 4862 participants surpassing the previous record of 4769 participants set in 1971. More nets were reported to be active than in any previous year. A sharp increase in the number of mobile and self-powered portable stations was evidenced. More fixed stations were using emergency power. In most categories, we showed improvement over last year's efforts.

Although participation was up, some of the other categories were lower than in previous banner years. Notably, the amount of traffic handled continues to drop. The net result was that we had more nets handling less traffic in more time than it took last year. The overall number of messages to the Section Emergency Coordinator or state Radio Officer also declined. Since the emphasis was again on operating two complete cycles of NTS, totals were lower than in the pre-1972 years when NTS net sessions were scheduled more heavily, with higher-level (region and area) nets meeting continuously and concurrently.

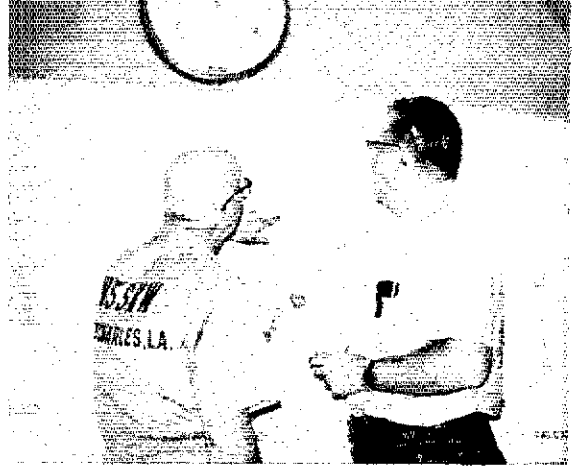
Judgement on our improvement (or non-improvement) is based in part on numerical scores submitted by Emergency Coordinators, Radio Officers, net managers and other leaders. The use of scores is not to imply that the SET is a contest (though one observer remarked: "Not a contest? Why, you even use multipliers!"), but rather to supply empirical evidence by which we can evaluate our efforts as compared to previous experiences.

In compiling the statistics which follow, it was observed that over 50 clubs were represented by membership participation in the SET. In several instances, entire clubs "went out" for the SET; other cases indicate that several members from various clubs joined in support of SET activities. It is hoped that club activity will continue in the

*Assistant Communications Manager.



Here are several of the participants in the Lincoln Co. (NE) test, lined-up and awaiting instruction: Left to right: WAØZSX, WØBLM, WØGPX, WBØANQ, WØKXD, KØBYK, WAØGAT and WAØZRQ.



What would an SET be like without the full scale effort set forth by the Southwest Louisiana group? EC W5SKW and Assistant EC WA5LPW survey a map to determine routes for the mobiles. Thirty-two mobiles participated.

SET, with clubs working in close cooperation with their ECs.

Well, we can claim another "best ever" label for the 1973 SET. Yet, to be satisfied with our results is to stifle further improvements. We *can* do better. The next SET will be on January 26-27, 1974. Plan now to improve your score in Seventy-four.

Nationwide Activity

Since this is the second year we have had "stepped-down" net activity, we are on equal grounds to compare scores with those of last year. Each category saw an increase except the number of messages handled. Our rate of handling traffic (messages handled divided by time) dropped. The increase in the number of nets reporting (133 in 1973, 98 in 1972) probably accounts for most of the increases in other column totals. Another plus is the jump in number of different states/provinces which reported net activity, an increase from 34 to 42. Nine "new" states were added; one province did not reappear.

For comparison purposes, the "average" net (including region and area nets) handled 111 messages in 354 minutes with 29 stations participating by handling traffic, 4 net control stations and 5 liaison stations to higher level NTS nets. The "average" section or local net handled 95 messages in 365 minutes with 29 participants, 4 NCSs and 5 liaison stations.

The reporting nets are listed below. Column A refers to the total number of messages handled; column B is the number of minutes in directed session; column C is the number of different stations participating by handling traffic; column D is the number of different NCSs; and column E is the number of different liaison stations to higher NTS levels. The "Total" column refers to the total number of *points*: 1 point for each message handled and each minute in session (columns A and B); 2 points for each station (column C); and 5 points for each NCS and liaison station (columns D and E).

Net Name	*A*	*B*	*C*	*D*	*E*	*Total*
AREA/REGION NETS–TCC						
EAN	556	228	54	4	10	962
CAN	469	285	54	4	16	962
PAN	360	294	42	4	–	758
1RN	262	380	30	5	7	762
2RN	193	257	32	5	11	594
3RN	120	240	28	4	7	471
4RN	281	355	35	4	12	786
RN5	296	403	48	7	10	880
RN6	48	116	6	2	3	201
RN7	146	319	14	4	6	543
8RN	193	451	28	7	11	790
9RN	197	328	30	8	12	685
TEN	218	390	36	3	9	740
ECN	61	222	12	6	2	347
TWN	105	259	20	5	6	459
TCC Pacific	213		20			253
ALABAMA						
AENB	33	187	13	5	8	311
AEND	42	349	14	4	4	459
AENM	97	134	25	3	3	311
ARKANSAS						
OZK	33	262	13	4	4	361
CALIFORNIA						
Inyo Emerg	5	180	3	1	1	201
Monterey Bay Area AREC	15	420	8	3	0	466
NCN	104	378	28	5	5	588
Orange Co. AREC	29	240	11	2	3	316
Orange Co. 40M AREC	92	180	28	4	2	358
Santa Barbara Section AREC	25	292	28	5	4	418
SCN	306	681	29	6	8	1115
COLORADO						
CCN	167	499	28	5	4	767
Colorado RACES	179	1260	112	2	14	1743
Cotter Club	5	–	3	3	1	31
Denver Autostart RTTY	61	298	6	0	5	396
District 1 Emerg.	12	330	3	3	1	368
SSN	107	212	21	6	7	426
CONNECTICUT						
Bristol Emerg.	83	385	25	4	4	558
CN	217	376	30	7	9	733
CPN	226	496	48	7	–	853
Nutmeg VHF Tfc.	23	180	5	1	3	233
DELAWARE						
DEPN	64	372	19	9	5	544
FLORIDA						
Bay Co. Amateur Radio Emerg.	26	135	12	3	3	215
FMTN	124	443	93	3	4	788
GN	161	600	32	6	7	890
NFPN	104	385	65	6	4	669
QFN	311	607	57	8	9	1117
QFTN	30	240	10	2	3	315
VFN	23	90	5	2	1	138
GEORGIA						
Georgia SSB	156	867	105	9	6	1308
GSN	210	481	31	8	10	843
ILLINOIS						
ILN	48	278	17	7	5	420
INDIANA						
Gibson Co. AREC	20	130	6	4	1	187
Kokomo ARC Emerg.	9	90	5	2	2	129
QIN	185	255	15	6	9	545
IOWA						
Zone 8A AREC/RACES	5	70	5	1	0	90

A critique session to discuss the SET results is a vital ingredient in the SET recipe. The Palo Alto ARS/Menlo Park C.D. Club held their critique at one of their monthly Board of Directors meetings. Three of the officers in attendance were (left to right): K6QOM, K6YT and W6FLE.

KANSAS						
KSBN	230	1075	141	3	8	1642
QKS	103	269	26	8	9	509
QKS-SS	68	484	12	4	2	606
Zone 3 AREC	13	75	5	2	3	118
Zone 10A AREC	17	80	21	2	0	149
KENTUCKY						
KNTN	57	1050	15	5	4	1182
KRN	26	90	18	1	3	172
KYN	133	825	26	9	12	1115
MKPN	201	459	24	3	10	773
LOUISIANA						
LAN	71	236	14	5	7	395
MAINE						
SGN	90	223	58	4	2	459
MARYLAND-DISTRICT OF COLUMBIA						
Allegany Co. Emerg. Phone	6	95	5	1	2	126
Cumberland Valley 2M	74	275	18	5	3	425
MDD	99	344	19	6	9	556
MEPTN	184	930	51	13	8	1321
MASSACHUSETTS						
Berkshire Co. AREC	25	120	10	4	4	205
FM2MN	13	59	5	2	1	97
WMN	61	192	12	4	5	322
MICHIGAN						
Muskegon Co. CD Emg.	87	420	22	2	1	566
QMN	118	412	34	7	5	658
Straits ARC	6	60		1		71
Wayne Co. 2P-M AREC	29	480	10	1	1	639
Wolverine Sideband	101	450	22	4	2	625
MISSISSIPPI						
MSBN	264	680	35	10	6	1094
MISSOURI						
Johnson Co. 2M AREC	18	61	8	1	3	115
MSN	12	21	9	5	4	96
Warrensburg Emerg.	18	54	6	2	3	109
MONTANA						
Missoula Area Emerg.	32	50	8	2	1	113
NEBRASKA						
Douglas Co. 2M AREC	8	850	55	5	..	993
NEW JERSEY						
Bayonne AREC/RACES	289	390	15	6	7	774
East Coast Hurricane & Weather	6	306	7	5	1	356
NJN	158	269	26	8	11	574
NJPN	121	387	125	5	7	818
Passaic Valley Tfc. & Emerg.	62	302	11	6	4	336
NEW YORK						
NLI	28	127	12	2	5	214
NYS	197	737	61	9	12	1161
10M AREC	10	60	6	2	1	97
NORTH CAROLINA						
Central NC Tfc.	12	240	8	6	4	318
Charlotte Hornet	17	720	4	1	1	755
Guilford Co. 2M	5	60	5	4	1	100
NORTH DAKOTA						
NODPON	96	170	40	5	1	366
OHIO						
BN	166	493	41	6	14	841
CIRCL	31	240	19	3	3	339
Clark Co. Emerg	40	241	14	3	4	344
Coleman Twp. EM	54	61	4	1	1	133
OSSBN	1061	1450	462	14	7	3540
Queen City Emerg.	103	360	15	3	3	523
Stark Co. Emerg.	173	640	30	14	20	1043
WARTS	79	1215	3	2	2	1320
OKLAHOMA						
OLZ	8	160	3	4	2	304
OREGON						
Portland Area AREC	16	175	13	3	3	247
PENNSYLVANIA						
EPA	87	269	22	5	5	450
Penn. Fone	114	964	45	9	5	1238
Phila. ARPSC	10	120	20	3	3	200
WPA	109	316	23	5	7	581
RHODE ISLAND						
Aquidneck Is. Comm.	23	160	15	1	2	228
TENNESSEE						
Cleveland ARC	11	240	8	1	3	287
E. Tennessee VHF	2	15	3	1	1	33
Memphis Emerg.	75	360	63	3	5	601
Rutherford Co. EC	8	90	8	2	2	134
Tennessee SET	306	724	103	8	0	1276
TN	89	247	15	6	7	431
TNN	22	100	9	2	1	155
TEXAS						
TEX	156	550	15	7	5	796
UTAH						
BUN	47	199	21	3	4	323
VIRGINIA						
Prince William Co. AREC	108	220	23	3	5	414
Va. AREC	8	53	30	1	2	136
VN	121	300	26	6	12	563
VSBN	356	1117	110	9	8	1778
Washington Co.	8	210	12	3	1	262
WASHINGTON						
AREC	63	695	2	1	1	772
Wash. State AREC	205	610	46	2	3	932
WSN	89	695	22	5	5	878
WEST VIRGINIA						
WVSEN	170	840	30	8	4	1130
WISCONSIN						
Wausau SET	7	5	1	1	1	24
ALBERTA						
APSN	154	720	26	5	4	971
MARITIME						
Atlantic Provinces	45	265	12	5	4	379
Newfoundland & Labrador	226	715	68	7	9	1157
ONTARIO						
Champlain Mininet	156	60	8	3	2	257
OQN	38	163	18	4	8	297

SASKATCHEWAN

SATN	17	125	6	4	4	194
1973 Totals	*14,781*	*47,178*	*3,870*	*582*	*635*	*75,784*
1972 Totals	*14,806*	*44,240*	*3,290*	*488*	*590*	*71,016*
Record	*28,108*	*64,805*	*6,622*	*729*	*754*	*113,447*

The following nets were reportedly active during the SET, but not formally reported:

BC Amateur Radio Public Service Corp Net
BC Emergency Net
Grey Burce Net (ON)
KY Traffic Net
NYC-LI Phone Net
Tri-Region Net (N. E. US)

Local Activity

Analysis of AREC/RACES reports yields increases in all categories except number of messages to the SEC or state RO. Fifty-seven sections reported activity in the 1973 SET compared to 54 last year. The total SET points reached an all-time high of better than 50,000 which topped the previous record of 1971 by nearly 6000 points!

Here is a breakdown of the results with numbers in parenthesis indicating 1972 totals:

EC/ROs submitting mail reports or mail and radio reports: 271 (263)
EC/ROs submitting radio reports only: 6 (20)
Hearsay reports: 2 (–)
Total AREC/RACES membership of participating groups: 9174 (8918)
Total reported participation: 4862 (4554)
AREC/RACES messages to SEC/state RO: 2970 (3097)
Self-powered portables/mobiles: 2214 (1549)
Fixed stations on emergency power 573 (433)
Total SET points: 50,770 (43,219)

The "average" local group has 34 registered AREC/RACES members and had 18 participants in the local test. Eleven messages were sent to the SEC or state RO. The local test included 8 mobiles and 2 fixed stations on emergency power.

Total scores of participating groups are listed below. Scores are based on the sum of the following: 1 point for each registered AREC or RACES member; 2 points for each amateur who participated in the local test; 1 point for each message from an AREC/RACES member to his SEC or state RO; 5 points for each mobile, self-powered portable or fixed station using emergency power throughout the local test; 5 points per agency for originating a message on behalf of a served agency; 10 points per community for contact with an agency or agencies to be served; 10 points for a press release; and 10 points for submitting a copy of the local emergency plan. Last year's scores are listed in parenthesis.

ATLANTIC DIVISION

Delaware (288)		271
Kent, New Castle Cos	WA3DUM	184
Sussex Co.	WA3GSM	87
Eastern Pennsylvania (349)		468
Lackawanna Co.	W3VAP	155
Montgomery Co.	W3ID	24
Philadelphia	WA3HET	200
York Co.	K3EOB	89
Maryland-District of Columbia (127)		944
Allegany Co	W3DLW	137
Anne Arundel Co.	WB6KGB/3	116
Baltimore Co.	WA3PJG	63
Calvert Co.	W3ZNW	45
Cecil Co.	WA3CBC	4
Frederick Co.	WA3GDC	35
Montgomery Co.	WA3PKS	43
Prince Georges Co.	K3ANA	209
Washington Co.	WA3CUC	292
Southern New Jersey (204)		157
Gloucester Co.	WA2SFA	149
Mercer Co	W2YPZ	8
Western New York (804)		832
Cayuga Co.	K2DUB	70
Chemung Co.	K2DNN	188
Delaware Co.	W2TFL	114
Erie,Niagara Cos.	WA2FYI	166
Glens Falls	K2AYO	162
Tompkins Co.	WB2TQF	132
Western Pennsylvania (916)		880
Allegheny, Westmoreland Cos.	K3SMB, K3CHD	593
Erie Co.	WA3HSR	229
McKean Co.	W3OCR	58

CENTRAL DIVISION

Illinois (462)		685
Cook Co.	W9HPG	647
McLean Co.	K9ORP	38
Indiana (753)		750
Cass Co.	K9VFF	91
Fayette Co.	W9BDP	4
Gibson Co.	K9PNP	83
Howard Co.	WA9QFQ	149
LaGrange Co.	WB9DNT	58
LaPorte Co.	K9HYV	131
Noble Co.	W9BTZ	71
Tippecanoe Co.	K9LQG	163
Wisconsin (705)		30
Marathon Co.	K9JPS	30

DAKOTA DIVISION

Minnesota (430)		160
Freeborn Co.	WØHH	84
Mower Co.	WØAZR	76
North Dakota (77)		28
Stark Co.	WBØAUM	28
South Dakota (0)		72
Lawrence Co.	WØDVB	72

EC VE5BO (seated, foreground) and VE5DN (seated, background) demonstrate their communications capabilities during the SET to a search and rescue team representative and a "Space Chasers" Radio Club officer.

DELTA DIVISION

Louisiana	(2315)	2368
Southwest La.	W5SKW	2286
Webster Parish	K5WOD	82
Mississippi	(0)	396
Amory	K5IKB	–
Booneville, Prentiss Cos.	WA5JTB	89
Harrison Co.	WB5GOI	132
Hinds Co. & Jackson Metro	WA5EIL	104
S. Monroe Co.	WA5SJM	71
Tennessee	(2912)	2566
Anderson Co.	WB4DYS	342
Bradley Co.	WA4GOL	120
Bristol	WA4JCI	101
Carter Co.	W4LBD	7
Coffee, Franklin Cos.	K4ECC	466
Cumberland Co.	WB4PHW	122
Fayette Co.	WB4LAZ	4
Greene Co.	W4ANB	80
Knox Co.	WA4HGQ	150
Lake, Obion Cos.	WB4TPS	140
Morgan Co.	WB4KMI	3
Overton Co.	W4CYS	9
Robertson Co.	WA4EQA	29
Rutherford Co.	WA4ZXV	94
Sevier Co.	W4SGI	42
Shelby Co.	W4OQG	425
Sullivan Co.	K4LRL	371
Washington Co.	WB4EHK	37
Weakley Co.	W4FLW	24

GREAT LAKES DIVISION

Kentucky	(2048)	2078
District One	K4UNW	87
District Four	K4UDZ	566
District Six	WA4AGH	126
District Eight	W8HTQ/4	855
District Twelve	WB4HRK	39
District Fourteen	WB4FDK	231
District Fifteen	WA4JQS	57
District Eighteen	K4AVX	82
District Nineteen	WB4IBO	55
Michigan	(1825)	1256
Charlevoix, Emmet Cos.	WA8AXF	19
Crawford Co.	WB8APN	43
Genesee Co.	WA8WQU, WB8IEK	117
Kalamazoo Co.	WA8STV	261
Lenawee Co.	WA8DVB	87
NOIBN	W8MPD	79
Southfield	K8LUY, W8HS	95
Washtenaw Co.	K8RUR	219
Wayne Co.	WB8IED	336
Ohio	(5055)	6311
Allen, Auglaize, Putnam Cos.	WA8MIH	228
Ashland, Richland Cos.	WB8CSH	108
Belmont, Monroe, Noble Cos.	W8BQ	51
Carroll, Stark Cos.	WA8MGL	358
Central Ohio	W8ERD	587
Clark Co.	W8VZF	228
Clinton, Fayette, Highland Cos.	K8CKY	8
Columbiana, Mahoning, Trumbull Cos.	W8OE	219
Darke, Miami, Shelby Cos.	W8ARW	245
Gallia, Jackson, Meigs Cos.	W8IGW	117
Greene, Montgomery, Preble Cos.	W8ILC	859
Hardin, Marion, Wyandot Cos.	WB8EDO	104
Harrison, Jefferson Cos.	W8ERR	141
Holmes, Wayne Cos.	WB8DQU	97
Licking Co.	W8EOG	113
Northeast Ohio	W8GRG	852
Northwest Ohio	K8LEI	738
Pike, Ross Cos.	K8SUB	117
Southwest Ohio	WA8COA	1141

HUDSON DIVISION

Eastern New York	(809)	1434
Albany Co.	WA2EAH	613
Columbia Co.	WA2CSQ	8
Rensselaer Co.	WA2SRW	39
Rockland Co.	K2CXO	142
Schenectady Co.	W2PKY	323
Ulster Co.	WA2WGS	9
Westchester Co	WA2JWL	300
New York City-Long Island	(2394)	1956
Huntington Twp.	WA2CRK	340
Kings Co.	WA2UCP	202
Nassau Co.	W2ELK, W2UAL	1021
Queens Co.	W2LXC	43
Richmond Co.	W2VKF	117
Smithtown	WB2GUB	233
Northern New Jersey	(954)	481
Bayonne	WA2FUH	165
Englewood	WA2CCF	148
Holmdel Twp.	WB2AUH	50
Passaic	K2KDQ	118

MIDWEST DIVISION

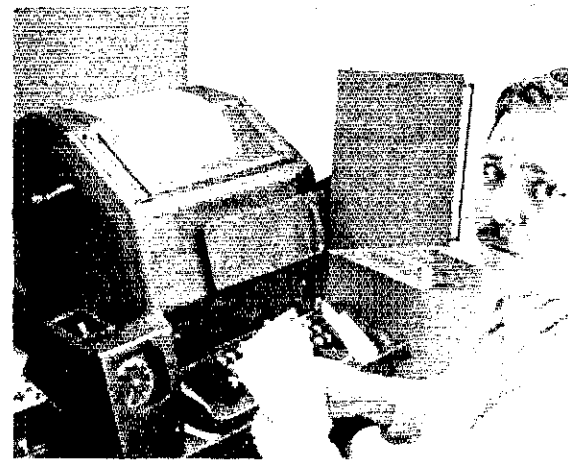
Iowa	(773)	593
Benton Co.	WAØAMD	59
Blackhawk Co.	WAØINC	111
Buena Vista Co.	KØEVC	54
Linn Co.	WØLIJ	189
Story Co.	WAØEYG	74
Zone 7C	WAØROM	75
Zone 8A	KØCNM	31
Kansas	(1498)	976
Zone 1	WAØSRR	173
Zone 3	WAØUXI	58
Zone 4	WAØTZW	17
Zone 5	WØMCH	60
Zone 9	WAØUTT	362
Zone 10A	WAØLBB	72
Zone 10B	WBØHBM	87
Zone 11	KØJDD	56
Zone 13	WØEDJ	91
Missouri	(123)	198
Johnson Co.	KØBIX	151
Saline Co.	KØONK	–
Stone, Taney Cos.	WAØJOG	47
Nebraska	(59)	398
Lancaster, Saline, Saunders Cos.	WØWKP	218
Lincoln Co.	WØCXH	132
Seward Co.	WØDOU	48

NEW ENGLAND DIVISION

Connecticut	(231)	209
Bristol	W1DGL	209
Civil Defense Area 3	K1YON	–
Communications Team 2	WA1HYN	–

Recognize these guys? W6ZRJ (standing) is sending his Pacific Division Director's SET message while a visitor is copying the message transmission. (That sure looks like ARRL Pres. W2TUK behind the mill!)

RTTY played a key role in the Denver, CO area. WØLRN (now Twelfth Region Net Manager) is pictured at the South Metro AREC link in the District 13B Emergency Operating Center.



Eastern Massachusetts	(379)	579
New Bedford Area	W1LE	100
Newton	W1RM	138
Norwood	K1HRV	70
Sharon	WA1MYK	77
Wellesley	WA1DMC	87
Weymouth	WA1OWQ	53
Winthrop	W1BB	54
New Hampshire	(389)	369
Belknap Co.	K1VXX	81
Rockinghain Co.	K1RSC	288
Rhode Island	(21)	161
Middletown, Newport, Portsmouth	W1HP	161
Western Massachusetts	–	284
Berkshire Co.	W1KZS	284

NORTHWESTERN DIVISION

Idaho	(428)	402
Ada Co.	W7JMH	402
Montana	(301)	389
Missoula Co.	K7IMZ	209
Park Co.	WA7IZR	34
Silver Bow Co.	WA7PZO	146
Oregon	(0)	257
Jackson Co.	W7HLF, WA7SNY	58
Lake Co.	WA7OYC	44
Washington Co.	WA7ELQ	155
Washington	(1089)	1536
Adams Co.	W7CTS	19
BEARS	W7RJW	201
Challam Co.	W7YRC	54
Island Co.	WA7NQW	102
King Co.	K7WTG	348
Lewis Co.	W7EBU	81
San Juan, Skagit, Snohomish Cos.	W7HFU	176
Walla Walla Co.	W7GVC	324
Whatcom Co.	K7VNE	184
Yakima Co.	K7VAS	47

PACIFIC DIVISION

Sacramento Valley	(577)	809
Sacramento City/Co.	WA6HGH/6	257
Sacramento Co.	WB6KZN	552
San Joaquin Valley	(0)	78
Eastern Kern Co.	WA6KZV	51
Tuolumne Co.	WB6RZI	27
Santa Clara Valley	(766)	966
Los Altos, Palo Alto Area	W6ASH	185
Los Gatos Area	WA6YDF	150
Menlo Park, Redwood City Area	W6DEE	494
Monterey Area	WB6YAM	71
San Jose Area	W6NLG	66

ROANOKE DIVISION

North Carolina	(528)	1127
Alamance Co.	WA4FFW	109
Buncombe Co.	WA4VNV	146
Forsyth Co.	W4IRE	51
Guilford Co.	W4AJT	139
Iredell Co.	WB4QQM	62
Mecklenburg Co.	WB4CFS	94
Rowan Co.	K4GBR	126
Wake Co.	W4PMN	400
Virginia	(309)	1099
Alexandria	W4HB	127
Alleghany Co.	WB4RZW	43
Arlington	WA4JJF	70
Augusta Co.	WB4KIT	62
Essex, Middlesex Cos	WA4WQG	17
Prince William Co.	WB4RDV	207
Virginia Beach	WB4UWS	–
Washington Co.	W4VTU	95
Area 2	K4CPQ	125
Area 7	W4GCE	148
Area 12	W4ACC	205
West Virginia	(446)	329
Berkeley Co.	W8AFC	99
Hancock Co.	K8QFW	148
Upshur Co.	WA8NDY	82

ROCKY MOUNTAIN DIVISION

Colorado	(457)	1231
Bent, Crowley, Otero Cos.	WØPGX	21
Boulder, Gilpin Cos.	KØGZG	70
Denver-North Metro Area	WØHFP	329
Denver-South Metro Area	WAØPXF	362
Eagle, Garfield, Pitkin Cos.	WAØYED	50
El Paso, Teller Cos.	WØGCH	237
Moffat, Rio Blanco, Routt Cos.	WØNZL	52
Pueblo Co.	KØPHF	110

SOUTHEASTERN DIVISION

Alabama	(1157)	1111
DeKalb Co.	WA4SNU	51
Jefferson Co.	W4GFT	794
Morgan Co.	WB4NLM	136
Tuscaloosa Co.	WB4SVH	130
Georgia	(245)	231
Athens Area	WA4AON	231
Cherokee Co.	–	–
Northern Florida	(492)	1600
Alachua Co.	WA4UFO	22
Bay Co.	W6DSD/4	102
Bradford Co.	WB4OMG	6
Clay Co.	W4WHK	11
Columbia Co.	W4CYG	67
Duval Co.	WA4VZF	172
Leon Co.	W4MOQ	92
Orange Co.	W4UJL	723
Pasco Co.	WA4WBM	111
Volusia Co.	WB4NJI	168
Washington Co.	W4IKB	57
Southern Florida	(2705)	1455
Dade Co.	W4LYT	433
Hendry Co.	WB4BMR	22
Hillsborough Co.	W4BNF	247
Okeechobee Co	WA4LSS	50
Palm Beach Co.	WB4RLU	356
Polk Co.	WA4WZZ	252
St. Lucie Co.	W4NTF	52

SOUTHWESTERN DIVISION

Arizona	(0)	635
Maricopa Co.	K7IWB	259
Pima Co.	K7NTG	376

Close cooperation between EC and Civil Defense is exemplified here in Belknap Co., NH. Operating during the SET are: Tilton C.D. Director K1VXX (left) and EC K1BCS (right).

Los Angeles	(195)	2631
Area D RACES	K6ZJS	530
Baldwin Park RACES	W6NRY	315
E. San Gabriel Valley	WA6IXG	588
San Fernando	WA6ILJ	129
South Bay	WA6CYJ	231
South Metropolitan	WB6VYX	293
W. Los Angeles	K6VGH	260
W. San Gabriel Valley	WB6IDO	285
Orange	(1219)	1471
Inyo Co.	WA6YWS	70
Lucerne Valley		
Orange Co.	K6LJA, WA6TVA, WB6WOO	387
Riverside Co.	K6CID, K6QES, WB6YXA	449
San Bernardino Co.	K6GGS	565
San Diego	(372)	835
Eastern District	W6NMH	159
Northern San Diego Co.	K6HAV	173
San Diego	W6INI	503
Santa Barbara	(393)	561
Lompoc	W6UJ	37
Northern Santa Barbara Co.	W6DKQ	178
San Luis Obispo Coastal Area	W6CDN	141
Southern Santa Barbara Co.	WA6PEF	123
Ventura Coastal Area	K6VBX	82

WEST GULF DIVISION

Northern Texas	(143)	596
Coryell Co.	WA5QOY	61
Hood, Johnson, Somervell, Tarrant, Wise Cos.	WA5UOC	535
Oklahoma	(888)	748
Garfield Co.	WA5ZOO	152
Oklahoma Co.	W5NL	293
Payne Co.	W5QIV	101
Tulsa Co.	K5OVT	202
Southern Texas	(553)	524
Bexar Co.	W5QMH	194
Calhoun Co.	W5ZPJ	102
Jeff Davis Co.	W5YCK	13
Jefferson Co.	W5TFW	113
Victoria Co.	W5HWY	102

CANADIAN DIVISION

Alberta	(244)	62
Lethbridge	VE6ATY	62
Maritime	(878)	835
Labrador, Newfoundland	VO1CA	835
Ontario	(905)	282
Ottawa Valley	VE3BPC	127
Toronto	VE3GFN	155
Saskatchewan	(1010)	1192
Prince Albert, Northern Saskatchewan	VE5BO	575
Regina, Southeastern Saskatchewan	VE5KF	135
Saskatoon	VE5RJ	307
Southwest Saskatchewan	VE5AQ	175
Total		50 770

And they said . . .

"First time participating in the SET using the local two-meter repeater, W4EXU. Use of the repeater sure brought out the mobile units." - (K4GHR, EC Rowan Co., NC) "Still like plan of lessening load on higher level NTS nets – the local and section level is where we need to work on problems." - (W4HFU, RM AL) "Too many people don't know there is no more P2 – replaced by Q, which . . . is 'inquiry' and should be limited to traffic of that nature. SET message writers need to know how to write messages concisely without long words such as 'participating' and other pompositions . . ." - (K7NHL, TWN Mgr.) "It was much, much harder getting people to serve on the TCC during SET than it was during the Christmas rush, and the reason is obvious and valid. Several people were not available because they were participating in SET at the local, section, region, or area level and could not take on more responsibility." - (K5MAT, TCC Pacific Dir.) "The news media concept of activating amateurs to come on frequency for emergency was utilized this year and proved very effective. It also helps toward PR work. We activated over one-half of our participants in this manner." - (VO1CA, EC, RM Newf.-Labr.) "Emergency power session was a complete washout. Net manager felt very lonely sitting there calling and no replies. The seven guys on frequency without emergency power and with traffic did get the point, however!" - (W9HRY, 9RN Mgr.) "Any net can pass a few pieces of traffic, taking a long time to do it, and come up with a big score. Does that measure the improvement of a net? I believe any net in the NTS should be rated by its efficiency." - (KØMRI, RM KS) "Generally a good SET, but there wasn't nearly enough traffic to keep people busy." - (VE2AWE, ECN Mgr.) "I see no useful purpose in sending messages to the SEC stating that 'I am participating in the SET.' First of all, it certainly does not fit into the pattern of any exercise that is being conducted; it's completely out of context. Second, I know from personal observation of one group whose entire 'exercise' consisted of sending a message to the SEC. This was done from normal home stations with no effort to promote mobile/portable operation and no exercise situation." - (W6INI, Acting EC San Diego, CA) "W2MTA (as MGR, NYS) initiated a scheme with great merit...he sent TP's to managers, etc., concerned,

(Continued on page 81)

1973 ARRL INTERNATIONAL DX COMPETITION — High-Claimed Scores

Because of poor conditions on phone the high-claimed cut-off has been lowered to 500K. The cw cut-off remains at 1 million.

The following are high *claimed* scores. Read (left to right): total score, multiplier, contacts. Please don't ask for DXCC credit based on log confirmations until the adjusted scores appear. - *WA1PID*

DX – CW

Single Op.

KH6RS (K2SIL, opr.) 5,074,506-302-5601
KV4HW (W6OAT, opr.) 4,601,593-310-5170
YV5KL 3,424,101-269-4243
KH6IJ 3,072,456-278-3684
LU5HFI 2,915,634-274-3547
TI2DX 2,689,619-257-3489
KH6IAB 2,603,520-256-3390
9Y4VU 2,097,044-262-2668
FA2IA 1,694,880-214-2640
I6BQI 1,552,749-211-2453
8P6DR 1,545,750-250-2061
OA4CBU 1,523,355-205-2477
TI2WX 1,444,401-228-2121
5I5CJ 1,359,072-208-2178
KL2Y 1,357,785-211-2145
CR6AI 1,291,662-219-1966
KX6BB 1,290,008-226-1936
OZ1LO 1,279,395-195-2187
JA1CWZ 1,233,210-185-2222
G3KMO 1,221,552-204-1996
I3ASE 1,181,208-178-2214
G3MXJ 1,058,688-192-1838
UI9J 1,034,841-197-1751
OX3YY 1,007,400-184-1825

Multi-Single

LU2DKG 2,548,506-252-3371
SK6CF 1,118,073-187-2018

W/VE – CW

Single Op.

K1NOL 2,097,900-333-2100
W1BPW 2,051,616-344-1988
K1LPL/3 2,004,966-321-2082
W1YK (WA1JLD, opr.) 1,927,002-301-2134
WZGXD 1,825,578-354-1719
K1DMR 1,802,808-343-1752
K1VTM 1,754,784-288-2031
WA1RCP 1,637,808-298-1832
WB4YOJ 1,608,240-312-1715
W2DXL 1,587,900-316-1693
W7SFA (K7JCA, opr.) 1,483,560-260-1902
W6RR 1,453,410-270-1795
K3YUA 1,438,434-314-1527
W5WZQ 1,394,316-308-1509
K6SDR 1,340,568-258-1732
K4PQL 1,323,144-282-1564
WA1PID 1,228,992-296-1384
K1JHX 1,202,427-271-1479
W6NUT (W6PAA, opr.) 1,152,480-245-1568
W3GRF 1,145,840-282-1354
W1FBY 1,132,332-254-1486
K1THQ 1,109,511-261-1417
W3EZT 1,104,876-282-1318
W8ROF 1,093,708-277-1268
W5SRX 1,067,352-286-1244

Multi-Single

K1ZND 2,182,728-348-2062
WA5LES 1,683,666-342-1641
WA1NRV 1,493,757-269-1851
W1FLM 1,295,000-300-1563
K6EBB 1,277,100-258-1650
W2YD 1,247,562-302-1377
WA1RBR 1,200,642-298-1343
K3HZL 1,180,512-288-1363
WA2BLV 1,137,168-298-1272
WA5IMK 1,088,061-299-1213
W5LUU 1,037,232-294-1176
W6KG 1,003,464-231-1457

Multi-Multi

W3AU 5,515,164-478-3846
W1MX 3,316,896-396-2792
W3FRY 2,934,205-395-2493
W3GPE 2,628,000-375-2336
W6ANN 2,225,727-309-2401
W5KFL 2,142,885-373-1915
W3GM 2,142,063-363-1967
W3SS 1,928,604-346-1858
W8SH 1,726,536-344-1673
K3BW 1,491,653-299-1549
W3TV 1,294,176-272-1586
WA3ATX 1,239,540-292-1415

DX – PHONE

Single Op.

6J9AA 8,937,708-299-9964
4M4AGP (W@YVA, opr.) 5,972,763-289-6889
KZ5JE 4,471,875-265-5625
XG1J 3,862,620-276-4665
LU5HFI 3,447,048-242-4748
VP2MY 3,166,380-245-4308
KH6BZF 3,115,365-239-4345
KH6IJ 3,085,638-243-4233
9Y4VU 3,031,800-248-4075
CE3AUW 2,925,600-212-4600
W4EV/VP9 2,511,750-250-3349
XE1LLS 2,486,055-247-3355
KH6IAB 2,248,704-244-3072
ZS6DW 1,656,600-200-2761
CT1BH 1,553,148-197-2626
HI8LC 1,166,814-213-1826
CT2BG 1,104,756-172-2141
CP1EU 995,553-201-1651
OA4AHA 961,442-154-2083
KG6IBO 886,854-158-1871
TI2WX 731,271-173-1409
OA4CBU 723,168-144-1674
VK4VU 599,886-138-1449
PJ8DX 561,216-158-1184
OA4AIW 540,540-143-1260

Multi-Single

G4ANT 1,914,332-196-3275
F6KAW 1,447,020-180-2680
DL@WW 1,068,714-162-2199
LU2DKG 915,066-174-1753
I8CZW 911,250-150-2025
I3MWP 504,275-115-1466

Multi-Multi

DL5AY 981,564-157-2084

W/VE – PHONE

Single Op.

W7RM (K7VPF, opr.) 2,523,456-312-2696
W6RR 2,104,290-309-2270
K6FBB (WA6LHN, opr.) 2,020,860-309-2180
W1YK (WA1JLD, opr.) 1,662,210-330-1679
K1JBX 1,503,888-304-1649
K1VTM 1,314,240-296-1480
W4ZCY 1,188,348-301-1316
K1THQ 1,159,191-297-1301
W3GRF (WA4KJR, opr.) 1,119,960-306-1220
K6SVL 1,108,665-213-1735
WB4YOJ 1,095,342-311-1174
W7TML/1 982,290-274-1195
WA@CVS 973,002-257-1262
W5SZ (WA5RXT, opr.) 952,593-311-1021
K1CPF 939,876-268-1169
W3EZT 913,545-303-1013
W2MB 896,346-297-1006
WA1PID 846,450-270-1045
K1CSJ/1 773,784-264- 977
W5QBM 742,014-273- 906
W2HTI 697,125-275- 845
W4WSF 642,372-269- 796
W6DGH 639,630-207-1030
W3VT 638,862-287- 742
W2YT 631,098-261- 806
W3CRE 630,270-235- 894
K1LPL/3 (W3GRM, opr.) 597,346-247- 806
W9EWC 588,984-253- 776
W5NMA 536,796-234- 765
W5EQT 529,815-247- 743
W9IY 507,528-213- 798

Multi-Single

W4QBK 1,686,288-344-1634
W1FBY 1,574,496-336-1562
K8HLR 1,542,501-367-1401
WA1KZE 1,348,848-304-1479
W6QA I 1,272,570-251-1690
W1ARR 1,180,800-328-1200
W@MYN 1,061,202-274-1291
W9EXE 1,060,896-344-1028
K6SDR 1,021,563-223-1527
WB6KBK 1,011,582-234-1506
W7VRO 907,350-230-1315
W6ONV 890,170-230-1293
W6KG 807,576-209-1326
K3HZL 763,955-315- 819
W3BWZ 753,960-305- 824
WB6SRA/6 661,824-192-1149
W@HZ 539,847-231- 779
WA2CLQ 532,440-261- 680
K4CFB 518,160-254- 680

Multi-Multi

W3AU 5,701,347-531-3579
K6SEN 4,065,090-358-3785
W7SFA 3,497,472-352-3312
W4BVV 3,336,858-426-2611
W3WJD 3,186,480-440-2414
W3GPE 2,472,000-400-2060
W3ERY 2,373,246-426-1857
WB5DTX 2,339,372-372-1917
WA3ATP 2,079,768-386-1796
W1MX 1,803,246-358-1679
K3BW 1,520,408-374-1364
W3GM 1,483,218-363-1362
WA5IMK 1,037,322-286-1209
WA3LHG 988,200-300-1098
W3DHM 937,440-336- 930
K2EL 775,065-317- 815
WA3AFX 768,222-294- 871

Strays

Stolen Equipment

Stolen from automobile in Dayton, Ohio, April 29: Yaesu FT-101, No. 82G12279/CW; 1.8 MHz and cw filter; Regency HR-2 No. 03-02030 with crystals for 147 and 146.97/94/91/76/37/34/31/16. Contact Bill Grenfell, W4GF, 7216 Valleycrest Blvd., Annandale, VA 22003. A reward is offered for information leading to the recovery of equipment.

On May 14, a Regency HR-2, No. 04-03920 and a 12 digit touch-tone pad were stolen from a car. Contact Ralph Edmond, 1034 Ehelsea, Glendale, MO 63233.

Collins 75S1, No. 967; 75S1, No. 11018, both with filters; 32S1, No. 567; 30L1, No. 12883; 516F power supply; 312B4 speaker, No. 52983 were stolen from Clarence Wright, K4CDP, 424 Hand Avenue, Ormond Beach, FL 32074.

Stolen in Chicago from locked car on April 26: Swan 500C, No. 1300821. Contact David Owens, W9MSK, 1310 N. Valley Lake Dr., Apartment 724, Schaumburg, IL 60172.

The following gear was stolen from Hofstra University grounds on Long Island, N.Y. between May 16 and May 21, 1973: Heathkit HW-100, No. R24-3166; HP-23 power supply, No. R24-3166; Philmore field strength meter; On-Line SWR Meter; connecting cables for the above. If seen, please notify Hofstra University Security Office, Hempstead, NY 11550, tel. no. (516) 560-3457.

The following equipment was stolen from WB6ERB, Foundation for the Junior Blind: Drake TR4 sideband transceiver, serial 23399; Drake RV4 VFO, serial 15453; Drake AC3 power supply, serial 24994. Please notify the Foundation for the Junior Blind, Att. George Newbaur, 5300 Angeles Vista Blvd., Los Angeles CA 90043.

A Clegg FM-27-B, Serial 27013-1119, was stolen on April 8, 1973 from Robert A. Brown, 16813 Briardale Rd., Derwood MD 20750. QST

Is Prose Listening?

BY JOHN G. TROSTER,* W6ISQ

"THIS IS THE first time I ever heard you on fone. You sick 'er somethin'?"

"Yeah, I'm sick. Marge got her license. I'm using one a her rigs."

"Ooooo. Real sorry to hear that. Then how come you was coaching her on the code so good?"

"I figured if I could get her interested, maybe she wouldn't be draggin' me off to the movies or play cards or somethin' else foolish when them DXpeditions or contests or any of that other good stuff comes on."

"You was thinkin' make-believe again."

"Anyway, she was goofin' along learning theory and code and learning how to tune the radio and all that. Then one day, when I was doing the laundry, she gets smart and tunes the receiver off the regular cw part of the band where I told her to always listen and copy code . . . and she hears all them people up there yak-yakin' on the fone part a the band."

"You never let her listen to fone before?"

"Certainly not! But when she heard all them people talkin' with their mouths instead of with their fingers, that done it. Her code speed jumped from 2 to 23 wpm in 4 days and she memorized the entire *License Manual* theory questions so good you could give her the last word of the answer and she'd give you the question."

"Just to get to *talk* on the radio?"

"It got worst. One day she got ahold of *QST* before I got a chance to rip out Lou Moreau's dangerous XYL column. Of course, she saw all that YL gossip and them YL fotos. 'How long has all them liberated XYLs been in there talking and I didn't know about it?' she wants to know. This could be terrible if she finds out about them XYLs; so I tell her that Lou really only writes about the Woman's Auxiliary that goes to the OM conventions and takes side bus trips to museums and monuments and tastes wine and stuff while the OMs conduct important convention meetings."

"Yeah, we gotta watch out for them liberated XYLs. No telling what they might do."

"Hah, don't worry about Marge. She can't do nothin. Anyway, she went straight for the General ticket since the Novices don't have any talk space on the dial, she says."

"You sure taught her good."

"I didn't eat nothin' but cheese samiches for 5 days after she got her ticket. I was too busy hookin' up all her new 2 kW rigs to do much cooking. Actually, I spent about half the time replacing burned out parts in them transmitters until she learned how to tune 'em right."

"She's got more than one rig?"

"Listen Charlie, she's got rigs and mikes all over the room. She changes bands by just punching a different mike button. Got all the mikes color coded to the right rig. She says it looks prettier that way."

"Oh yeah? Sounds to me like she's got the old cw OM all bamboozled with all that nifty stuff."

"Look Charlie, she don't know a thing what she's doing! I hooked it all up for her. I oughta know."

"Sure hope you're right. How does she get out?"

"Well, she started out DXing. And considering I only put her up a couple a dipoles, she was getting out pretty good. Then one day she heard one a them YL nets . . . and I think I'm saved. Maybe she'll stick right there with them gals and chatter. But wouldn't ya know it . . . one a them gals asked her to make a fone patch . . . then. But Charlie . . . she's got one on every rig now! You betcha."

"Even on 6?"

"Even on 2. Anyway, she begins to make all these patches all over the country . . . but she forgets to make 'em collect. Then she begins to make friends with these land-line people strung across the U.S. of A. and now she calls 'em up just to see how they're comin' along."

"Maybe there's a amateur land-line license you could get to save ya all them fone bills."

"Well, things started getting really bad then. First she made me move my old Super Skyrider and 210 TNT rig out to the garage. Then when I was out of town for a couple or weeks, she finally decided that absolutely she just got to get a beam. So she hires this fella to plant a 135 foot self-supporting push-button tower in the back yard . . . complete with a stack of 6-element yagis on all bands."

"She oughta get out real good. I told ya she'd get even."

"She said she didn't want to tear up her rose garden, so she had this fella plant the tower right where I had my old 15 meter beam . . . remember the one with the fishing pole elements? Well, the fella stuck her tower right between them old fishin' pole elements so's I can't armstrong my beam no more. It's frozen on due south forever."

*82 Belbrook Way, Atherton, CA 94025.

"You'll be top sig in Easter Island."

"That done it. I was gonna get even with *her*. So one day when she was out for a few hours, I climb the tower and tied in a gamma match to her 135-foot tower to make me a dandy DX vertical. Then when she wasn't on the air, I could just clip on the old rig and I'm in BIG business. Well, when I was up there, I got to thinking. Maybe I'd just climb on up the rest of the way to the top of the tower and . . . get this . . . I'd really get even with her. I'd short out them yagi driven elements up there. And that's what I done!"

"Now you're thinking. But boy, I wouldn't want to be around your shack when she finds out what you been up to."

"So I fired up the old Super Skyrider and TNT, and Charlie, I was hearing and working that good DX stuff like I never knew existed before. I got so excited that I . . . ahhhhhh . . . didn't hear her come home. But she *did* come home all right . . . and headed right for her rig like usual. And then . . . she punched one a them buttons."

"You was still clipped on to that vert . . . all them kWs???"

"Every last one a them came a flyin'. The old TNT exploded. Glass, bakelite, Fahnestock clips, everything plastered all over the garage walls. That copper tubing coil . . . uncoiled like a rattlesnake and zip . . . right through the front tire of my Model A. And my great old faithful Super Skyrider — solid carbon. Yep, even the ARRL museum won't take it."

"At least you didn't get hurt."

"Weallll, I had the cans on . . . and it burned my tongue a little when them gold inlays melted out. But I'm a cw fella, so's it don't matter much. I ain't telling Marge, but I'm gonna turn in the gold on a new receiver."

"What happened to her rig?"

"She never missed a syllable."

"You better watch out. She *must* know you was up to somethin' over there."

"As a matter of fact, Charlie, I am getting kind a worried. When I went to tear Lou's column outa *QST* this month, it was already tore out. I'll betcha she squirreled it away. Nah, what can Marge do? She don't know nothin'."

"I dunno, you better keep your eyes open. Lou might get them XYLs all stirred up . . . might even demand their own separate bands, 'er sumthin'."

"Naw, Charlie. I think I got her this time. When she went out this morning, I opened up her 20-meter rig and wrapped a little condenser across the VFO. The way I figure it, she's gonna be about ten kc lower than she thinks she is. So when she starts calling that early evening DX, she's gonna wind up outside the band. And I got the phone number of the FCC monitoring station right here and as soon as she hits the button I'm gonna dial the FCC and report a female U.S. of A. voice outside the band and please issue an immediate pink slip that takes her ticket away for two years . . . haw!"

"Two years? For outa the band?"

"It ain't being out a the band — it's what she's gonna tell the inspector when she sends the pink slip back that ought to be good for the two years . . . maybe more. Anyway Charlie, I gotta switch back to her 20-meter rig and make sure I got it tuned up and ready to trap her good."

"You're on 20."

"I got the blue mike . . . I'm on 15 . . . ahhhh . . . ain't . . ."

"You're color blind. You're on 20."

"The blue mike is *supposed* to be . . . I hooked it up myself yesterday . . . it always was before . . . unless . . . she — naw, she don't know how . . . to . . . ahhhhh, Charlie . . . you copying me outside the . . . ahhhhh . . . ban . . . ba . . .?"

"Yeah, I was kinda wonderin' how come you was calling me down there outside the band. But then I heard maybe the FCC was gonna widen the fone bands, so I thought maybe they done it already."

"They didn't do it soon enough . . . ahhh . . . have I been signing my call?"

"Oh yeah, you been doing that real loud and legal. Good sig."

"You think maybe Prose is listening?"

"He's *always* listening . . . and maybe Lou is listening now too."

QST

SET

(Continued from page 78)

wherein he requested holding off all Q-type traffic for the duration of Saturday . . . preventing it from flooding a declared disaster area in WNY (Operation Slick). Works great, and I believe we should use it in actual emergencies." - (W2FR, 2RN Mgr.) "The repeaters are extremely valuable.... A separate full-time control station on each repeater frequency being used in an emergency is essential." - (W8GRG, EC Northeast OH) "We were very busy all day Saturday, but were looking for traffic to help keep the frequency open Sunday. I think that SET should be reduced to just one day." - (W8HTQ/4, EC Jefferson Co., KY) "The words 'TEST MESSAGE' at the beginning of the text were understood under QRM conditions to be 'TEXT OF MESSAGE,' and were not included in the messages relayed for CD and ARC in two instances. I strongly suggest 'SIMULATED TRAFFIC' or some similar phrase be adopted." - (W5QIV, EC Payne Co., OK) "The breakdown in

Mississippi is back on the SET map and the guys pictured here helped. In a combined effort, members of North and South Monroe Co. AREC groups that participated include (standing, from left) WA5SIM, WA5ZTQ and K5IKB; (seated) WB5GUD, W5DAT and W5QQP.

an emergency is at the section level, not area or region. A structured operation for two days like this just isn't the answer. We had traffic on RN6 for two or three days after the SET . . ." (W6LRU, RN6 Mgr.) "Things were certainly much quieter for the traffickers this year . . . There seemed to be fewer groups operating, and many of them were 'only going through the motions.' The emergency power session was very realistic when it struck, *without* warning, *in the midst of a session* already in progress. Only 4 stations were able to check in, again demonstrating the lack of emergency-powered stations." - (WA2FVH, PAM NNJ). "3RN was entirely spontaneously conducted with no prior assignments or commitments from any net member. I feel that this year's SET was highly successful. It also ranks as one of the best to my knowledge." - (W3NEM, 3RN Mgr.) "Not enough traffic; not enough confusion; not enough inexperienced operators trying to handle traffic . . ." - (W3LOS, WPA Mgr.) "The drill was considered successful, with participation better than expected, however, weak spots were noted *where improvement is needed. It's quite apparent* we need SET to keep us from backsliding to the point where we could not furnish communications should there be a real emergency." - (W8AEC, EC Berkeley Co., WV) QST

NEW BOOKS

RCA Designer's Handbook, Solid-State Power Circuits, Series SP-52, by RCA, Somerville, NJ. Hardbound edition, 6-1/4 × 9-1/4 inches. Price $7.50, 698 pages, including index.

Most solid-state text books treat only one or two kinds of device, are written at a technical level somewhat beyond the comprehension of many *radio amateurs, and contain myriad pages of* equations. Furthermore, such publications deal substantially with electronics circuits not directly applicable to communications equipment. Many books which are comparable in scope and page count to this RCA publication cost upwards of $15.

It is refreshing to scan the pages of this book and note plain-language explanations of how diodes, bipolar transistors, unijunction transistors and triacs are manufactured and used. Twenty chapters are devoted to theory and application of the aforementioned devices in power handling circuits from dc to microwaves.

Practical examples of working circuits are given throughout the book, complete with parts values and operating conditions. There are circuits for af amplifiers, narrow- and wide-band rf amplifiers, microwave oscillators, dc power supplies, motor-speed controls and automotive ignition systems. Considerable emphasis is placed on proper rf network design for solid-state amplifiers (linear or Class C), and Smith charts are contained in the pages as aids to network design.

A-m, fm and ssb modulation techniques are discussed, and a section is devoted to selecting the proper transistor for a given application. Additional practical information is supplied relative to stabilization of hf amplifiers. Thermal considerations are treated in depth, offering guidelines *for heat-sink selection.*

It is this reviewer's firm conviction that no amateur solid-state enthusiast/builder should be without this book. It picks up where the Handbooks leave off, and tells the story in terms that any licensed amateur should be able to understand. — *W1CER*

Television Interference Manual, by B. Priestley, G3JGO, published by The Radio Society of Great Britain, 35 Doughty St., London, WCIN 2AE (England). Paperback, 6 × 8 inches, 50 pages, price 80 pence. Available in U.S.A. from Comtec Books, Greenville, NH 03048, price $3.00.

While TVI is no longer a major ham headache in the USA, it apparently remains a problem in Great Britain. *If any amateur in the States has a serious* TVI problem, we strongly recommend acquiring a copy of this publication.

All phases of television interference are treated in comprehensive detail, even including information on Hi-Fi interference. The book is illustrated with plenty of circuits for harmonic suppression, traps, and filters.

Methods for detecting harmonic leakage from transmitters are described, along with details for TVI-free transmitter design. Some of the methods for harmonic suppression have been given little circulation in this country.

The only problem for amateurs in the United States and Canada using this publication are the television channel relationships. The television channel allocations in Europe are different than *those on this continent. However, this is not a* serious problem when using the book to cure harmonic problems. One needs only to keep in mind the *difference* in channel allocations.

We cannot help but give this book a four-star rating. It is well-written, easy to understand, and certainly should be of help to any amateur with a TVI problem. — *W1ICP*

Strays

Ham's Life Saved by Repeater

Berge, WB6OSH was injured in a serious accident March 31, and he probably owes his life to the fact that he was carrying a one-watt two-meter fm rig with him at the time. While digging on his grape farm near Sanger, he dislodged a large concrete slab which fell on him, breaking his pelvis and causing serious internal injuries. Pinned under the concrete at the bottom of a four foot hole, he called for help thru the local repeater. Local hams working on communications for the telethon answered his call and sent an ambulance and equipment to get him out from under the concrete. At the time of this writing, he is still being taken care of at Fresno Community Hospital. *(Tnx Fresno ARC* Skip*)*

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WN5GTO's definition of a heptode is a mod frog!

The Origin of Amateur Radio*

This little story, from the journal of our sister society in Spain, shows that ham problems — and humor — are pretty much universal.

BY VICENTE GASPAR HUELBES,** EA4EX

THERE IS NO lack of people who maintain that the term "radio" is only an acronym for the Spanish phrase *ruido a domicilio* (house noise). This is incorrect, however, since radio was simply derived from the word radio, which means radio.

At the present time it is just exactly 110 years since radio had not yet been invented. The radio amateurs of those days, as now, held club meetings, but they were irritated and bored since they could say nothing about International Morse Code, transistors, DX, or about anything at all. Actually, they just met in order to hope; they anxiously read all the literature in the hope that there would be an announcement of the invention of radio. They had a few radio parts but, as they could not be used in any application, their hopes and desires were frustrated. There were some who had an aptitude for playing musical instruments and so they got together and formed bands. That was the origin of the ham bands. They listened to conversations like this:

"I wish radio would be invented."

"Why?"

"Well, so I could call CQ."

"On what frequency?"

"Well, on a frequency on which a QSO is in progress, so as to be sure I am in the band."

One guy went so far as to construct a plug-in tank coil but, as he had nothing to plug it into, he eventually went berserk and smashed it to bits. Ten years later he constructed a transmitter whose tube filaments were heated by oil burners. Obviously, the waves came out black and mixed with smoke. Such waves had the advantage of being perfectly visible, so that one could see what happened to them during periods of bad propagation. On the other hand, any place these waves managed to reach was immediately blacked out; besides, they smelled like the devil. The disappointed ham once again went berserk and smashed the oil-burning transmitter.

Thus things went. At rare intervals, an encouraging event would take place, such as the invention of the lamp bulb by a man named Ofile. This news was received with great jubilation by the hams, although it represented only a side-product of electricity, which had not yet been discovered. But it could not be denied that it was at least *something*, and it created an atmosphere of hope.

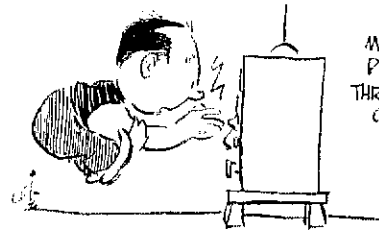
Discovery!

But now things were about to happen. It went like this: It occurred to one of the younger, more restless, of the hams to insert his fingers into an outlet socket, and he was knocked to the floor by a very handsome jolt. Surprised by the phenomenon, he consulted a jolt specialist, who told him that sort of thing could be expected to happen in such a case and that the jolt was caused by some kind of current. In that way it was discovered that what outlet sockets provided was electric current. Electricity was discovered! This was just what the hams needed. Since then, of course, outlet sockets have been very much sought after, since they are of enormous utility.

Once it was known where to obtain electric current, events followed one another with dizzying speed. Pliers, insulating tape, electric meters, legal restrictions, and equipment malfunctions were rapidly invented.

The first transmitter to be operated from electricity was not long in appearing, but was so limited in power that it could not be heard by more than one receiver at a time. If more than one receiver was turned on, nobody could hear anything at all. Later on they were able to perfect and build transmitters that could be heard by up to five receivers at once. There was a newly rich guy who had two receivers, since he could afford them but, as he received two-fifths of all the signals from any one transmitter, he was called a band hog.

From those days to the present time, equipment has been continually improved until it has reached the marvelous state of perfection we know today. To demonstrate this to a non-believer, I recently made a schedule with my brother (at an hour agreeable to him) to illustrate with what ease a radio conversation could be maintained between Madrid and Albacete. And, at the appointed hour, my brother came up on the air calling me. But three fellow hams with more power than I had beat me to it, and he answered them. Many calls were made, the transmitter was soundly kicked, three microphones were checked out at each of five separate positions, the antenna was inspected, the frequency was changed twice to elude a broadcast station, propagation conditions went sour and, after two hours, we had to leave off without having exchanged a single word with my brother. QST



* From the magazine *Revista de Radio*, Union de Radioaficionados Espanoles (URE).

** Translated from the Spanish by Keith S. Williams, W6DTY, 355 East Laurel St., Oxnard, CA 93030

AMATEUR RADIO PUBLIC SERVICE

NTS RACES AREC

In the Public Interest, Convenience, Necessity

CONDUCTED BY GEORGE HART,* WINJM

FALSE ALARMS

OCCASIONALLY WE GET A "PHONEY" alert, and everybody gets all excited while details are sought after. Usually, as available details unfold, the plausibility of the emergency fades and the situation normalizes before emergency operation is extensively committed. Aside from some slight inconvenience and a considerable amount of indignation on the part of those affected, no harm is done.

Back through the years, there have been many such situations. They are nothing new. Some feel that our society is getting sicker and that the frequency of such happenings is increasing. Maybe so, but we know of no statistics to support this; the writer remembers a great many of them, including the Orson Welles's "War of the Worlds" scare in 1940. Some have suggested a procedure for checking before alerting nets or emergency organizations when an alarm is sounded.

Any fire or police department will tell you that it receives as many false alarms as it does real ones, maybe more. In most cases, the procedure is to go on the assumption that the alarm is genuine and legitimate. If time is wasted in checking, lives can be lost. On the other hand, when an alarm is found to be false, there is then time to conduct further investigation to determine who was responsible and to devise ways to reduce the number of false alerts. For those that are accidental, institution of corrective procedures. For those that are deliberate, collection and presentation of facts to authorities who can prosecute.

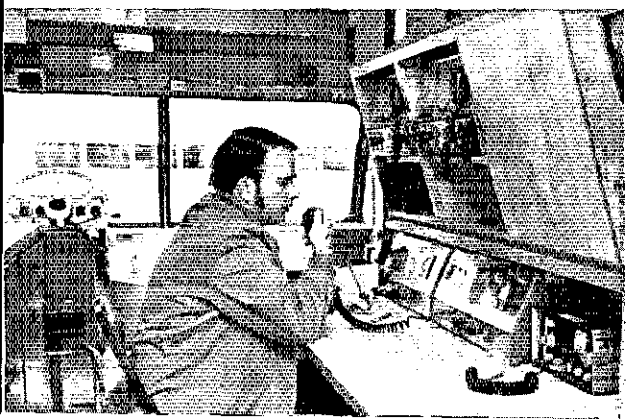
But such procedure should come after the exact status of the emergency has been determined, not before or during it. Understand, we are not suggesting that details pertinent to the emergency situation should not be collected at the time. The more details, the better, but for the sake of aiding, abetting and speeding assistance or relief, not for the sake purely of establishing authenticity of the emergency itself.

We recall an incident many years ago of a weak cw signal that popped up on 75 meter phone, claiming to be from an overturned car which had plunged off the highway down an embankment. The operator claimed he was pinned under the wreckage, alone and badly injured, needed help. He was rather vague as to his exact location, but gave a route number and the name of a nearby town.

The operator who received this signal immediately notified state police and they promised a prompt investigation. Meanwhile, contact was maintained with the stricken party by a number of amateurs who collected on the frequency. The cw signal transmitted seldom, then only for short times, giving only very vague information. Some of the participants became skeptical, but most were convinced they were participating in a rescue which would save a life. Hours passed, as the impromptu net maintained its vigil, trying to maintain contact with the weak cw signal, warning off intruding casual stations. The weak signal soon disappeared, and speculation was that the car battery had died or the victim had passed out. Eventually the state police reported that they had covered every inch of several miles of the highway in the vicinity mentioned, found no trace of such an incident. Many amateurs still hung around, hoping to catch another contact with the supposed victim, but it was a futile vigil. Nothing was ever heard further on the matter, and it became obvious that it was a hoax, perpetrated by unknown person or persons for reasons, if any, known only to themselves.

Those amateurs participating were most embarrassed, and most likely the state police were a

*Communications Manager, ARRL.



During March the Miami Valley FM Assn. assisted local agencies in the search for a drowned fireman (see Public Service Diary). Their communications van was used as the command post. K8GKH is at the controls.

QST for

The Eastern NY EC dinner meeting in Kingston, NY on Apr. 7 was the scene for a gathering of some of the ENY officials. Pictured on the left (l. to r.) are Hudson Div. Director K2SJO, SCM K2SJN and SEC W2URP. On the right, (standing, l. to r.) ECs W2HO, WA2SRW, K2CXO, W2PKY, WA2EAH and (kneeling) WA2WGS and WB2DXM (AEC).

little annoyed, although probably used to such things. But the amateurs involved deserved commendation, not condemnation. They responded promptly and decisively, on the assumption that the call for help was a genuine one. They could hardly have done otherwise. To await definite authentication of some kind could have meant the life of a bleeding accident victim. Most hoaxes are devised to retain the flavor of possibility, so that those wishing to help will continue their abortive efforts. We have no alternative but to exert the maximum effort until or unless it becomes obvious that there is no real emergency. We are communicators. Let those from whom or to whom we communicate be the ultimate judges as to whether the communications we handle are genuine or bogus. This is not our function. — *W1NJM*

Public Service Diary

Because of blizzard conditions on Jan. 8-9 and 27-29, Clayton, NM, was without telephone service and had intermittent power service. WB5DAT operated from home and mobile handling health and welfare messages. Sixteen other amateurs assisted. - (WA5RQS, EC Hansford Co., TX)

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During the SET, a tornado touched down in Orlando, FL, at 1240 on Jan. 28. W4RHE/mobile alerted EC W4UJL who called Orange Co. c.d. and Assistant EC WA4WSO. Within minutes an emergency net was established using the WB4QEL repeater. At Red Cross Headquarters, W4UJL provided the only communications into the disaster area for the Red Cross. W4PAO reported damage in the disaster area. K4HTZ/mobile assisted W4RHE and W4PAO at the Red Cross command post. W4WGR activated the Orange Co. EOC and W4YSO activated the Winter Park EOC. The net was secured at 1200, Jan. 29, after normal communications had been restored. Twenty-one amateurs participated. Since the Kissimmee-St. Cloud area suffered similar damage from a tornado, W4SPX/mobile was sent to the area to supply communications to Orlando. - (W4UJL, EC Orange Co., FL)

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On March 10 and two subsequent weekends, the Miami Valley FM Assn. provided communications assistance to the Miamisburg, OH, Fire Department, Red Cross and Dayton suburban fire and rescue departments during a search for a drowned fireman. The club repeater, WB8CQK, was used with the MVFMA van which was used as a command post with links to several agencies. Facilities of the WA8PLZ repeater were used to request supplies, manpower and coordinate activities. A total of 24 amateurs provided about 76 hours of service. - (W8KKF)

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At 0113 GMT on Mar. 15, HK1BSR called into the Intercontinental Amateur Traffic Net reporting that the Colombian Naval Base at Cartagena had lost contact with a vessel in distress between Colombia and Panama. The information was relayed by W4BOZ and KZ5ML to Albrook AFB, CZ. WA3RCN located HK3COC who, assisted by HK3CLX and HK3UU, acted as interpreter and coordinator between US and Colombian authorities. Several other amateurs assisted under poor band conditions. - (W4BOZ)

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During prolonged heavy rainfall in Chattanooga, TN, W4WHG called the Chattanooga Tri-State FM Assn. Emergency Net at 0800 on Mar. 16. WB4UDX, at the Red Cross building, was NCS using the WB4KLO repeater. The club provided communications from disaster relief centers to ARC Headquarters. K4s KTC YET and WA4MVR set up in Jasper and South Pittsburg and K4BPE assisted from Catoosa Co., GA. Mobiles reported water levels as the Tennessee River crested 7 feet above flood level, and assisted officials in evacuation of threatened areas. Mobiles at the shelters handled many health and welfare messages. On Mar. 18, the club made flood damage reports to the Red Cross. The net secured at 1700, after 58 hours of operation. An account of the club's participation was read into the Congressional Record on Apr. 30. - (WA4MVR)

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On Mar. 28, WB4JOY/mobile came upon a bad accident. Via 2 meters, he contacted K4UMD who called police and ambulance. Help arrived shortly after the call. - (K4AOZ)

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When a tornado touched down in Fairfax Co., VA, on Apr. 1, the Northern Virginia Radio Club station at the Red Cross Chapter House, W4PAY, was activated using the WB4QFP repeater.

WB4UKA and WB4SPZ, both mobile, went to the scene with Red Cross personnel to handle communications back to W4PAY until normal service was restored. - (WA4PBG, SEC VA)

High water in the Mississippi River caused a levee to break flooding West Alton, MO, and nearly flooding Grafton, IL. Members of Egyptian Radio Club's Mobile Emergency Corps and others supplied communications for c.d. and Red Cross in continuous effort from Apr. 2 to Apr. 7 using the W9AIU 2-meter repeater. Forty-eight amateurs took part. - (W9YZE)

In Baton Rouge, LA on Apr. 4, WA5BDK had severe chest pains while in QSO with WA5QBO. WA5QBO called the police. WB5BKE was listening and asked for WA5BDK's location. He arrived at the scene with the police and took the heart-attack victim to the hospital. WA5QBO notified the victim's father, WA5BDJ, and wife. - (WA5BDJ)

On Apr. 13, WA1LRK/1 reported a highway accident in Dennis, MA, via W1VAK repeater. State police were alerted and arrived at the site within minutes. - (WA1MKP)

Public Service Honor Roll April 1973

This listing is available to amateurs whose public service performance during the month indicated qualities for 30 or more total points in the nine categories below, as reported to their SCM. A delineation 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*	*5*		*5*	*Totals*
WB4SVH	10	10	12	12	12	10			5	71
WA8ETX	10	10	12	12	12	6			5	67
K4TXJ	10	10	12	6	12	16				66
WA2RYD	10	10	12	12	12	4			5	65
WB5AMN	9	10		9	12	20			5	65
KØPLV/4	10	10	12	12	12		3		5	64
WB8JAD	10	10	12	12	12	2			5	63
WA1MSK	10	10	12	12	12	1			5	62
WAØVAS		10		12	12	20	3		5	62
W2ROE	10	10	12		12	12			5	61
WA2TRK	10	10	12	12	12				5	61
WA3RCI	10	10	12	12	3	6	3		5	61
WB2WEI	10	10	12	12	12		3			59
WB5EIN	10	10	12	12	12		3			59
WAØMLE	10	10	12	6	12		3		5	58
WA3QLG	10	10	12	12	12	1				57
WA3QQR	10	10	12	12	12	1				57
WB4WCM	10	10	12	12	12	1				57
WB2AEH	10	10	12	12	12					56
WB2CHY	10	10	12	12	12					56
WB2OYV	10	10	12	12	12					56
WA3DUM	10	10	12	12	12					56
WA3PXA	10	10	12	12	12					56
WB4HKP	10	10	12	12	12					56
WA5YEA	10	10	12	12	12					56
W7OCX	10	5	12	12	12				5	56
WB9AHJ	10	10	12	12	12					56
WA9IOD	10	10	12		12	4	3		5	56
WBØHBM	10	10	12	12	12					56
WA2CXY	10	10	12	6	12				5	55
W8QCU	10	10	12	3	12		3		5	55
WA2ICU	10	10	12	9	12	1				54
W3ABI	10	10	12	3	12	2	3			52
WA3ROZ	10	10		12		20				52
WA8UPI	10	10		12	12	2			5	51
KØODA	10	5	12	12	12					51
KØITW		10		12	9	20				51
WA1LIR	10	10		12	12	6				50
WA2EUO	10	10	6	12	12					50
WA4KWC		10		12		20	3		5	50
W4WXZ	7	10	12	3	9	9				50
W7BO	8	10	12	12	3				5	50
WA7JQS		10		12	12	11			5	50
WBØCZR	10	10	12	6	12					50
WA6IVA	10	10		12	12				5	49
W7GHT	10	10	12		12				5	49
K7OUF	10	10	12		12				5	49
WB9HEG	10	10	12		12				5	49
WB9KVN	10	10	12		12				5	49
KØBIX	10	10	12		12				5	49
KØMRI	10	10	12		12				5	49
VE3BQZ	10	10	12	12					5	49
WA2CNE	10	10	12	3	12					47
K3KAJ	10	7	12	12	12					47
K4VIG	10	10	3	12	12					47
WB4YCV	10	8	12		12				5	47
WA6DET	10	10	12	3	12					47
W8GLC	10	8	12		12				5	47
WB5FDS	10		12	12	12					46
W2TPV/Ø	10	6	12		12				5	45
WA3ATQ	3	10			12	20				45
WA3PJG	10	10	12		12	1				45
W6LYY	10	6	12	12					5	45
WB8CSH	6	10	9	12	6	2				45

WA2AYC	44	K4UNW	39	WN3SZD	34			
WB2EBX	44	W5GHP	39	W3YA	34			
WA2PIL	44	W9MUC	39	W4UQ	34			
K3OIO	44	KØBAD/4	39	WB5FML	34			
WA3SCR	44	WNØGVR	39	WB6VKV	34			
W4ZJY	44	WØIIC	39	W6YBV	34			
WB5DLW	44	WBØHOX	39	WA7BDD	34			
K5MAT	44	VE3AWE	39	K7WWR	34			
K5YTA	44	VE3DPO	39	WB8ALU	34			
W7DAN	44	VE3EWD	39	WA8EIW	34			
WBØHSZ	44	VE3GEN	39	WB8KKI	34			
WAØVYB	44	VE3GT	39	W9KRR	34			
VE3BRG	44	WB4EKJ	38	W9QLW	34			
VE3GJG	44	WB8EEZ	38	WAØYFO	34			
VE3SB	44	K8MLO	38	VE3CYR	34			
WA8VKF	43	K3MVO	37	VE3DVF	34			
WAØTFC	43	K4KNP	37	VE3EHF	34			
WA5VBM	42	WB4SQA	37	WA2LCC	33			
W6BGF	42	W6INH	37	WA4BXT	33			
K6UYK	42	WA8NOQ*	37	WB5DBK	33			
WA8ZNC	42	K9HDP	37	WBIBX	33			
WB9LOT	42	WA4JQS	36	WA2UOO	32			
W7LBK	41	WB6MXI	36	K2VGD	32			
WA8BCX	41	W7WAH/5	36	WA3MQP	32			
WA1QZH	40	WBØFMR	36	WB4WXX	32			
W3ICS	40	WNØGOL	36	W6NIE	32			
WB6AKR	40	WA1KVI	35	W6OAW	32			
W6JTA	40	WA1NLD	35	WB6PGK	32			
WA7TXV	40	W5VZO/4	35	WB6ZVC	32			
K1SXF	39	W6DFF	35	WB8JGW	32			
W1UBG	39	W7PI	35	VE3ASZ	32			
W2ER	39	WBØHCK	35	W2CU	31			
WB2LZN	39	WB2VEJ	34	W3TN	31			
W2RUF	39	W3CB	34	WA5ZBN	31			
W3LQS	39	WA3HV	34	WA3RKH	30			
W3NFM	39	WA3QIA	34	W5ABQ	30			
				W6RFF	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.

Communications for the March of Dimes Annual Walk-A-Thon, held in the San Jose (CA) area on Mar. 11, was provided by members of the Santa Clara Valley VHF Relay Society using the WB6OQS repeater. K6IAQ, shown here, was communications chairman for the event.

A plea for drugs for a young leukemia victim in Bogota, Colombia, was heard by WB2GYD at 2330 on Apr. 16. YS1RDL acted as interpreter and HK4CZZ/W2 called the hospital in Bogota to corroborate the need for drugs. WB2GYD called the Health Service and they arranged for the drugs to be flown to Bogota the following morning. - (WB2GYD)

— . . . —

AREC members were mobilized to aid Red Cross in operations required by flooding in the Milwaukee (WI) area, Apr. 21-22. Thirty-seven amateurs participated. - (K9KJT, EC Milwaukee Co., WI)

— . . . —

A tornado struck a school in Sumner, MS, on Apr. 24 injuring 35 people. K5s BWW UBL and WA5VOR relayed factual reports and administration traffic to c.d. in Jackson. Information was supplied to the weather service by K5MWR via State c.d. - (WA5FII, SEC MS)

— . . . —

On Apr. 25-26, several tornadoes and hail severely damaged power and phone service in the Houston and Baytown, TX, area. Twenty-five amateurs provided communications between Baytown and Houston and liaison to Harris Co. Sheriff Dept. and Texas Dept. of Public Safety. Operation began at 2200 and secured at 0430 the following day. - (WA5ABA, EC Harris Co., TX)

— . . . —

A munition train exploded in Roseville, CA, on Apr 28. Red Cross efforts were aided by members of the Mt. Vaca Repeater Club going to shelters and reporting conditions to officials. - (Golden Gate Chapter, Red Cross)

— . . . —

On Apr. 29, VE1SH learned that assistance was needed in the flood-stricken Fredericton, NB, area. He contacted VE1ACA in Moncton to gather equipment and personnel. VE1SH and VE1NU arrived in the effected area and linked relief boats and barges with base station VE1AVA. Requests for relief operators, equipment and welfare messages were relayed to VE1ACA through VE1ANW. VE1SH and VE1NU were relieved late the following day by VEIs AHM DK WT. The Fredericton ARC, Loyalist City ARC and Maritime VHF Assn. were represented in the operation. - (VE1SH)

— . . . —

Assistant EC W8GSR was asked to set up communications between a rock festival at Chippewa Lake (OH) and nearby towns. On May 5, one of the participants lacerated a finger requiring stitches and parental permission. WA8ETX contacted WB8FUJ on the Stark Co. Six Meter Emergency Net who called the parents. - (WA8ETX, Ass't. SCM OH)

— . . . —

On May 6, WA7PHD spotted an accident 21 miles south of Cuba, NM, and reported it to the Southern Amateur Radio Service on 40 meters. W5OWV directed WA5VDV to determine the emergency need. WA5VDV advised that the Texas Dept. of Public Safety had been asked to notify New Mexico authorities. Within 30 minutes, WA7PHD reported that police and ambulance had arrived. - (K5RV)

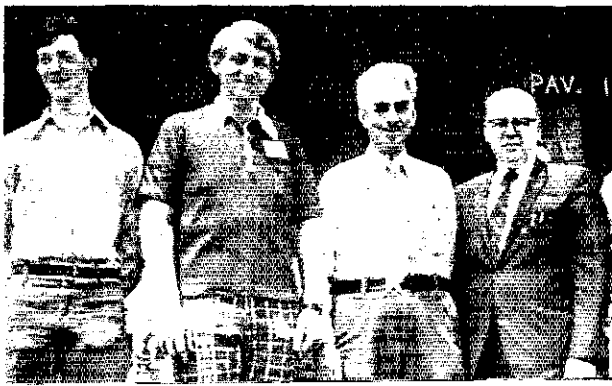
— . . . —

At 1800 May 10, the Stark Co. Six Meter Emergency Net was alerted to possible tornado conditions in northern Ohio. Contact was maintained with the Akron-Canton Airport weather bureau using the 2-meter fm RACES link. Amateurs throughout northeastern Ohio were utilized to spot the storms and confirm that they were tornadoes. The net secured at 0100 May 11. - (WA8ETX, Ass't. SCM OH)

— . . . —

On May 12, WØCQE heard a ship sending SOS. He called WØQAU who copied the distress message indicating that the ship was on fire. WØQAU called Richards-Gebaur AFB Communications Station and they notified the Coast Guard who sent rescue ships to the crippled ship in the Caribbean Sea. - (WØQAU)

— . . . —



The "OZK" Arkansas CW Traffic Net picnic was held in North Little Rock on Apr. 29 with 80 amateurs present. Four of those present are shown here. Left to right are: WB5FDP, PAM; WA5VWH, SCM; W4WHN, Delta Division Director; and W5EIJ, RM.

BRASS POUNDERS LEAGUE

Winners of BPL Certificates for April Traffic

Call	*Orig.*	*Rcvd.*	*Rel.*	*Del*	*Total*
W3CUL	201	969	878	61	2109
WAØVAS	125	497	45	452	1119
WØWYX	55	488	130	358	1031
W1PEX	99	418	335	37	889
KØONK	158	381	306	12	857
WB2WPT	17	372	360	55	804
WA9EED	425	288	16	54	783
WA8MCR	15	327	292	35	669
W3VR	156	268	232	12	668
K5TFY	1	323	320	—	644
KØPIV/4	29	260	180	59	528
K4SCL	216	197	88	25	526
WBØFMN	40	242	240	2	524
K4KNP	13	253	248	3	517
W6RSV	36	241	202	27	506

BPL for 100 or more originations-plus-deliveries

W4KFC	277	K6UYK	136	W2OE	103
WBQCU	204	WB4ZMK	124	WN1POJ	102
WAØAUX	167	WAØMLE	124	WN3SZD	102
WA3RCL	144	K9HDP	115	WB2ADW	101
WNØGQL	144	WNØGVR	111	WA3SQO	100
		WB5EIN	104		

More-Than-One Operator Station

W3ABT 131
VE2QN(Mar.) 105

BPL Medallions (see July, 1968 *QST*, p. 99) have been awarded to the following amateurs since last month's listings. WA1MSK, WA2RYD, K4EAC, WB4GHD, WA4WQU, W6JTA, WB8HUP, WB9AHJ, WBØAXW, WNØFSL, WAØTFC.

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.

Thirty-eight SEC reports were received for April listing 11,041 AREC members. That's four more reports than last month but two fewer than Feb. April '72 saw 37 reports covering 12,507 members. Membership has been hovering around the 11K mark for some time now. How about an upswing? This month, British Columbia and Missouri join the list of reported sections. Sections reporting: Alta, BC, Conn, EBay, ENY, EMass, Kans, Ky, LA, Mar, Mich, Miss, Mo, Mont, Nebr, Nev, NFla, NTex, Ohio, Okla, Org, Oreg, SV, SDgo, SBar, SCV, Sask, SDak, SFla, STex, Tenn, Utah, Va, Wash, WVa, WMass, WNY, WPa.

Traffic Talk

No amateur is required to handle traffic. However, once a message is accepted, either from another amateur for relay or delivery or from a third party for amateur origination, it is the responsibility of the amateur to route the message to its destination with a maximum of dispatch. Whenever difficulties in the handling of a particular message are encountered, the originating station should be serviced.

A service message should be originated under any of the following conditions: (1) when a message is received which contains insufficient address for delivery and no information can be obtained from the telephone book or directory assistance. (Insufficient address is determined by the station attempting delivery, not by a relaying station who may *think* the address is not sufficient.) (2) when a message is received with some parts garbled, making delivery impossible or impractical. (3) whenever there is a long delay in relaying or delivering a message. (4) whenever handling instructions request a service message. (5) if there are any other inquiries concerning the status of a particular message.

A service message is sent in standard ARRL form just like any other message. It is customary to use the proword SERVICE or prosign SVC preceding the number of the message. Service or svc is not appropriate as the check of the message; the check should indicate the number of words in the text, not the nature of the traffic. Service messages are always sent to the station of origin, using the same precedence as the message it services.

It is most embarrassing to offer to originate traffic for someone and later have him ask you why his message was never delivered. If you have received a service message, you can explain the *exact circumstances*. *Without service information*, you can only make guesses and excuses; excuses which seldom impress others of the communications capabilities of amateur radio. Don't just forget it, service it! — *WA1FCM*

National Traffic System. For the second time this year, all three area nets reported 100% representation. Good show! WAØMLE has issued 1st annual CAN certificates to WB4WCM, W5GHP, WB5FDP, W7WAH/5, VE4RO; 2nd annuals to KØs AZJ DDA MRI; and 3rd annuals to W4OGG, W5QU, W9DND, WØZHN, WAØIAW. W2FR sez it looks like 100% representation is gettin' to be a habit in 2RN! Third annual 2RN certificates were earned by W2FZK, K2RXQ, WB2LZN and 4th annuals by WA2ICU and WB2VPR. Interest in D2RN is increasing and things shaping up well reports WA2RYD. W3NEM indicates that 3RN has a few ops that are handling liaison and NCS jobs. They are all new and young ops but they are good. D4RN is plagued by poor band conditions on both 40 and 75 meters. WA9EED submits his first 9RN report and plans to eliminate some of the duplications in the function roster by recruiting from the ranks. VE3AWE is pleased with increasing activity from VE1- and VE2 land on ECN.

(Continued on page 119)

Three Emergency Coordinators who were active in the Simulated Emergency are pictured. At the left is WA7ADW, EC Josephine Co., OR; center is WA1MYK, EC for Sharon, MA; and WA5JTB, EC Prentiss Co., MS, on the right. The 1973 SET results appear elsewhere in this issue.

 (Continued from page 100)

To: Chief, Safety & Special
Radio Services Bureau

PETITION FOR POSTPONEMENT
OF EFFECTIVE DATE

The American Radio Relay League, Incorporated, by its General Counsel, respectfully requests that the date for complete implementation of the rules pertaining to repeater stations in the Amateur Radio Service, adopted by the Report and Order released September 8, 1972, in Docket No. 18803, 37 FCC 2d 225, 25 RR 2d 1665, be extended from June 30, 1973, to October 30, 1973.

In support whereof, the following is respectfully submitted:

1. After an extensive and comprehensive rule making proceeding extending over a period of two and a half years, the Commission issued on September 8, 1972, a Report and Order adopting rules and policies for the licensing and operation of amateur repeater stations. In paragraph 23, the Commission said as follows:

> "Existing remotely controlled stations may continue to operate under their current authorizations until midnight local time June 30, 1973, or until the expiration date of their license, whichever occurs first."

In a Public Notice released October 6, 1972 (Mimeo 90785), the Commission advised that "[a]pplications for station license modification filed after April 30, 1973, may not be processed in time to permit continuity of operation' after June 30, 1973. That Public Notice also stated that all repeater applications filed after October 17, 1972, must comply with the new rules and that all repeaters authorized as the result of an application filed prior to October 17, 1972, "must comply by no later than June 30, 1973."

2. The new rules require the submission of information and material never before required of applicants in the Amateur Radio Service. As a result, many questions arose as to just what must be submitted with the applications. From time to time, the Commission issued clarifying comments and instructions to some prospective and actual applicants. As evidence of the lack of understanding as to what is desired, an estimated 90% of all applications filed by April 30, 1973, were returned for further information and some were returned a second time. Upon learning of the return of applications filed well before April 30th, others delayed the filing of applications until after that date in a good faith effort to submit so complete an application that it would not be returned for more information. The end result has been such a deluge of applications that full compliance by many existing repeaters simply cannot be achieved by the deadline of June 30th. Thus, many repeaters now providing a most essential public service, particularly in emergency situations involving safety of life and property, will be forced to suspend operation at midnight local time on June 30, 1973, even though some or most will have received their new licenses because they cannot modify their operations to fully satisfy the new rules.

3. The fact that some existing repeater operators did not meet the April 30th target date for submission of their applications should not have the practical effect of closing down repeaters operating under authorizations issued pursuant to applications filed prior to October 17, 1972. After all, it must be remembered that the new rules (1) are complex when compared to the other rules for the Amateur Radio Service, (2) involve use of techniques never before required of amateurs, and (3) raised many questions for which answers were not readily and quickly available. It also must be remembered that all of the work must be performed by amateurs during their spare time, usually on weekends, and at their own expense. To rigidly apply deadlines as is done in the commercial services would be most unrealistic in the amateur service.

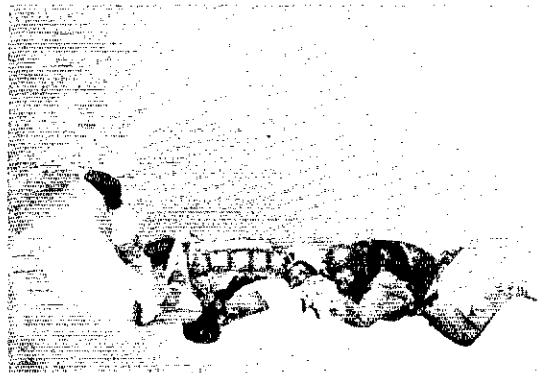
4. Almost without exception, existing repeater operators have made a good faith effort to meet the target dates and to comply with the new rules. Under the circumstances, it is respectfully submitted that the public interest, convenience and necessity will be served most effectively by the grant of the relatively brief postponement requested herein.

Wherefore, the premises considered, it is respectfully requested that the June 30, 1973 date set forth in the Report and Order in Docket No. 18803 be extended to October 30, 1973.

Respectfully submitted,
THE AMERICAN RADIO RELAY
LEAGUE, INCORPORATED
By Robert M. Booth, Jr.
Its General Counsel

May 30, 1973 QST

Strays



Celebrating their 21st wedding anniversary with a jump high above Lake Elsinore in Southern California are Lolly (W6MAW) and Zeke (W6EOO) Lenn. Wonder which has the 2 meter walkie talkie?

Correspondence From Members-

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

CORRECTION

● Thank you for the report on the Nicaragua Christmas disaster activities. I am afraid that due to an inadvertent transposition of call letters in my letter report, I may be responsible for failure to give credit to Bill Criswell, YN1TC, for his very extensive and valuable assistance. His activities were important in successful handling of emergency messages between the U. S. State Department Disaster Task Force in Washington, D.C. and the Embassy and Nicaragua officials. – *Bill Hudgins, W3YY, Washington, D.C.*

TOPPER

● Yes, I can top W6GCM's thirty-nine membership certificates (Strays, Page 34, April *QST*), with a total of forty-four, not counting two duplicates for one year. Earliest date is October 4, 1929. – *Gene Hubbell, W9ERU/W7DI, Scottsdale, AZ*

FEES

● Re, Happenings of the Month, page 94, May *QST*, I feel that if the FCC is going to continue these high fees, they should at least be open on Saturday for amateur exams. Most of us lose a half day of work or school taking the exam. – *Harold E. Pearson, W9MQM, Buffalo Grove, IL*

A NEW BREED?

● Rebellious thinking seems to be contagious. I refer, of course, to the growing opposition to the new so called repeater rules and the repeater group which vows to remain in operation even if they are unable to comply with the regulations. The repeater has bred a type of operation previously unknown to amateur radio; domination of its channel. It is of no avail to complain, the rules are now a fact and will remain. Unless a master *frequency plan is accepted and coordinated on at* least a regional scale the rules will get tougher. I think amateurs can meet the challenge and develop the repeater system that will eliminate the need for control operators and ease the restrictions. – *Harry E. Wilkins, WA3TTE/9, ex-WB4PHZ, WRSW AM & FM, Warsaw, IN*

[EDITOR'S NOTE: Please see "Repeater News" elsewhere in this issue. A master plan *is* accepted and coordinated throughout the United States. There are regional coordinators in most parts of the country which help new repeaters in frequency selection. With very few exceptions, the majority of repeater owners are cooperating with each other. What is most important is that amateurs can work out their own problems, without federal intervention.]

A SECURE FEELING

● At about midnight on Tuesday, 3 April 1973, while on a passage from Russell, New Zealand to Tonga we encountered gale force winds and hove the boat to. Shortly thereafter the tiller broke and a few hours later the rudder carried away. We were near the Star of Bengal reefs of the Kermadec Islands, about 250 miles northeast of New Zealand.

Earlier, while going from Rarotaoga to New Zealand, we had established schedules with several New Zealand amateurs, and upon leaving Russell, we reestablished these schedules. Shortly after the rudder carried away we were able to contact ZL1BHQ and ZL4IE and advise them of the situation. While there was no immediate danger to the yacht, we were not sure just what could be done. These amateurs, as well as ZL1AIR and others, stood by us on schedule until we made port in Auckland under jury rig.

It is a great feeling of security to know that friends are ready to assist in case of danger and storm.

We wish also to acknowledge the assistance of K3NPV who relayed messages to our family in Virginia on this occasion.

It is our considered opinion that an amateur radio set on board a cruising yacht is one of the most valuable things one can have. – *Dr. S. L. Seaton, K4OR/MM, Master, Yacht Que Coisa, Auckland, New Zealand*

QST COVERS

● The April *QST* has a man on the cover. Again.

I have been reading *QST* as man and boy for nigh on forty years. In all that time the February and March 1973 issues were/are the only time *QST* has run YLs on the cover two issues in succession.

I bet it shook up Peterborough.

XYLs forever? – *Mike Fern, WA6OWJ, Los Angeles, CA*

THE GIL CARTOONS

● *Playboy* does it, *Esquire* does it and even *MAD* does it, so why not a compilation of *GIL*'s cartoons?

I didn't climb aboard until the late 40's but can remember learning much about the mysteries of our hobby from that monthly circumstance that found Jeeves holding onto the end of a 900 foot long wire, or carrying some six tons of gear on his back for his Master's Field Day . . . or the lightning bolts, black eyes, mobile rigs, etc., that somehow needed just his touch . . . and the mastery of *GIL* to work. Perhaps the sale of a memorial issue to that fine illustrator and ham could be applied to some worthwhile display or memorial within the Headquarters; I miss his contributions . . . and I'm certain many others do. – *Herbert M. Rosenthal, Lt. Col., USAF, WØOC, Stilwell, KS*

BOOST FOR BEGINNERS

● Just a short note telling you how much I enjoyed "A Primer for Novices" by Margaret S. Koerner, WBØBEM, beginning in the April issue.

I hope this is only one of many series items in future *QST*s. As a Novice reaching for the General ticket this really hits home. I almost became a dropout until I read her article.

Keep this type of tale coming, OMs. – *Hugh C. Bryant, WN5GLZ, Azle, TX*

● Congratulations to you for finally helping the Novices and would be Novices through WBØBEM's story. I liked the article so much I'm going to the library to get her first one which appeared in February '71 *QST*. Will give both to my son Mike, 12 years old, who now knows the code alphabet and is studying the License Manual for his Novice test. – *B. C. MacDonald, Jr., WAØWWS, St. Louis, MO*

A CANADIAN VIEW

● Having been an active Canadian amateur for over 46 years and being issued with the call sign NC5BR in 1926, later VE5BR and VE7BR, I am keenly aware of the past history of amateur radio and all the struggles that took place over the years in the effort to preserve our place in society.

The very survival of amateur radio as we know it today is due entirely to the collective efforts of both Canadian and U.S. amateurs through the instrument of the ARRL.

The ARRL provides our only coordinated representation to both Governments, and in turn our only weapon in fighting for our position in the international forum.

The policy of the ARRL has been very democratic, and the Canadian Division of the League has never to my knowledge been dictated to by the U.S. headquarters Division.

With common cultures and language and the World's longest unfortified border the Canadian and U.S. amateurs have little or nothing to create differences or friction between the two groups. Standing together as a common block we may reasonably hope that our chances of maintaining and improving the amateurs' privileges and stature on an international basis are good.

I personally see no reason why we should expect the U.S. amateur to operate in a phone band more restricted than the Canadian. I also feel that general conditions on the 75-meter phone band particularly have only improved since the U.S. band was extended and we now find ourselves enjoying contacts with hams all over the U.S. which did not happen when we huddled together in our own little part of the spectrum.

In conclusion I feel very strongly that every North American amateur owes it to himself, and to the avocation that he now enjoys, to belong to and support the ARRL as the only established and proven instrument that can insure the survival of our ideals. – *A. J. Spilsbury, VE7BR, Vancouver, B.C., Canada*

UNUSUAL EFFECT

● Having recently returned from an extended vacation abroad and being out of touch with the happenings in amateur radio during that time (8 months), I have been inundated by the amount of proposed and passed legislation issued by the FCC. As usual, I am generally in complete support of your petitions, and appreciate the complete coverage of the issues in *QST*.

One item I wonder about, however, is your statement in response to Docket 19555 that "No responsible person ever has contended that the generation, transmission and propagation of radio . . . signals have any effect . . . upon . . . the environment." (*QST*, December, 1972, page 79.) Some things it is very difficult to prove at present. Perhaps such a contention should be so classified.

In 1969-1970, while flying from Alameda Naval Air Station, we experienced a phenomenon which I called the Bay Area Effect. Basically, it occurred that while flying over the San Francisco Bay area, there was sufficient ambient electromagnetic radiation to defeat the squelch circuits in our aircraft communications receivers every time we flew into the area. Depending upon undefined individual receiver characteristics, often this "white interference" was bad enough to hamper communication on the selected frequency even though there was no other intended transmission at the same time on any frequency within 10 MHz (This was determined by analyzing frequency assignments in the uhf aircraft band for the area.).

While this discussion concerns the effects of ambient electromagnetic radiation on a device intended for processing radiated signals, the hypothetical extremes might be worthy of study. Perhaps some responsible person is currently preparing a study which will refute or prove your statement. I tend to agree with what you said, but at this time, who really knows? – *D. E. Thompson, K8OTJ/6, Laguna Beach, CA*

SWEATY PALMS

● Just a word of appreciation for the hilarious and amusing article by Joel M. Rose, W8GOE, entitled "Sweaty Palms at the Old Federal Building," on page 66 of April *QST*.

I think this is one of the funniest, yet true to life, articles I've read for a long time! Having gone through this experience about two years ago, I could re-live it all over again except, this time, it was funny!

The only thing I thought Joel might have added to the article was a word or two concerning broken pencil leads!

Maybe you can persuade Mr. Rose to write another similar article on the subject of that first QSO! – *Rodney H. Burk, WB8HGE, Casstown, OH*

● Congratulations to W8GOE on his excellent article "Sweaty Palms at the Old Federal Building." His story had me recalling the time I took my General test, with sweaty palms of course! A last moment glance at the old *License Manual* had helped me answer several questions on filters. There always seems to be some kind of know-it-all at the FCC office. But I warn Novices and beginners, pay no heed or else. *Neil Higashida, WB6KXC, Mission Hills, CA*

PUBLIC SERVICE

● Thanks for the ARRL Public Service Award. I am not normally a DX chaser, or a certificate hunter, but the receipt of an unsolicited award such as this is deeply appreciated. I feel that we must seize every opportunity of performing public service in order to foster and promote the image of the Radio Amateur in the public eye, and shall continue to do so whenever opportunity offers. – *L. Colin Curtis, VE7BMK, Kamloops, B.C., Canada*

FEEDBACK

On page 102, May *Correspondence From Members*, K2QBV's call was inadvertently listed as W2QBV. Our apologies to OM Kornreich. 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

GERMANY EXPANDS 160-METER BAND

At the request of the *Deutscher Amateur Radio Club*, the telecommunication authority of the Federal Republic of Germany has changed the 160-meter amateur allocation from 1825-1835 to 1815-1835 kHz, at the same time deleting a little-used segment at 1985-1992 kHz. The ssb sub-band remains 1832-1835 kHz.

Amateur operation on 160 meters in Europe is permitted only in certain countries, by a footnote to the ITU Radio Regulations. The maximum input power permitted is 10 watts in order to minimize the possibility of interference to the fixed and mobile services, which have priority in Region 1.

NEW PREFIX FOR NORWEGIAN NOVICES

As mentioned in this column for April Norway has joined the growing list of countries which permit their youth to take part in amateur radio activities by acquiring Novice licenses The *Norsk Radio Relae Liga* announces that the call sign prefix for this new class of license is LB.

In other news from Norway, the telecommunication authority has authorized for the first time the use of RTTY, slow-scan television, and vhf repeaters on a routine basis. The maximum power input permitted in Norway is 600 watts.

ANNIVERSARIES

Several national amateur radio societies mark important anniversaries this year:

The *Guayaquil Radio Club* marked its fiftieth anniversary on May 9.

The *Liga Colombiana de Radio Aficionados* is celebrating its fortieth anniversary by sponsoring the HK Contest on July 21-22 (see page 117, June *QST*).

The *Radio Club Uruguayo* is also sponsoring a contest to mark its 40th year, the American Contest on August 19. Participation is limited to amateurs in North and South America; details are in "Operating Events" this month.

UNOFFICIAL "WELCOMING CENTER" FOR FOREIGN AMATEURS VISITING NEW YORK CITY

One of the many satisfactions of amateur radio is, when traveling, the chance to meet people with the same ideas and preoccupations. George and Eva Pataki, WB2AQC and WA2BAV, know this well; they have traveled extensively themselves and have enjoyed many times the hospitality of hams overseas.

Foreign amateurs often come to New York and wish to meet the local hams. In order to help them, the Patakis have established a "Welcoming Center" for foreign amateurs visiting New York City. Usually an amateur planning to visit will write them in advance, and then will telephone as soon as he arrives in town. If the visitor has a reciprocal operating permit, he may operate their station. He will also be treated to sightseeing tours, visits to local radio clubs or stores, or perhaps to informal gatherings of local hams.

The Patakis' address is 34-24 76th Street, Jackson Heights, NY 11372 USA. They urge hams in other cities, in the U.S. and abroad, to organize and publicize similar efforts to make visiting foreign amateurs feel welcome when they visit.

DX OPERATING NOTES

Reciprocal Operating

(Bold face type indicates changes since last list.)

United States reciprocal operating agreements exist only with: Argentina, Australia, Austria, Barbados, Belgium, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Fiji, Finland, France*, Germany, Guatemala, Guyana, Honduras, India, Indonesia, Ireland, Israel, Jamaica, Kuwait, Luxembourg, Monaco, Netherlands*, New Zealand, Nicaragua, Norway, Panama, Paraguay, Peru, Portugal, Sierra

Early visitors to WB2AQC's New York City "Welcoming Center" included (seated) HI8VMS, ex-DE3GWW, and HI8FAI; (standing) WA2RZO/ex-HH2DF, HI3LMG, WB2VAE, WB2AQC, G3SKR, and JA1ANE.

At its triennial meeting in Santiago, Chile in April, the *Union Interamericana de Radioaficionados – IARU Region 2* elected an Executive Committee expanded to seven members, here shown with IARU president WØDX. (L-r) VE3CJ, WØDX, CE3ABZ, XE1CCP, W2TUK, OA4AV, HP1ND, and YV5BPG. A total of fourteen national amateur societies in the Americas were represented at the conference.

Leone, Sweden, Switzerland, Trinidad and Tobago, United Kingdom*, Uruguay, and Venezuela. Several other foreign countries grant FCC licensees amateur radio operating privileges on a courtesy basis; write *ARRL* headquarters for details.

Canada has reciprocity with: Belgium, Brazil, Dominica, Dominican Republic, Ecuador, France, Germany, Guatemala, Israel, Luxembourg, Mexico, Netherlands, Nicaragua, Norway, Peru, Portugal, Panama, Senegal, Sweden, Switzerland, U.S., Uruguay, Venezuela, and Commonwealth countries.

Third-Party Restrictions

Messages and other communications – and then only if not important enough to justify use of the regular international communications facilities – may be handled by U.S. radio amateurs on behalf of third parties *only* with amateurs in the following countries.** Argentina, Barbados (only U.S. stations /8P), Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Greenland (XP calls only), Guatemala, Guyana, Haiti, Honduras, Israel, Jordan, Liberia, Mexico, Nicaragua, Panama, Paraguay, Peru, Trinidad & Tobago, Uruguay and Venezuela. Permissible prefixes: CE CM CO CP CX EL HC HH HI HK HP HR JY LU OA PY TG TI VE VO W or K/8P XE XP YN YS YV ZP 4X 4Z 8R and 9Y4. Canadian hams may handle these same type third-party messages with amateurs in Bolivia, Chile, Costa Rica, Dominican Republic, El Salvador, Honduras, Israel, Mexico, Peru, Trinidad & Tobago, U.S., and Venezuela. Permissible prefixes are: CE CP HI HR K OA TI W XE YS YV 4X 4Z and 9Y4.

DX Restrictions

Amateur licensees are warned that international communications are limited by the following notifications of foreign countries made to the ITU under the provisions in Article 41 of the Geneva (1959) Conference.

The Director General of the Posts and Telegraphs Department of Vietnam has notified the ITU that there is no objection to communications between amateur stations in other countries and XV5AC. However, communication with other amateur stations in Vietnam (XV or 3W8) is forbidden. Canadian amateurs may not communicate with Cyprus, Gabon, Iraq, Pakistan, Turkey, Khmer Republic (except XU1AA), Vietnam, Libya, and Yemen. Prefixes to be avoided by Canadians are AP TA TR8 XU XV YI ZC4 3W8 4W 5A.

*Agreement includes overseas entities.

**By special agreements, third-party traffic is also permissible with amateurs in Australia and the Federal Republic of Germany for traffic regarding amateur satellites, with 4U1ITU, and with personnel of Project Hope in Jamaica. QST

July 1923

. . . The schooner *Bowdoin*, finally off for the Arctic, has Don Mix, 1TS, aboard as radio operator, with the latest gear designed and donated by Zenith (and others). A weekly news story will be transmitted; ARRL members are asked to copy it and deliver to local papers so the public may have news of this expedition.

. . . This could be called the "filter" issue. F. S. Dellenbaugh has an extensive treatise on such networks, complete with curves of the performance of many designs. Technical Editor Kruse decries keying thumps, and describes a number of filters to avoid this annoying characteristic. There is also a wavetrap design to minimize interference, especially from nearby broadcast stations.

. . . WWV of Bustans, in Washington, will soon transmit some standard frequencies so that amateurs may calibrate their wavemeters. Caution: use loosest possible coupling, to avoid overload!

. . . More regulatory problems ('twas ever thus!). A Hoover conference in March brought numerous attacks from broadcasters on the informal (and liberal) amateur wavelength assignments previously enjoyed. We are cut back to 220 meters as the top wave, so that 150 to 220 meters is the entire (though still informal) amateur spectrum. Attempts to impose evening quiet hours on all amateurs were finally beaten back by ARRL efforts, and a voluntary system accepted.

. . . Several pages are devoted to instruction on learning the code, complete with code practice unit circuits. Even then the concept of aural recognition and "dits and dahs" was used.

(Continued on page 113)

Hamfest Calendar

California — The Tri-Counties Council of Amateur Radio Club's 1st Annual B-B-Q Hamfest is Sunday, July 22, at the Union Oil Orcutt Hill Picnic Grounds, hwy. 101 between Los Alamos and Santa Maria. 10 AM to 4 PM. Swap sessions, auctions, etc. A Santa Maria type B-B-Q plus beans, toasted bread and coffee is at 1 PM. Bring a dish for pot-luck such as, salad, pickles, cake, pie, etc. Advance reservations necessary. Adults $2.50; children under 12 $1.25. For info write: Ticket Chairman, D. Paul Gagnon, WA6DEL, 1791 Hedon Circle, Camarillo CA 93010.

Illinois — The Quad-Co. Amateur Radio Club's 16th Annual Hamfest of the "Breakfast Club" is July 14, 15 at Terry Park 3/4 mile east of Palmyra. All other groups are invited to meet at the hamfest, giving prior notice to the hamfest committee. Saturday night dancing and movies. Bring a basket lunch. Sandwiches and soft drinks available. Mobile talk-in on 3973 kHz from noon Sat. to 11 AM Sun. Games, contests, golfing and fishing. Bring your swap gear. Camping facilities Fri. afternoon until Mon. morning. Pre-registration until July 4, $1; $1.50 at gate. Write "Hamfest" c/o Quad-Co ARC, Box 81, Chatham IL 62629.

Illinois — The Six Meter Club of Chicago's 16th Annual Picnic and Hamfest is Sunday, August 5 at the Frankfort Picnic Grove, 1 mile north of U.S. 30 on U.S. 45 Frankfort. Food and drink available. Swap n' Shop section provided. Advance tickets $1.50; at gate $2. For tickets and info contact Val Hellwig, K9ZWV, 3420 South 60th Court, Cicero IL 60650.

Illinois — The Hamfesters Radio Club's 39th Annual Hamfest is Sunday, August 12 at Santa Fe Park, 91st and Wolf Rd., Willow Springs IL.

Illinois — The Shawnee Amateur Radio Association hamfest is August 12 at Riverside Park, Murphysboro. For info. write: SARA, 502 W. Kenicott, Carbondale IL 62901.

Indiana — The Wabash Valley Amateur Radio Association's 26th Annual Hamfest and VHF Picnic is Sunday, July 29. Registration 9 AM. Free bingo games for XYLs at 1 PM. Registration $1.50 or 4 for $5. Vendors must register. Talk-in on 52.525 and 146.94. The VHF Picnic is at Turkey Run State Park near Marshall on IN 47. Campgrounds, playgrounds and scenic trails. Free coffee and donuts for early arrivers.

Kansas — The Kansas Nebraska Radio Club's 22nd Annual Hamfest is Sunday, August 5 at the Moose Bldg., 113 W. 5th St., Concordia. Registration 9 AM. Mobile talk-in on 3920 kHz and on 146.94 or .94- .34 repeater. Bring your favorite covered dish, free soft drinks. Swap tables.

Minnesota — St. Cloud Amateur Radio Club's Hamfest is Sunday, August 12 at Sauk Rapids Municipal Park, Sauk Rapids. Registration $1 rain or shine. Refreshments, games, gear swap, etc. For info. write: Gary and Lolly Loomis, Box 103, Clear Lake MN.

Missouri — The Zero-Beaters ARC Annual Hamfest is August 5, Washington Mo. Ham Auction, large trader row, entertainment for XYL and children. St. Louis ARC Ham of the Year Award. Missouri Army MARS Meeting. Write Zero-Beaters Arc, Box 24, Dutzow MO 63342 for tickets and details.

Missouri — The Annual Hambutchers Net Picnic is at the Park in Booneville, Mo., july 21 and 22. Music and dancing on Saturday night, free to all. Sunday, usual registrations, get togethers, eyeballs. A covered dish dinner. Registration $1.25. Herbert M. Peery, WØGQR, Net Mgr.

Montana — The 39th Annual Glacier Waterton Hamfest is July 20-22 at Somers. Hams attend from Canada, Idaho, Montana and E. Washington. Contact WA7JQS for details.

Nebraska — The Central Nebraska Amateur Radio Club's Annual Steak fry is at Victoria Springs State Park on Sunday, July 29. Registration $2 for persons over 7. Bring your own table service. For early arrivers a weiner roast and campfire Sing Song is Saturday evening and a pancake breakfast Sunday morning. Contact a club member during a net or send advance registration: WAØLWK, Box 34, Miburn NE 68857.

New Jersey — The Knight Raiders VHF Club's 7th Annual Hamfest is at 10 AM Saturday, August 11 at the YM/YMHA Camp, Rifle Camp Rd., W. Paterson. Gigantic flea market, auction, swimming and boating, picnic tables and B-B-Q pits available. Contests, door prizes, displays, refreshments will be available. Navy MARS meeting. Talk-in .94 fm, 145.71 a-m and 50.200 ssb. Tickets $1 advance: $1.50 at door. Children under 12 free. For info and tickets write: Knight Raiders VHF Club, Inc. PO Box 1054, Passaic NJ 07055.

North Carolina — The Cary Amateur Radio Club's Swapfest is Saturday, July 21, 1 PM, at the Cary Lions Club shelter. Rain or shine; no admission; talk in on 146.94 and 3923. Further info from K4FBG.

Ontario — The Annual Convention of the Radio Society of Ontario is August 17-19 at Queens University, Kingston, Ontario. R.S.O., C.A.R.F., and ARRL Forums, technical forums, banquet, demonstrations, displays, prizes, social events are the highlights of a complete program. Accomodation at Victoria Hall (on Campus) and a trailer park is located at nearby Lake Ontario Park. Check the "CJ Net" nightly (3790 kHz 2230 GMT) for details or write Kingston ARC, PO Box 1402, Kingston ON Canada.

Pennsylvania — The Two Rivers Hamfest is Sunday, July 22 at the Green Valley Volunteer Fire Station off the E. Pittsburgh-McKeesport Blvd. For info write: Ed Rottman, WA3PHY, 1034 Huston Dr., West Mifflin PA 15122.

Pennsylvania — The 36th Annual Hamfest of the South Hills Brass Pounders and Modulators is Sunday, August 5 from noon 'til dusk at St Clair Beach, McMurray (5 mi. south of Mt. Lebanon on Rt. 19). Swap n' Shop, picnic space for the family, mobile check in on 29.0 Tickets $1.50; $2 at gate. For info and tickets write: Lou Cowan, 26 Graper Street, Pittsburgh PA 15227.

Pennsylvania — The Mt. Airy VHF Radio Club's (Pack Rats) 18th Annual family day and picnic, Sunday August 12 (rain date Aug. 19) at the Fort Washington State Park, Flourtown. Games, entertainment and free soda. Talk-in stations on 50.2 MHz fm, and 146.52 MHz fm.

South Dakota — The Hub City Radio Club of Aberdeen's Annual South Dakota Ham Picnic is August 4 at Wylie Park, Aberdeen beginning at 1 PM. Prizes, flea market, activities for XYL and jr. operators. Limited camping. For info or tickets contact: WØOGS, 1017 7th Ave. S.W. Aberdeen SD 57401.

Tennessee — The Oak Ridge Amateur Radio Club's Annual Hamfest is July 21-22. For info write: Ruth Ann Fisher, Secretary, Oak Ridge Amateur Radio Club, Inc. Box 291, Oak Ridge TN 37830.

Texas — The 3rd Annual Amateur Radio Appreciation Day is July 29 in Junction. This is a

free, B-B-Q for anyone holding an amateur license and their family. The day is sponsored by the Kimble County Chamber of Commerce to show its appreciation of the many public services and disaster assistance amateur radio operators provide. For info contact: Lewis Ranson, WB5BBT, Junction TX 76849.

Virginia — The Shenandoah Valley Annual Hamfest is August 4-5 in Winchester. The hamfest dinner is Friday, August 4 at Carpers Valley Golf Club. The hamfest begins 10 AM Sunday at the Winchester National Guard Armory. For further info write: The Shenandoah Valley Amateur Radio Club, Inc., PO Box 139, Winchester VA 22601.

Washington — The Northwest Amateur Monitoring Service 2nd Annual Picnic is Sunday, July 15. NAMS operates everyday from 9 AM to 5:45 PM on 3970 kHz. This year two nets will open activities with a picnic on July 14; the Noontime Net (11:30 to 12:15) and WARTS operating after 6 PM. The picnic is at Lewis and Clark State Park near Centralia. (Turn E. off 15 onto State Hwy 12 and St. Mary's Corner onto the old Hwy 99. Signs are posted 1.7 mi. from Mary's Corner.) Some camping available. For info, write: Louis Huber, Box 95 Main Office, Seattle WA 98111.

Wisconsin — South Milwaukee ARC Swapfest is Saturday, July 14 from 7 AM at Oak Creek, VFW Post 434, 9327 Shepard Ave. Admission $1. Food available, talk-in 146.94. Write SMARC, Box 102, S. Milwaukee WI 53172.

COMING ARRL CONVENTIONS

June 30-July 1 — Rocky Mountain Division, Cheyenne, Wyoming.

June 30-July 1 — West Virginia State, Jackson's Mill.

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, Burbank, 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.

MICHIGAN STATE CONVENTION

Escanaba **August 4-5, 1973**

The Delta County Amateur Radio Society invites you to attend the 1973 ARRL Michigan State Convention to be held at the Upper Peninsula State Fair Grounds in Escanaba, Michigan August 4-5. The two-day program will include technical talks, net meetings, the semi-annual meeting of the Upper Peninsula Amateur Radio Repeater Association, hidden transmitter hunts, a special program for the YLs, and other activities of interest to all. There will be a banquet on Saturday evening. A refreshment stand will be open on the grounds during the convention. Talk-in on 3920 kHz, 52.525 MHz and 146.94 MHz. Tickets $1 at the door. For further information, including a list of nearby motels, write to DCARS, P.O. Box 266, Gladstone, Michigan 49837. QST

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 Aimont Road, Downsview, ON.

VE4 — D. E. McVittie, VE4OX, 647 Academy Road, Winnipeg R3N OE8, MB.

VE5 — A. Lloyd Jones, VE5JI, 2328 Grant Road, Regina, SK. S4S 5E5.

VE6 — D. C. Davidson, VE6IK, 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*.

Happenings of the Month

CONGRESSMAN PRAISES AMATEURS

The Honorable Lamar Baker, representing the 3rd Tennessee District (Chattanooga), praised amateurs of his district through remarks in the *Congressional Record* dated April 30. The text follows:

HAM RADIO OPERATORS ASSIST IN FLOOD, FIRE EMERGENCIES
HON. LAMAR BAKER
OF TENNESSEE
IN THE HOUSE OF REPRESENTATIVES
Monday, April 30, 1973

Mr. BAKER. Mr. Speaker, I am constantly reminded of the invaluable service which volunteer groups render in countless communities across our country. One such group, the Chattanooga Tri-State FM Association, was active during two recent periods of disaster in Chattanooga. The Chattanooga Tri-State FM Association is a ham radio network. According to Jim Carmical, CTS secretary whose call letters are WA4YHG, the club provided 58 continuous hours of communications service during floods which hit Chattanooga during the latter part of March of this year. The club also performed valuable service in assisting with communications during an emergency which arose when a gasoline tank caught fire. Mr. Carmical has given the following account of activities of Tri-State FM Club during this period. Other officers of the club are president, Horace Forstner, Wooten Road, Ringgold, Ga., vice president, Phil Lytle, Notre Dame Avenue, Chattanooga, and treasurer, James Cox, Valley Lane, Hixson, Tenn. It is this kind of community spirit and desire to serve which makes Tennessee and the Third District such a fine place to live. I ask that Mr. Carmical's account be included in the RECORD at this point:

CHATTANOOGA TRI STATE FM ASSOCIATION PARTICIPATES IN FLOOD EMERGENCY

On top of nearly a week of heavy rainfall in the Tennessee Valley, seven and a half inches of rain fell on the Chattanooga area the weekend of March sixteen to eighteen. Over an inch fell in one hour between seven and eight a.m. of the sixteenth at which time W4WHG, President, called the Chattanooga Tri-State FM Association Emergency net. After fifty eight consecutive hours of operation the net was secured at five o'clock Sunday afternoon the eighteenth.

The net control station WB4UDX, is located in the *American Red Cross Building* in downtown Chattanooga. Repeater WB4KLO performed flawlessly from its location on Signal Mountain. At various times W4WHG, K4TND, K4KTC, K4YET, K4EPM, K4RJW, K4JAF and WA4MVR acted as net control.

The Tri-State FM Association provided communications from the Radio Control Center permanently located in the ARC Building. Over thirty stations were used during the flood emergency including mobiles, fixed and portables.

During the height of the floor the club provided communications from disaster relief centers set up by Red Cross to Headquarters as all the ARC personnel were tied up manning the centers, phones were out part of the time and overloaded the rest. Seven centers were manned in Chattanooga plus two in nearby Jasper and South Pittsburg Tennessee, where K4KTC, K4YET and WA4MVR set up communications for disaster relief. K4BPE was active in helping with disaster communications from Catoosa County Georgia, also through WB4KLO repeater. Simultaneously, mobiles were reporting water levels as the water rose in the Tennessee River to its crest of 36.9 feet. Flood level is thirty feet. Additional flooding in other parts of the city was caused by Chickamauga Creek which normally flows into the Tennessee River, but was backed up by the highest river level since before the TVA systems of dams was formed.

Damage from the flood to businesses and homes has now been conservatively assessed at sixty million dollars. Club reports of water levels were used to assist local police, Red Cross, and other agencies in the evacuation of sections threatened or already flooded. On Sunday the club made a street-by-street survey of flooded sections for the Red Cross to provide street names and house numbers affected. This report was later used to verify damage when claims were filed with the ARC totalling over $800,000 and were paid to over 1,600 people who received immediate disaster relief in food, food stamps, clothing and household goods. The mobiles stationed at the ARC shelters not only provided communications for ARC but handled many health and welfare messages while the phones were out or overloaded with traffic.

As always after an emergency, we look back and see how we could have improved the overall

The February *QST* story, "An IC Keyer with Programmable, Erasable Memory," won the Cover Plaque for its author, Thomas P. Riley, WA1BYM. New England Director Robert York Chapman, W1QV, presents the plaque to Tom and his wife. *(Photo thanks to the Fall River* Herald News*)*

"Everybody's first Hawaiian contact" Katashi Nose, KH6IJ, won the January *QST* Cover Plaque with the "cover story," "Crossed Yagi Antennas for Circular Polarization." Southwestern Division Director John R. Griggs, W6KW (left) does the honors while Lew McCoy, W1ICP, Novice and Beginner Editor of *QST* holds up the award. *(Photo by Armond M. Noble, WB6AUH, courtesy of* Worldradio/NEWS*)*

operation, but in general it was a huge success. The local ARC director told the club later that they simply could not have accomplished what they did without the club assistance. He stated our club excelled all other disaster units in communications, both in reliability and speed. We had ironed out some of the kinks in disaster work at a local gasoline tank farm fire last July, so we feel we're now ready for anything.

UCBA HEAD INDICTED

George Bennett of Detroit and the United CBers of America, a Michigan non-profit organization of which he is president, were indicted May 4 by a Federal Grand Jury at Detroit on eleven counts. Charges included distributing counterfeit radio station licenses; making false statements in applications for FCC licenses; attempted fraud of the public and of the government; impeding the lawful regulatory functions of FCC; violation of the mail fraud statute and conspiracy. Fourteen people active in UCBA were named as coconspirators but not as defendents. Bennett was also charged, in a separate action, of criminal contempt for defiance of an order of the Federal District Court which had enjoined Bennett from further operations of a radio transmitter without a license. Evidence was developed by FCC and was presented to the Grand Jury by Gordon S. Gold, Assistant U.S. Attorney for the Eastern District of Michigan.

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A Federal Grand Jury in Kansas City, Kansas, has returned a three-count indictment against Donald W. McKinzie of Kansas City, for violations of the Communications Act. McKinzie was accused of continuing operation in the Citizens Radio Service band under such homemade callsigns as Diablo and Triple 6 after revocation of his wife's license in 1971, despite a warning letter from the Commission. Bond was set at $1,500.

NEW EXAM ANSWERS: FEEDBACK

Last month, "Happenings" presented new study questions for Novice and Generals with references and answers. Three of the Novice answers on pages 84 and 85 need correction or improvement:

What is . . . inductance? Capacitance?

. . . Inductance measures the ability to store energy in a magnetic field, usually of a coil of wire. Capacitance measures the ability to store energy in an electric field, usually of two conductors close together but separated by an insulator.

Draw the schematic diagram of a circuit having the following components:

a) *battery with internal resistance*
b) resistive load
c) voltmeter
d) ammeter

From the values indicated by the meters in the circuit above, how can the value of the resistive load be determined? How can the power consumed by the load be determined?

From Ohm's Law (N29) we know that the resistance R of a resistive load equals the voltage E across it, divided by the current I flowing through it. These values are indicated by voltmeter V and ammeter A, respectively. Power consumed by a load is the product of the voltage across it and the current flowing through it (n23). This is expressed by the equation P equals EI.

In the above circuit, what must the value of the resistive load be in order for the maximum power *to be delivered from the* battery?

Maximum power is obtained from the battery by making the load resistance equal to the internal resistance of the battery. This is known as the maximum power transfer theorem, and is a simple example of impedance matching.

A 8-page insert containing the new questions and answers has been bound into copies of the 69th edition of the *License Manual* shipped from Newington after the first week of June. A limited number of the inserts are available from hq. for those who have the 69th edition (green stripe) *without* the insert: send a large (*QST* size) envelope addressed to yourself bearing 8¢ postage and ask for "New FCC Questions."

CLUB BULLETIN CONTEST

The Amateur Radio News Service is again conducting a contest among club bulletins in the following categories:

Class A – Offset or letterpress:
A-1 Single club with 50 or more members
A-2 Single club with fewer than 50 members
Multiple A: Multiple club, section, division, etc.

Class B – Printed by other methods (e.g., Mimeograph, Ditto, etc.)
B-1 Single club with 50 or more members
B-2 Single club with fewer than 50 members
B-3 One- or two-sheet publications
Multiple B: Multiple club, section, division, etc.

The Honorable Athniel C. Ottley, KV4BW, (far right), is sworn in as Lieutenant Governor of the Virgin Islands, the youngest person to hold the office. Judge Eileen Peterson administers the oath while Governor Melvin H. Evans(left) and Public Safety Commissioner Alphonso Christian (right background) look on. Heary congratulations, Addie! *(Photo by Les Scott, KV4EY).*

Judging categories include: general format; page 1 or cover; editorials; club activity coverage; use of club members' contributions; technical articles; use of photographic process (Class A papers); use of hand-drawn art (Class B papers); special categories, as determined by the judges.

The contest is open to all non-profit amateur radio publications; entrants need not be members of ARNS. Entries will consist of any three 1972 issues selected by the entrant. The outside envelope should designate the class (A-1, B-3, etc., as described above) and must be postmarked on or prior to July 31, 1973. Entries are to be mailed to: Jim Romelfanger, K9PKQ, 117-1/2 Fourth Street, Baraboo, Wisconsin 53193

ARRL REQUESTS DELAY IN RACES STUDY

The ARRL has asked for an extension in time for comments on Docket No. 19723, FCC's inquiry into the Radio Amateur Civil Emergency Service (see "Happenings," June *QST*). The original deadline for comments was July 1, but the League has asked for a new date, September 4, basically on grounds that 'the League will be unable to complete meaningful comments without having received the views of members." Postal delays to the West Coast, Hawaii and Alaska are also mentioned.

BOARD MEETING JULY 19

The second of two meetings held each year by the ARRL Board of Directors is scheduled for July 19 at the Holiday Inn in Hartford, Conn. Your views on League policy matters (as for instance the RACES study) should be conveyed to your director (listed on page 8 of this and every *QST*) well before that date; the directors will begin arriving here as early as July 16 for consultations and committee meetings.

SCOUT JAMBOREE: KJ3BSA & KJ7BSA

Amateur radio will be demonstrated in early August to more than 100,000 participants and visitors at the National Scout Jamboree, sponsored by the Boy Scouts of America. Special amateur radio stations will be in operation at each of the two Jamboree sites; Farragut State Park, Idaho, and Moraine State Park, Pennsylvania. The purpose of these stations is to promote amateur radio among youth, to interest scouts in earning the radio merit badge, to handle messages between the scouts and their homes in cooperation with area radio amateurs and nets, and to provide contact with the Jamboree for those not able to attend. Communication will also be provided between the two widely-separated Jamboree sites.

Three separate operating positions are expected to be manned almost continuously, using the special events call signs KJ7BSA July 28-August 9 from Idaho, and KJ3BSA July 30-August 11 from Pennsylvania. QSL requests accompanied by a stamped, addressed envelope may be directed to 225 Main Street, Newington, CT 06111 USA. All other contacts will be confirmed via the bureau. Suggested frequencies for finding KJ3BSA and KJ7BSA are 5 kHz above the lower limit of the General and Novice subbands: 3530, 3705, 3895, 7030, 7105, 7230, 14030, 14280, 21030, 21105, 21355, 28105, and 28505 kHz.

At Jamboree East, message traffic will be handled by members of the Butler County Amateur Radio Association, going into and out of the park by 2-meter a.m. Arrangements for traffic at Jamboree West are incomplete. Routing via organized nets and the National Traffic System of ARRL is recommended; no traffic can be accepted by the exhibit stations or on the listed frequencies.

Ham Radio Manager for Jamboree East is Dave Sumner, K1ZND, assistant secretary of ARRL, and the assistant manager is Shelly Weil, W2GQN. At Jamboree West, Rick Niswander, WA1PID/WA8VRB, ARRL assistant communications manager for contests, is manager and Donald W. Burks, WØOOF is assistant. Dave and Rick can be reached at ARRL hq. until shortly before the Jambo.

EXECUTIVE COMMITTEE MINUTES

Minutes of
EXECUTIVE COMMITTEE MEETING
No. 335 May 5, 1973

Pursuant to due notice, the Executive Committee of The American Radio Relay League, Inc., met at the Sheraton Motor Inn, Birmingham, Alabama, at 9:02 A.M. on May 5, 1973. Present: President Harry J. Dannals, W2TUK, in the Chair; First Vice President Charles G. Compton, WØBUO; Directors Victor C. Clark, W4KFC, Noel B. Eaton, VE3CJ, John R. Griggs, W6KW, and Robert B. Thurston, W7PGY; and General Manager John Huntoon, W1RW. Also present were General Counsel Robert M. Booth, Jr., W3PS; Directors Roy L. Albright, W5EYB, Larry E. Price, W4DQD, and Larry J. Shima, WØPAN; and Vice Director Franklin Cassen, W4WBK.

On motion of Mr. Eaton, affiliation was unanimously GRANTED to the following societies:

Burlington Amateur Radio Club, Burlington, Ontario; Cherry Hill High School East Amateur Radio Club, Cherry Hill, N. J.; DePauw University Amateur Radio Club, Greencastle, Ind.; Don Bosco High School Amateur Radio Club, Ramsey, N. J.; East High Ham Club, Sioux City, Iowa; Harvard Wireless Club, Cambridge, Mass.; J. M. Wright Technical School Amateur Radio Club, Stamford, Conn.; Lakeshore Halls Radio Club, Madison, Wisconsin; Loyola High School Radio Club, Towson, Maryland; Moraine Valley Community College Amateur Radio Club, Palos Hills, Ill.; Mt. Carmel Radio Club, Newark, N. J.; The Nights of The Roundtable, Washington, D.C.; Northern Virginia Community College Amateur Radio Club, Annandale, Va.; The Phillips Academy Radio Club, Andover, Mass.; Prosser Vocational School Amateur Radio Club, New Albany, Ind.; Rice University Amateur Radio Club, Houston, Texas; Richardson Court Association Amateur Radio Club (Iowa State Univ.), Ames, Iowa; Rutherford County Amateur Radio Society, Murfreesboro, Tenn.; Split Rock Amateur Radio Society, Denville, N. J.; Sun City Amateur Radio Club, Sun City, Calif.; Top Of Panhandle Amateur Radio Club, Perryton, Texas; University Of Idaho Amateur Radio Club, Moscow, Idaho; Xavier High School Radio Club, New York, N. Y.

On motion of Mr. Griggs, unanimously VOTED to grant approval for the holding of a Tennessee State Convention in Memphis on October 6-7, 1973; and, in confirmation of previous actions by mail, to approve the holding of a Florida State Convention in Orlando on June 2-3, 1973, a Rocky Mountain Division Convention in Cheyenne, Wyoming, on June 30-July 1, a Midwest Division Convention in Lincoln, Nebraska, on October 5-7, 1973, and a Southwestern Division Convention in North Hollywood, California, on October 20-21, 1973.

On motion of Mr. Griggs, Life Membership was unanimously GRANTED to the following applicants:

Jim Alexander, KØHIP; Ralph G. Alley, W9JR; Richard Aronson, WB2WQU; August J. Asor, W1JAK; Thomas B. J. Atkins, VE3CDM; F. Raymond Aylwin, VE2BCR; R. W. Badrock, VK3-ARY; Marshall P. Badt, W8FBV; Julius Balazowich, K8EYQ; William P. Baldyga, K1YGS; M. Crosby Bartlett, W9MC/WB4OFE; Joseph Bauer, W6NMC; Richard M. Bell, WA4BNO; Gregory L. Best, WBØAZK; Nicholas J. Berg, Jr., WA9AIB; Thomas R. Berger, WØLWA; Bertus L. Berry, Jr., WA6OJV; Ira R. Bickham, Jr., K8HRR; Lloyd O. Bingham, WA5VCN; Lennart H. Bjerken, WB4USY; Harold Blackstone, WB2EPT; Stephen M. Bland, WB9FVW; Ernest C. Blind, W7DDQ; Steven E. Boone, WA8SWM; John R. Boyd, W4WWG; Paul A. Breton, K1IMA; Frank E. Brooks, W4UMC; Charles E. Brown, K4VLR; Donald M. Brownlee, VE2AGW; John W. Browning, W8DDF/W6ASA; Andrew K. Brumbaugh, WA2RPO; Charles H. Brydges, W4WXZ; Francis H. Buchanan, WA4WJH; Richard O. Bumgarner, W3CQM/WA3IGP; Alan Burgstahler, WA6AWD; F. John Byzet, III, WA4IAX; Jack L. Carlson, W7GHO; Richard G. Carnes, W8GSR; Richard H. Carnes, WA8BSL; Kenneth E. Case, K5IZM; Clyde Wayne Chaffin, K5USC; John Jay Christensen, WA7UJY; Anthony H. Cipolla, W2QL; David R. Coahran, WA7FNK; George G. Cole, WB4BYD; Robert A. Collinge, WA4JVA; Onas E. Collins; J. M. Condit, K7HJN; Jerry N. Connaway, W5KLV; Clarence L. Cooper, KØLVR; Paul A. Covey, KØWHO/KG6JAO; Jerry Cross, K4TIG; James A. Crossler, KL7GNZ; Spencer L. Cullen, Jr., WB4VDM; F. Norman Davis, W1GKJ; Robert Deck, WB9DYY; John M. Desloge, Jr., KØGJD; Walter P. Dixon, WA3LAW; Michael O. Dobson, WAØWQI; Benjamin S. Doe, Jr., K6SUA; Joseph M. Donovan, Jr., WA8ZPS; Gerald F. Dreger, WØKB; Edward W. Dunn, Jr., K5PQZ; Carl A. Ebhardt, W4HJZ; Ron R. Eckton, W6DZO; John J. Edell, W2ZPG; William T. Edelstein, WB4OSQ; Richard H. Ellis, W5YCK; Glenn E. Ewing, K7GBW; LeRoy Ferguson, WA2RQH; Kenneth G. Finch, KØKCJ; Fred Fish, W5LO; Loring S. Fisher, W2GCT; James N. Fleming, K9FRZ; David W. Freeman, W4OLA; Roberto Gorbea Frontera, KP4AEF; Robert D. Fusfeld, WA6BHW; David W. Gadbois, WAØVYB; William J. Gage, W5ICL; Fran Galland, WA7DUG; W. H. Galpin, VE3CK; J. N. Garretson, K5QJC; Denis W. Garrod, VE3CYR; David T. Geiser, WA2ANU; James T. Gerrity, WA2DXI; Charles A. Gilliland, WAØKDC; Raymond Grace, Jr., WA6OWM; Dennis B. Griffin, WA2CEB; Karl E. Grunewald, WA8ZAV; Leonard W. Haeseler, W1GFT; John L. Halley, WA5WWY; John E. Hamlet, Jr., K4HHG/DL5ND; Calvin J. Hammack, Jr., K5HWO; John R. Harrison, WA2-ODI; Benjamin Hassell, W8VPC; J. R. Hawkins; Harry W. Hebb, WB4CYP; Phil C. Hendricks, WA6ANR; Wilmer R. Hutchinson, W5EVY; Tokihiko Ikemizu, JA2CAP; Max B. Ives, KØEFU; Edward R. Johnson, WA2EXL; William J. Johnson, WB4ALH; Charles R. Jones, K9TZJ; Gary E. Jones, WA8YXI; Melvyn C. Keesler, W8HLT; Ed Kelly, VP9GE; Karl Khuen-Kryk, W3ZVK/VK6IZ; Carl Kirschbaum, W3OOE; John R. Klingman, WA7MHH; B. C. Knauber, WA7JWY; Ernest A. Knipp; Bennett Kutler; Paul H. LaFrentz, W6KWO; Wilfred Stanley Lamb, W1WHQ; William C. Laubengayer, WØYEY; Frank J. Lauri, Jr., WB2TUT; Elliott D. Lawrence, WA6TLA; Richard E. Lee, K4BAP; Thomas D. Legault, WA1DAF; Kenneth R. Lenz, WB2TBW; Eric H. Lewis, WA2YFM; William G. Lindeke, W9BVL; Walter L. Lototski, Jr., WA1MKS; John R. Low, K3YHR; Donald F. Lynch, Jr., W4ZYT; Stewart D. Lyon, W6CUX; Rex J. Maner, W5QQQ; William C. Mann, WA1-

The Abington Amateur Radio Club has gotten away from any possible "old man" image this year: the four officers installed April 28 range in age from 15 to 22, and all are bachelors. Left to right, seated: past president John Evans, K3SQO; president Robert G. Foytack, WA3EYU. Standing, from left: Jeff Kishel, WA3RGN, secretary; vice president Robert G. Chime., WA3LWR; treasurer George Kondraske, WA3PLP and Chester Brzostek, W3GSG, trustee. The club was very active in the aftermath of Hurricane Agnes last year. *(Photo via WA3LWR)*

FCM; Gary W. Martin, W7GRS; Bruce S. Marcus, WA1NXG; James Robert Mayes, WB4ORP; Robert J. McClements, VP2LJ; Jerold R. McGonegle, K4YGM; Eugene C. McGuire, WN2AXP; Robert J. McKibbin, KØGUY; Neil McKie, WA6KLA; David J. McQuate, WA8YWQ; Alexander I. Meleg, Sr., W8OJW; George A. Meyer, WØAUR; Stuart Mitchell, WAØDYJ; William T. Mitchell, III, WB4JEZ; Richard R. Moist, KØLJJ; Gerald Molaver, K1TGX; Ralph J. Morel, Jr., WA5ZFB; Thomas J. Morgavi, W5FMO; Charles B. Morrison, WA4BXR; John W. Musgrave, Jr., WB6UIB; John Vernon Neal, VE2-BVN; Read R. Nielson, W8KIK; Paul W. Norden, WB2UKW; Delf A. Norona, WA8NDY; Peter E. Olson, WA2BXK; Andrew Omori, KH6GMW; Harry E. Palmer, WA4YDQ; Paul A. Passman, WBØBBC; Charles R. Perring, WA9HMY; H. J. Peterson, WAØLVM; David C. Petke, K1PKQ/KG6; James A. Petroski, K2KIB; G. L. Pierce, K4HIY; Joseph C. Pinckney, WB2VNM; Richard Z. Plasencia, K4YXC; Arthur A. Poulis, WA1MIF; William H. Propst,W3NL; Gordon M. Pugh,W1JTB/W2GHR; Walter Page Pyne, WA3EOP; William A. Ramhow, WB9AVD; Michael W. Raveill, WBØDZQ; Joseph H. Rees, WB5BZE; James A. Reeves, WA9HKE; Frank A. Regier, ODSCG; Glen R. Reid, Jr., K5HGB; K. W. Reid, WØKCL; Alf Reinertsen; Harry W. Reynolds, VE3MO; Julius C. Rivman, W2TD; Stephen W. Rosecrants, WA2LEZ; Joel L. Satin, W3GOH; Benjamin L. Schaefer, WA3ATP; Eric B. Schaim, W8SBS; Lloyd R. Schoenig, K3ZPN/WA2KOI; Donald K. Schwemle,WAØNRE; Gerald N. Seligman, W7BUN; James Shank, W3CNS; Roy J. Shlemon, K6GVG; Richard L. Siff, WA4BUE; Currin L. Skutt, W8FSZ; Leo J. Small, K4AGC; William E. B. Snyder, WN3RAX; Lawrence G. Sollitt, WB2WBU; James K. Sparkman, Jr., WN3SNI; Thomas P. Spetz, WA8WZX; David W. Stapleton, W1GJV; Carl E. Starnes, W4EAT; Lewis Brandt Steingold, W4BLO; Harold M. Steinman, K1FHN; James E. Sumner, VE6AW; Tim Swarthout, WA5QEG; Maury A. Swartz, WA4LYL; Nathaniel H. Swartz, K1SOP; David S. Taylor, WBØCCW; Hoyt K. Taylor, Jr., WB4UZD; Joseph A. Taylor, W9OMT/WØHXC; A. Edward Terpening, W4VCY; Carolyn Thompson, K1BJZ; Dennis Valliant, WA5DVZ; John F. Valker, WØGH; Hugh VanEaton, W4BTN/W5OCH; David A. Vavra, WA3HYF; Kenneth R. Waites, WB9FIX; Thomas J. Warren, WB2JYM; Harry T. Watts, Jr., W9ZYZ; George J. Wear, WA2KAQ; Robert W. Weightman, WA7IPR; Bryan F. West, WB4DRC; Susan D. White, WN6FPU; Sam K. Whitley, W5WAX; William A. Wiese, K3FUO; Bede D. Willenbring, WAØQNV; Norman D. Yeutter, WØKCJ; Ervin W. Young, WB9LAC.

On motion of Mr. Thurston, unanimously VOTED that Dorothy M. McCarthy is authorized to sign, on behalf of the Treasurer, checks drawn on League depositories, vice Diane Heath, resigned.

The Committee proceeded to an examination of FCC Docket 19723, concerning an evaluation of the Radio Amateur Civil Emergency Service, and on motion of Mr. Griggs, unanimously VOTED that the General Counsel request an extension of 60 days for filing of comment in order that QST and other publications will have adequate time to disseminate the notice to interested parties.

President Dannals, jointly with Director Eaton, reported highlights of developments at the conference of Region II IARU, held in mid-April in Santiago, Chile. During the course of this discussion the Committee was in recess from 10:15 to 10:30 A.M., and again for luncheon from 12:05 to 1:15 P.M.

After an examination of recommendations from Communications Manager George Hart concerning rules and procedures for club affiliation, on motion of Mr. Eaton, unanimously VOTED that the material be added to the "director's workbook" now in process, to be used as guidelines.

The Committee next examined in detail and discussed at length the amateur satellite program, and indicated to President Dannals and Director Clark, as representatives of the League to the Amateur Satellite Service Committee, general endorsement of the Amsat proposal to set up an organization for the solicitation and receipt of contributions to further amateur space activities.

The Committee was in recess from 3:15 to 3:25 P.M.

After a discussion of fm repeater problems under the new rules and subsequent interpretations from FCC, on motion of Mr. Compton, unanimously VOTED that the General Counsel request postponement of the July 1 effective date as necessary so that repeater licensees who have not been able to meet the deadline for filing applications will not be obliged to cease operation pending completion of paperwork.

On motion of Mr. Eaton, unanimously VOTED that the League takes due note of May 17 as World Telecommunications Day, and that a message of congratulation be transmitted to the International Telecommunication Union.

During the course of its meeting the Committee discussed, without formal action, the 220 MHz amateur band situation, W2OXR's court appeal on Docket 19245, credit for portions of amateur examinations without payment of multiple fees, the Intruder Watch, a "procedural manual" from the General Counsel for the information of directors, and a forthcoming hf World Administrative Radio Conference.

There being no further business, the Committee adjourned, at 5:25 P.M.

Respectfully submitted,
JOHN HUNTOON, W1RW
Secretary

ARRL REQUESTS POSTPONEMENT OF REPEATER RULES

Complexities of the new rules in Docket 18803 concerning repeaters, especially as involves compliance with the requirements for license applications, coupled with uncertainties as to just how they would be interpreted and applied, has delayed submission of applications by many active repeater licensees. Believing that a shutdown of current repeater activity would be highly undesirable, especially as it might disrupt emergency communications capability, ARRL has requested postponement of the effective date to make certain all licensees have adequate time to submit their applications in the proper form.

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of Effective Date of Rules for Amateur Repeater Stations,
Section 97.41 (d) et seq.

(Continued on page 89)

FM REPEATER NEWS

At press time, FCC has been issuing repeater licenses at a pretty good clip. It is difficult to get an accurate figure but it is safe to say that the number of WR calls has now passed the 150 mark. An up-to-date figure on the number of repeaters in the United States would be something over 700. This is easy to verify because we have just completed the 1973 edition of the *ARRL Repeater Directory* which lists 718 repeaters. Incidentally, if you desire the latest edition, please send us an s.a.s.e., 6 × 9-inch envelope, with 28 cents postage, first class.

Band Plans

A great deal of work has been done by the ARRL Repeater Advisory Committee on national band plans and some results can be reported. The 600-kHz spacing has been standardized in the 146- to 148-MHz band, using 30-kHz spacing as a standard and with 15-kHz splits as needed. The portion from 146 MHz to 147 MHz employs low inputs with high outputs. There has been considerable discussion as to input/output standards in the 147- to 148-MHz section. The California plan, which calls for inputs high with outputs low is the one the committee elected to follow. With very few exceptions, the majority of machines on the West Coast, the North Central section, and the entire East Coast are operating high in, low out, in the top segment of 2 meters.

The band plan for 220 MHz that has been adopted is exactly the same as proposed in November 1972 *QST*. This plan is the one put forth by the California Amateur Radio Council and the Northeast Repeater Association. For those of you not familiar with the plan here are the details.

It is proposed that 220-MHz fm repeaters employ a 1.60-MHz input/output spacing with input low and output high, with channel spacing of 40 kHz in the 220-MHz band. When the demand for channels dictates, these channels will be split to 20 kHz in the 220-MHz band. Development of 220-MHz repeaters should begin with the 223.38/224.98-MHz pair, and proceed down the band. Full-duplex repeaters should begin with the 222.34/223.94-MHz pair and grow up the band. Calling channels at 223.50 MHz are suggested. It has been proposed to use 20-kHz spacing at the start but frequency coordinators should not assign adjacent channels in any given area.

National FM Simplex Calling Channel

There is demand, particularly from areas with little or no 220-MHz activity at present, for a "National FM Calling Channel" analogous to 52.525 and 146.94. We therefore propose that 223.50 be established as such a national calling frequency (simplex only).

AFSK RTTY FM Channels

There is also demand for a national repeater channel pair. 223.10/224.70 is proposed for this use, and should be easy to remember as 146.70 is quite popular in many areas for this use.

Point-to-Point and Control Links

Much of the use of the 220-MHz band up to now has been for remote control links. Since such applications are not required to be within the segments allocated for repeater use, we urge that the segment from 220.30 to 220.00 be used as much as possible for these purposes, with growth starting at 220.30 and proceeding up the band.

Input Low or High

We suggest that all repeaters in the 220-MHz band operate with inputs low and outputs high. With high outputs in the 220-MHz band there is less possibility for TVI to channel 13, and there is less chance of causing QRM to the DX chasers in the 220- and 222-MHz segments.

440- to 450 MHz

There are still no firm recommendations for 450 MHz. The committee is still trying to resolve the problems of a band plan and hopefully, we will have news soon.

18803

Howard Lester, W2ODC, Chairman of the Repeater Advisory Committee, has asked his committee members for advice about repeater and remote-base regulations. Should there be changes in the repeater regs? What should be changed in the repeater rules? Why the change is needed? What should the rules be changed to? If you are a repeater owner, give the problem some serious thought and then write promptly to Howard.* The information will be correlated, discussed by the committee, and then passed on to the ARRL Board of Directors for consideration at their mid-July meeting. — *WIICP*

* 8 Bath St., P.O. Box 6, Alplaus, NY 12008.

Amateur Satellite

(Continued from page 71)

requires only 0.02 watts of power for normal operation and will function properly at temperatures between −40°F and +160°F. John Goode, W5CAY, who designed and built this system, must be congratulated for his work on this truly unique concept. Amsat feels that this system has many spinoffs and is trying to encourage the use of this design in other applications. It could be employed to monitor the status of terrestrial repeaters or could become the eyes of a blind amateur who wishes to monitor voltages, frequencies and currents pertaining to his equipment.[3]

Part II which includes descriptions of the Command Decoder System, Codestore, the Two-to-Ten Meter Repeater, and the 435 MHz beacon, will appear in a future issue. QST

[3] King, Jan A., "Australis-Oscar 5 Spacecraft Performance," *QST*, December 1970, pages 64-69.

The World Above 50 Mc.

CONDUCTED BY BILL SMITH,* W7JNK

Tropo Ducting

TYPICALLY this time of year we are favored by tropo conditions that result in an extension of the normal vhf and uhf operating ranges. Tropospheric ducting has been responsible for many extremely long-haul contacts, such as the 432-MHz work two summers ago between the midwest and the east coast, and more recently a 700-mile contact on 1296 from the midwest to New York. The transpacific work of W6NLZ and KH6UK is a classic example. More of these opportunities may be available than are being observed, and a basic knowledge of factors contributing to ducting will aid in their observation.

The "normal atmosphere" is one in which the temperature is highest at or just above ground level, the air becoming cooler with increased altitude. Similarly the air closest to the surface has the highest water vapor content, this factor also showing a steady decrease with altitude. The weather is constantly changing and weather forecasters take readings throughout the day of air temperatures and water vapor content at the surface, and at elevations to 20,000 feet or more.

Cold or cool air surges southward from Canada and warm, moist air drifts north from the Gulf of Mexico. The area where opposing air masses meet, forming a boundary line between the two weather systems, is what vhf DXers should be interested in. To the north of the boundary line the air is cold and dry, to the south the air is warmer and moist. Across the boundary line in a space of a few miles to perhaps 100 miles, temperatures differ sharply, as does the moisture content of the atmosphere.

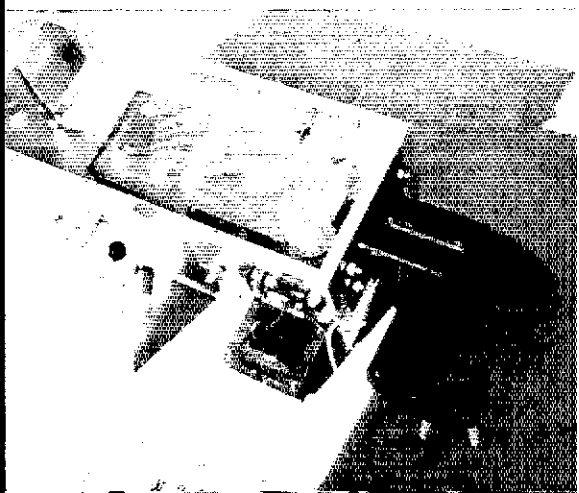
The formation of this boundary line between air masses is the most important key to long-haul tropospheric bending of vhf waves. One of the unusual properties of such air-boundary formations is that in the region where the atmosphere changes from hot to cold, or wet to dry, an invisible electronic pipeline, or duct, may form and stretch along the boundary line at elevations varying from tens to thousands of feet. A tropo duct could be compared to the metal ducting work in heating and cooling systems, but with two of the four sides. Signals entering the ducts are virtually unattenuated by distance, and are propagated as far as the duct extends. We don't know a great deal about ducts and what is known may be of limited accuracy. But as a guide to when and where to look for ducting DX, we offer the following.

Ducts are frequency sensitive and are seldom physically large enough in terms of wavelengths to propagate 50-MHz signals, but at 144 MHz and up signals are easily propagated. The efficiency of a duct as a transmission device increases with frequency, to the cut-off frequency of the particular duct. Therefore, if a duct is good into the uhf range, signals there may be stronger than vhf signals.

Ducts are usually associated with cold fronts moving into a region that has been warm, fairly moist, and stable. Time of day does not matter, and a dramatic change in temperature is not required. A drop of 10 to 15 degrees across the front is often adequate, and mild temperature changes are usually better since they are less likely to be associated with unstable conditions, such as in thunderstorms, which could destroy a duct.

If there is severe weather it usually forms along the leading edge of the front. The vertical movement of air flow along the front virtually guarantees that no duct will form, unless the weather is very stable immediately behind the front. Ducts *directly associated* with a front usually form just ahead of the front, just behind, or seemingly along the actual boundary. It appears that a duct associated with a cold front moving south, the duct is more likely to form just after the front passes, whereas if a duct forms in association with a warm front moving north, it will appear just ahead of the front. On the occasion that a duct is not associated with the direct front line, it may

* Send reports and correspondence to Bill Smith, W7JNK, ARRL, 225 Main St., Newington, CT 06111.



Typically ham nature, take a given design and modify it, and that is what W9OJI did with the K2RIW 432 amplifier. W9OJI's version has been reworked for 144 giving excellent results. Information is available from W9OJI.

John Meyers, WA7VJE, is one of the many 50 MHz ssb operators active in the Phoenix area where competition is keen in the quest for 50 MHz WAS.

form at right angles to the front. This typically occurs when a cold front traveling south from Canada generates a northward flow of moist air from the Gulf of Mexico, feeding a low-pressure center associated with a cold front. The warm moist air travels north, quite often at altitudes of 1000 to 3000 feet, creating a thick blanket of warm moist air with a sharp contrasting layer of dryer air above.

In a sense, the duct is carried along by the front. If the front is moving at 15 miles per hour and the duct-type opening lasts one hour at your location, it could be assumed the duct has a width of 15 miles. This narrow width is a major reason why the favorable propagation conditions associated with it may be missed. You have to be within the area to place a signal into the duct. The ducts can form quickly, last but a few minutes, and pass just as quickly. Although the duct may be quite narrow, it may extend over one thousand miles.

Duct-propagated signals may be quite strong, or quite weak, but normally they have nearly constant amplitude. Power and antenna height are not necessarily important for long-haul ducting.

While there are much more technical explanations for weather patterns and how they effect tropo ducting, the information given here will serve as a guide as to when and where to look, and, we hope, help you work some long-haul DX this summer and fall. For more on tropospheric propagation and other forms of vhf DX, see Chapter 2 of *The Radio Amateur's VHF Manual*, and the bibliography at the end of that chapter.

OVS and Operating News

50 MHz was beginning to convince DXers in mid May that the 1973 summer sporadic *E* season was never coming. There were third-hand reports of *E* openings the last week of April, but the week of May 13 saw the band beginning to open in most areas. Apparently the first major opening came the evening of the 17th. From Oklahoma City, K5CFM found six meters open to both coasts at the same time. Tony either worked or heard stations in Maryland, Virginia, North Carolina, Tennessee, Washington and California and as the MUF shot upwards, Arkansas was worked (a 300-mile-plus path) in mid-evening. K5CFM adds that 6-meter fm travelers in Arkansas and Oklahoma are welcome to use the three repeaters operating in Tulsa, Oklahoma City, and Fort Smith; 52.68 in and 52.525 out.

W5ORH, also Oklahoma City, said he heard several 8s and 9s on 144 MHz about the same time. The following night 6 was open for more than seven hours from Oklahoma City, particularly to 6s and 7s, with strong signals. W7JRF, Phoenix, worked many 5s and 6s, lending hope of a productive summer *E* season, however late.

W1HDQ, Canton, Ct. observed E_s briefly several times on the 10-meter band during April, but the first solid 50-MHz opening came the morning of May 17, to Florida, as represented by W4GDS, WB4OSN, WB4BND, and WA4MHS. W4GDS caught the opening when he ran across the morning W1AW code practice session (50.08, cw, 9 am EDST, Monday through Friday).

As the morning wore on, the Floridians began to work stations to the northwest. In the period around noon, W1HDQ was able to hear back scatter from Kentucky, Indiana, Ohio, and Michigan stations, working the 4s. They were heard only from the south, there being no trace of signal on the direct path. This back scatter was exceptionally well-defined, and more like what would be expected of $F2$ than E_s propagation. On May 23 the band sounded the same, from Connecticut to Florida, but no back scatter could be heard when the optimum path for the 4s shifted around to the northwest. The first double-hop came that night.

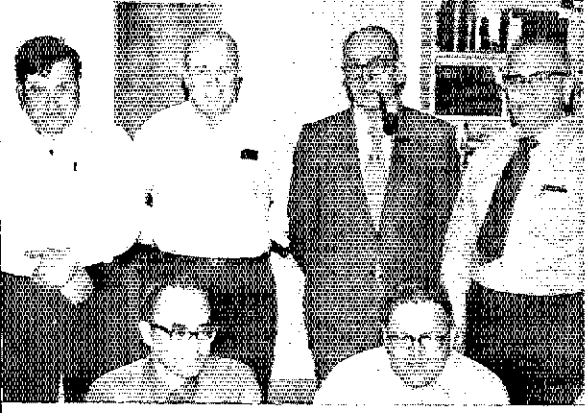
The first three Florida operators mentioned above were the crew of the VP5RS DXpedition, which did such outstanding work on 6 last June. W4GDS mentioned that cards for that expedition can still be obtained, but don't wait much longer; the supply is nearly exhausted. Send a stamped addressed envelope with your card.

Bob also passed along recent word from 8P6EN, who worked many US stations last year. The 8P6EN ssb beacon is currently in operation for 5 hours daily, beginning at 2230Z, on 50.103. As of May 20, Alan had worked only Kentucky and Kansas this year. Be sure to let 8P6EN know if you hear him – with copy to us, too, please!

Earlier in this reporting period this is what was happening around the country. WA1OUB, New Hampshire, worked long-haul aurora April 13 to VE4MA and W7VDZ, Wyoming. Bob said W7VDZ was heard by WA1EKJ in Maine. WA1OUB worked all U.S. call areas except 5 and 6, while running 500 watts to a pair of stacked 6-element wide-spaced Yagis at 70 feet. WA3PNQ, 60 miles south of Washington, D.C. in Maryland, says the April 1 aurora was the strongest he has ever heard. No doubt about it, April was a fine month for aurora, with "the buzz" being reported on at least 13 days of the month.

At Norfolk, Va., WB2LAI/4 reports *E* to Texas the morning of April 8. He recently completed a new receiver and has a new 10-element Yagi 73 feet in the air.

K5ZMS/5, San Antonio, says April wasn't too productive, but he heard Spanish-speaking stations April 13, apparently from South America, via *TE*. JA1LZK wrote Ray from Japan that JAs were working into Australia and Guam, "but nothing out of the ordinary." (I) JA1LZK says the level of six-meter activity is quite high in Japan and with the 50-watt power limit, many JAs are concentrating on antenna systems. Stacked Yagis and



K1OJQ took this picture at a recent informal vhf confab in the Boston area. Pictured left to right, standing, W1GAN, W1JOT, VE2LI and W1AYG. Seated are K4GGI and K1AGB.

some 4-bay systems are becoming popular. Alan, 8P6EN, Barbados, tells Ray he will be going to Australia this coming winter, so those still needing an 8P6 contact would do well to work Alan this summer.

K4FPT/7, Tucson, Ariz., is looking for a-m contacts above 50.4, running mostly homebrew equipment. W7UQ, the club station at the University of Idaho, will be active this summer, operated by WA7FSL. Gary says he hopes to put Idaho into many six-meter logs, with a Swan 250C and 6-element Yagi. In Phoenix, W7JRF, ex-K8REG, works Bay-Area stations with ease, on Saturday and Sunday morning scatter. Vince reports several minor *E* openings in early May. K7ZCB, near Portland, is getting his feet wet in the scatter game, after a contact with W7JRF.

WBØFVL, Minnesota, sent a photocopy of a photograph he made of the 6-meter fax signal of WBØBJN, Iowa, during the April 1 aurora. It would not reproduce well here, but it is interesting to see what an aurorally-propagated fax signal looks like! In addition to the April 1 contact, Bob worked WB8KAY, Michigan, during the April 14 aurora giving him five states worked via fax. He says KØFDS and WØALG are also active in Minnesota on 50-MHz fax.

There appears to be some confusion as to the actual frequency of the KH6EQI beacon. Last month I had word from KH6HLK, gathered during a 20-meter contact, that the beacon operated on 50.110. Now I have a letter from KH6GRU saying the beacon is on 50.104, transmitting "VVVV de KH6EQI," with a recently updated solid-state cw identifier.

144-MHz DXing was boosted by April aurora. W3LNA, Pa., worked his state number 27, South Dakota, on the 14th. Larry also worked into Minnesota, Illinois and Wisconsin the same evening. K4MSG, Avon, N.C., continues to improve his station adding a ssb mixer and a pair of 6146s for summer tropo work. WA4WZQ, Winston-Salem, N.C., found the April 1 aurora to his liking, adding several states to his growing list. Contacts included Iowa and Missouri. He runs about 200 watts and has a 44-element Yagi array. In Arizona, WA7FPO, Phoenix, has joined WA7BBM, Tucson, on ssb and is running 200 watts to a 16-element Swan-type Yagi at 70 feet. Glen will be watching for 144 *E* this summer.

In Michigan, WA8KPN got in on the April 1 aurora, working from New Hampshire to Iowa. Says Ralph, "sounded like 40 meters at contest time." W8UCI worked 13 states during the April 1 session and WB8JXF reports that K8LZF worked stations from Massachusetts to Missouri.

In Minneapolis, WØRLI says April was *the* aurora month, with buzz openings on 13 days. April 1 and 13 were the best. The April 13 opening, a late-night affair, apparently caught many operators sleeping, but Hank says K2RTH, New York, worked a 1187-mile haul to KØWLU, near Sioux Falls, South Dakota. Hank heard only 17 stations active, but the opening was better than the now much-heralded April 1 aurora. Signals over 1000-mile paths were typically 20 dB over the noise. WØRLI offers some interesting suggestions, especially when searching for long-haul aurora. Hank has observed stations answering his CQs tend to be below his frequency and that there appears to be a negative frequency shift on long-haul paths. Hank suggests on paths in excess of 700 miles that the answering station transmit one to two kHz high. And, I might add, it wouldn't hurt to tune the receiver either! Seemingly we are falling into the low-band pattern of listening only on our own frequency, a bad practice on vhf. WØRLI goes on to say that long-haul signals seem most often to appear when loud near-local signals are building or fading. The long-haul signals peak anywhere from a true heading to 30 degrees north of true, and on occasion, even south of true. Don't neglect to peak the antenna on every signal! Hank believes many long-haul aurora contacts are missed because of improper antenna heading, and lack of activity in upper midwestern states.

In Hawaii, KH6HRV and KH6HMD are now active on 145.1 MHz ssb. KH6HLK will soon join them and all three would entertain tropo schedules with the mainland. Interested operators should contact Steve Grant, KH6HRV; P.O. Box 411; Haleiwa, Hawaii 96712.

220 and 420 MHz got some play from the state seekers during the April aurora sessions. W5ORH, Oklahoma City, and WØEYE, Colorado exchanged reports giving each a new state, and then switched to 432, where they found signals peaking 15 dB above the noise. Again, new states for both. WØEYE also worked WØYZS, Missouri, for another new state. KØTLM, Kansas City, also heard WØEYE on 432, but could not make it 2 way.

WA6UAM, San Jose, has updated his 220 receiving system with the addition of a new preamp, and says W6RME will soon join the growing number of San Francisco area 220 operators. K7ZCB, near Portland, has his new 220 amplifier working. W8UCI, Michigan, made his first 220 aurora contacts April 1, working K2BWR and W2EIF, both in New Jersey. Gerry notes that 220 aurora signals seem broader than their 144-MHz counterparts. VE3EMS has developed an easily-duplicated two-tube 220 transmitting converter, built on a circuit board. K2RTH, W2EIF and W3CJK assisted Peter in the project. VE3EMS says he can supply a template and construction information for postage. Remember that U.S. stamps can not be used in Canada.

Everytime I publish the WAS boxes I get in trouble with someone. This last time I prompted the wrath of K4QIF. Be it known to all that Rusty has 22 states, 7 call areas and best DX of 1065 miles on 432, placing him number one in the fourth call area. K4QIF also reports two new states

Highlight of the West Coast VHF-UHF Conference, held May 4-6 at Manhattan Beach, California, was a lively EME Forum. Participants included, from the left, Mike Staal, K6MYC; Steve Mieth, W6YFK; Lewis Anciaux, WB6NMT; Joe Reisert, W6FZJ; and Harley Herndon, WA6HXW.

on 1296; his own, Virginia, W4JFU, and adjacent Maryland, W3AED; bringing Rusty to 8 states, 5 call areas, and 551 miles on 1296.

West Coast VHF-UHF Conference

This annual affair is held in various California cities each year the first weekend in May. The site in 1973 was Manhattan Beach, California. Program Chairman WA6HXM offered fine technical fare; the latest solid-state technology, transmitting and receiving; nostalgic 50-Mc DX tapes; Oscar info; perhaps the most comprehensive EME Forum yet presented; noise-figure and antenna-performance measuring sessions; and a philosophical look at "The World Above 50 Mc" by retired *QST* VHF Editor, Ed Tilton, W1HDQ.

Noise figure measurement ran far into Saturday night. Conducted by Chuck Swedblom, WA6EXV, assisted by Bill Burns, WA6QYR, this resulted in comparative evaluation of over 40 units, both converters and preamplifiers, for 50 through 2304 MHz. As usual, this part of the program brought some surprises, pleasant and otherwise, such as a 50-MHz converter with a 15-dB noise figure (WB6YVP), and a 40673 preamplifier showing 1.6 dB (W6FZJ). FET converters for 144 by WB6IMV, WA6EXV, and WB6YVP showed 2.25, 3.0 and 3.2 dB, while a Parks 6CW4 job entered by K6ZE showed 4.8 dB. Nine transistor preamps for 144 ranged from 1.1 dB (WB6NMT) to 9.5 dB (WA6NUL).

Homebuilt 220-MHz converters by W6OLP, WB6YVP, and WA6UAM (the last with a 417A front end) were revealing, at 6.25, 11, and 15 dB. Three transistor preamps by WB6NMT should help those converters, as Louis' amplifiers gave readings of 0.4, 1.25, and 2.3 dB.

Two Parks 432-3 solid-state 432 converters (K7ICW and WB6CXF) did fairly well, at 4.5 and 5.6 dB. WA6EXV's homebuilt job did 6.0. The best 432-MHz preamp (W6FZJ's, using an MT4575 transistor) measured 1.2 dB. Joe had two others, another MT4575 and a 2N5650) under 2 dB. Six other front ends for 432 (by W6FZJ, K6JKQ, K7ICW, and K5FPT) did 2.5 dB or better, but WA7FPO didn't fare so well at 8.25 dB.

Two 1296-MHz converters by WB6CXF and WA6EXV showed 8.0 and 8.4 dB. Two preamps for this frequency (W6FZJ and WA6UAM) did very well, at 3.5 and 4.5 dB. A 2305-MHz converter by WA6EXV measured 3.5 dB. Since this had a diode mixer with no preselection, the low figure may have been the result of lack of rejection at the image frequency. In any event, WA6EXV wants it known that none of the figures is guaranteed in absolute terms. The best available equipment and techniques were used, so the results should be useful on a comparative basis.

The EME Forum brought together outstanding moonbouncers, including some who have EME capability on two bands. The great increase in interest and participation in this session provided ample evidence of the growing stature of EME in vhf and uhf circles.

A bit of the show was a demonstration by Bill Troetschel, K6UQH, who brought his "poor-man's" solid-state transverter for 1296 MHz. The receiving portion of this unit *may* be in this issue of *QST*. (No way to be sure, at this writing, but it is expected to be here.) Bill kept the ssb signal source a secret until the last moment, then brought down the house by revealing it to be a 27-MHz CB rig! It does the job extremely well, however, and fits nicely into a project for an all-12-volt 1296-MHz ssb station. W1HDQ can vouch for the performance of this setup, having observed it in operation, two-way, on 1296 MHz over a 50-mile path, from K6UQH, a few days previous to the Conference.

FP8AA Operation on 50 and 144 MHz and Oscar

Rich, K2OJD/FP8AA, will be in operation from St. Pierre, beginning about August 7. He will keep meteor-scatter skeds on both 6 and 2, with emphasis on the latter. He will also try for Oscar contacts, with cw, on 145.95 MHz. Other operating frequencies will be 144.1 MHz (ssb and cw), and 50.11 MHz (ssb and cw), with possible shifts to 50.09 MHz, in case of severe QRM on 50.11. Skeds will be kept on 144.1 only. Anyone interested, contact K2OJD or W2AZL. Oh, yes, FP8AA will also put in some time on 1.827 MHz, tuning 1.806 MHz, and plus and minus 3 kHz of his own frequency. QST

One corner of the appreciative audience at a Conference Technical Session: Foreground, John Manon, W6FIG, of TRW, who presented information on VHF and UHF solid-state power amplifiers. Left, Ed Tilton, W1HDQ. Right, Paul Shuch, WA6UAM. Conference photos by WB6BMB.

How's DX?

CONDUCTED BY ROD NEWKIRK,* W9BRD

H o w :

A contest inertia problem always nettled W9DY, president of Radio Amateur Megacycle Society. Take ARRL's Field Day, for example. The club's dozen or so operators each naturally required a half hour, more or less, to limber up and get contest exchanges rolling smoothly. This was especially true if any exchange specifications differed from the previous year's routine. Clearly this warm-up hesitation subtracted from over-all results.

Bud mulled over remedial measures for a while, then had each member bring a pencil to a pre-FD RAMS meeting where prepared sample contest log sheets awaited. The pages carried sample exchange info for initial reference, as well as assigned callsigns. For an added fillip W9DY selected juicy calls – SY1MA, AC4YN, YK1AA, etc. A chance to be rare DX! When the gang had their pencils and paper ready Bud hollered "Go!" and the fun began.

Slowly at first; the guys were a little self-conscious opening up, talking to themselves as it were. Then "SY1MA" and "AC4YN" called short CQs and the fight was on. Bedlam! A Chinese kindergarten would have been proud of the decibels. Cupped hands beamed audio all over the hall, QSOs began adding up and 20 never sounded so grand.

After a riotous twenty minutes W9DY silenced the battle. By then RAMS not only had the Field Day exchange down pat but they had established to the satisfactory enlightenment of everyone the minimum station identification tolerated by FCC in such activities. *This* is important. A later tape playback added to the fun. Member WB9AJZ, it was ascertained, won this impromptu DX test by working every other "station" and a dupe besides.

Parker Brothers probably could do up a fancy package for this little gig but all you really need are pencils, scratch paper and a little lung power. When the bands drop dead, folks, don't fidget, fret and fume. Call a club meeting and go all-audio, even A2 oral telegraphy if you like. Instant pile-up, and any number can play.

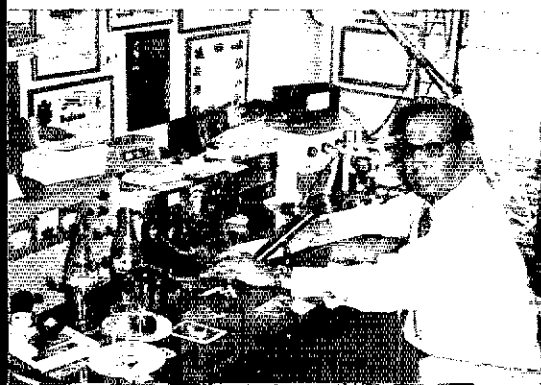
† † †

W h a t :

All that activity you dig in a ham's back yard may not be routine grass farming and gardening. It's the 160-meter off-season, you see, and what's better than radials for a current-fed vertical? More radials, of course. It's tedious back-bending work but higher radiation efficiency is the payoff and the jackpot is more DX. Unless you have room for a high and long horizontal, another 1.8-MHz weapon of proven effectiveness. Anyway, it's time for a recap of recent 160-meter DX developments thanks to correspondence from Ws 1HGT 2BP 3IN 4BRB 4WFL/1, WAs 1GXE 9NKT, VO1KE and the encyclopedic W1BB newsletter. . . . Some countries totals recorded after the 1972-'73 season's fireworks: W1BB 112, KV4FZ 88, W2EQS 86, W8ANO 78, W1HGT 65, W9PNE 62, W4BRB

*c/o ARRL, 225 Main St., Newington, CT 06111.

XE1LLS, one of our many good ham neighbors to the south, runs a potent installation in Mexico City. Miguel makes his mark in any DX operating event that comes along and strives to QSL 100 percent. The inviting QTH of the Month at right is that of XE1DE at Villa Obregon. *(Photos via WB6KUC and F. Roberts)*



59, W2BP 54, PY1DVG 36, 8P6DR 34, WA4RGH 28, EP2BQ 18, WB9BUV 17, OK1MCW 17, WA9NKT 12 and ZL1AYG (now ZL2AGX) 9. In this regard it's interesting to note that research by the North Wales University College GW3UCB gang indicates that as many as 237 countries have been active on 160 at one time or another in past years . . . . Worked All Continents, an achievement now certified for 160 by ARRL for IARU, was lately gained by Ws 2EQS 4BRB 4QCW 6RW, K4BHG, WA4PXP, WB4JFK, OL1AOH and other collectors. DL9KR claims the feat four times and needs only Africa for a voice sweep, a stunt already clinched by W1HGT . . . . In this new 1.8-MHz era there's more than enough DX to go around. Here's a sample of what you missed if you're stuck with one of those 80-and-up factory stations: CO2s DL QR, CW3AA, CXs 2CR 3BH, DLs 1FF 9KR, DU1PAR, ELs 8H 9J, ELs ØN/mm 2CB, EP2BQ, FMØADT, FPØCA, dozens of Gs, GB3BCT, GC3ZES, GM3s IAA IGW WDF YCB, GWs 3UCB 3UPK 3YGH 4AEC, HBs 9CM 9NL ØNL, HR2HH, HS1AHM, JAs 1HKP 2GQO 3AA 3AHQ 3SCG/mm 3UI 6CAZ 7AO 7IO 9AKU/mm, JD1ACX, JHis HVF LKH, JR6s AG CF EA, JY9FOC, K5CIT/KH6, KB6DA, KH6JBO, KH6s CHC HCM IJ RS, KL7s CL HIY, KP4s AST CS DLW, KS6DH, KV4s EY FZ HW, KZ5LS, LUs 1BSA 5EVM 5HFI 6EF 8BAJ, OA8V, OE5KE, OKs 1ATP 1FCW 1FGW 1JCW 1MAC 1MCW 2BCI 2BEN, OKs 1AOH 1APC 5ANJ, PAØPN, PJ2VD, PYs 1DVG 1MGF 2BJH 2BKO 2FIQ, VKs 2AVA 2EO 2LS 3ABR 3ACE 3APN 3AQO 3AKN 3AXZ 3BM 3CZ 3KS 3QI 3XB 4LQ 5BC 6HD 7IB 9GN, VO1KE, VPs 2AAA 2DAE 2LH 2MAD 5RF 7NY 8KF 9BO 9EW, VR1W, VS6DO, WAØZQB/KL7, YN1CW, YVs 1AR 5CIZ 5CKR ØAA, ZD9BM, ZF1GS, ZLs 1AQ 1AYG 1MQ 2AGX 3OX 3RB, ZP9AY, ZS1MH, 4M4AGP, 4W1AE, 5W1AL, 5Z4KL and 8P6DR. A few of the many whopper two-ways included WA8IJI-JA7AO, OK1ATP-W7DOL/6, K6UA-G3ZEM, W1HGT-VR1W/KB6DA, 4W1AE-VE1MX, W1BB-VP8KF, KS6DH-KV4FZ and VK6HD-GW3YGH. Not bad for a "local" band, eh? . . . Some of the brethren banging away from our side were W1s BJJ GAM GBP IIJ PL, K1ICD, WA1s JUY PID, W2s AQT HUG IU GBY KHT LL LWI QD TR UEZ UWD, K2s ANR BQO GNC OJD, WA2HNK, W3s HUS VAN, W4s EX YWX, K4s CIA IXC, WA4s DRH GEQ SGF, W5s RTQ SBX SUS SZ YG, WA5s REL ZNY, W6s ITY TYR, K6s DDO ILG, W7s ILC OAU, W8s ALB EOJ HKB JIN, K8s HKB KAS, W9s BQM DL UCW, K9YWO, WA9UET, WØs NFL PSF RHI, VEs 1ASJ 1ZZ 3BM 3DU 3QU 5XU 7UZ and KL7HEE/W3. Always room for more! . . . Beverage receiving antennas, anyone? No, we don't mean beer-can verticals. WA8IJI rigged up three of 'em, each a thousand feet long supported by trees and poles just high enough to clear ambling bipeds. Quarter-mile spools of light but strong electric-fence wire did the job. Terminating the end of preferred direction with a 300-600-ohm resistor kills QRM from the rear in accordance with theory. Tested against various skywires the Beverages produce a consistent three-S signal-to-noise advantage. One of these monsters clinches a QSO with JA7AO . . . . PY1DVG's Beverage, a 600-footer, gives him a ten-dB S/N boost which he finds crucially advantageous in pulling through weak Europeans. Rolf's varies in height from 7 to 17 feet with the favored end terminated in 300 ohms to ground. As is customary, no insulation precautions were taken. . . . W1BB got his Beverage back up, and K2GNC is another new member of the big-B club who reports gratifying DX results. W2BXS/1 found enough terrain available up Maine way to reel out a Beverage. Jack used to punch brass at WSL . . . . Famed DX pioneer Paul Godley dropped W1BB a line to express interest in modern Beverage use. He recalls, however, at the Ardrossan Transatlantics site of yore, that fade-outs on the long ground-scraping horizontal sometimes still left audible signals on a big vertical. Paul suggests that 160-meter men in positions to do so thoroughly investigate possibilities of such diversity reception. Mr. Godley, whose ham ticket 2ZE expired in 1924 due to business and family pressures, still keeps an ear on the bands and claims a current code speed of 40-45 wpm, both landwire and radio versions! . . . OK1ATP, who found the 1972-'73 season a shade beneath 1971-'72 in DX intensity, is thinking in terms of 1.8-MHz rhombics and 8JKs! Meanwhile Jarda hits every continent with his big horizontal dipole . . . . K2GNC and others get fine DX results from phased verticals. Bill's 130-foot-spaced job has a nice lobe toward Europe and front-to-back ratio that effectively chops down kibitzers to the rear. . . . Theorists abound on top band. SWR G. Allen of Australia, long an astute 1.8-MHz observer, suggests an optimum-sunspot-numbers theory for best overall 160-meter conditions. That is, the band's DX possibilities worsen both above and below a certain value of solar activity. Fellow ionospheric student DL9KR notes enhancement of 160-meter DX conditions in the early stages of magnetic storms. Jan agrees that those sunset-sunrise propagation peaks are made even more impressive by accompanying dips in skip-noise figures. . . . Ocean-going mobiles are getting into the 160-meter act. ELØN/mm (G3UOF) runs 100 watts to a 280-foot lazy-L aboard the *Alchiba* on Caribbean runs. JA3SVG/mm plies the Pacific, working much stuff near 1805 kHz around 1000 GMT. . . . W/Ks hunting Hawaii, those who can do so, are urged by K5CIT/KH6 to use the 2-MHz end. In KH6-land the 1.8-MHz slot is pinned by loran, other QRM, and is more subject to signal absorption per frequency ratio. Try the high end for KH6s about a half hour before your local sunrise. . . . EI2CB, who is Mr. Africa in many a WAC-hungry 1.8-MHz log, observes: "Very few gentlemen left on 20 ssb. It's refreshing to find the 160-meter DX atmosphere so different, no cutthroat jamming, obscenities, etc. I find low-band DXing still a gentleman's hobby where QSLs arrive direct and immediately." . . . Alas, apparently QSLs can come as hard on 160 as on any other band. GM3WDF worked 43 W/Ks, QSLd every one, and so far has only seven (7) replies to show for it. Fellas! . . . Fanciers of QRP find top band a worthy challenge. W9PNE's five-watter has accumulated more than forty states. . . . G3TZM, held to the 10-watt British power limit on 160, finally crossed the pond to W1HGT after five years trying. . . . EP2BQ found it lonely during quiet periods not to have locals with which to compare DX notes. Harry, needing only Oceania for WAC, is constantly amazed at the long 160-meter bounce. . . . LU8BAJ enthusiastically returns to 1.8 MHz after 47 years of the higher-frequency rat race. . . . W2EQS, long a ringleader in 160-meter operating ventures, closed his New Jersey top-band log at almost ninety countries worked and moved to Indiana. Welcome to the midwestern hoondocks, Chas — you'll have to *sweat* for EUs now. . . . W8ANO says he hasn't called CQ DX in years and votes for less CQ-DXing on 160. He once counted a solid dozen CQ-DXs plastering QSOs around 1805 kHz When the band is obviously open with goodies rolling in why not quietly choose a target? . . . W6BHY, who made quite a few WACs possible for Oceania-hungry 1.8-MHz folk while signing VR1W and KB6DA from the same hamshack, urges QRQ and shorter calls when 160 hots up. Too much 10-wpm clunking when 25- or 30-wpm code would be perfectly readable. . . . The 1825-1830-kHz DX window to Europe (the only spot over there usually clear of continental commercials) gets harder to keep open as local W/K 160-meter ragchewers proliferate. Even certain DX hounds who stand to benefit most by not transmitting in that five-kHz notch sometimes clobber it. HW NW? . . . Markers WCC, WNU, KPH and DHJ on 2036, 2048, 2054 and 1830 kHz respectively continue to radiate solid clews on 160-meter conditions. Then there's W1AW on 1805 with scheduled transmissions. W1BB adds another, Ireland's EJK on 1827 kHz, signing "Valencia Radio" while working ships with

a-m. . . . We called this the 1.8-MHz off-season, terminology doubtless valid for the bulk of DX doings on that band. But transequatorial skip, while peaking at the equinoxes, knows no season. *Viz.*, it's VK-ZL time! VE5XU, for example, says he finds it easier to work Australia during summer months than other nearer stuff. Quit fooling with those radials long enough to stand by for sunrise, OM, and hope that local thunderstorms visit elsewhere. CU on 160!

† † †

Where:

ASIA — WB5EAZ snickered when I sent my QSL to UAØAJ addressed simply "Alex, UAØAJ, Krasnayarsk City, U.S.S.R." Two months later I received in return a lovely Christmas card, letter and QSL! Alex wants to complete WAS and still needs cards for his QSOs with W4AIS, W5EU, K5TYF, W7s IR ISG KSG and RO. (WB5EAY) . . . W9FJL, who signed SU1MR and was one of the HZ1AB boys years ago, reports receipt of QSLs for 7Z3AB/8Z4 contacts made in May, 1972. Dick has no knowledge of such operation. (W1CW) . . . Operator Art of KA1IW can receive cards via his home W1JAJ address. (DXNS) . . . Seekers of QSLs for contacts with HS1IR, VS5IR, YB4-5-6-7AAH, 9M2IR and 9V1OQ should consult John via his Malaysia address. (WCDXB)

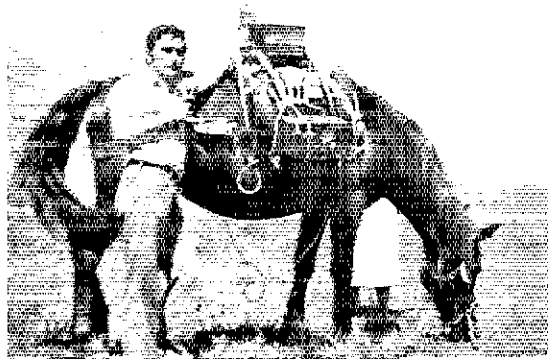
OCEANIA — ZL2PU/c of the Chathams intends to discharge QSL obligations upon return to the mainland. (DXNS) . . . When mailing self-addressed envelopes it's wise to place the s.a.e. fold at the bottom of the enclosing envelope so that a letter-opener won't slice the enclosure. (KH6IJ) . . . As far as I know WA2HSU still manages QSLs for FK8CE and FY7AM. What I meant in my previous report was that those calls evidently were hootlegged in late December. (K2HYM) . . . I manage QSLs for blind amateurs F6BTQ and ZL1IA. Ivan is working toward WAS and DXCC from Auckland. (WB9EFQ) . . . W6KNH says there's been no Fanning activity since VR3AC shut down last December. (K2HTM) . . . W6ANN terminates his QSL managership for VJ8GH due to lack of log cooperation. (DXNS) . . . No logs have been received from DU1EN since last August. (WB2FVO via W1CW)

SOUTH AMERICA — By early April I had finally QSLd all outstanding requests for my Paraguay cards. If you haven't yet received your deserved QSL please apply again to my Stateside QTH [in the listing to follow]. (ex-ZP5TT) . . . I manage all non-U.S.A. QSLing for HK4AJF as of the first of this year, s.a.s.e. (self-addressed U.S.-stamped envelopes) or s.a.e. plus International Reply Coupons (IRCs) required. (WA2BIQ) . . . My super-QSLer of the Month just has to be ZP5KA who came through with my 100th confirmed country. (WA1NNC) . . . Contacts made by CE9s AA and AC in 1972 from O'Higgins antarctic base are confirmed through me, and all requests accompanied by s.a.e and IRCs have been answered direct, others via bureaus. I also manage QSLing for the current activity of CE9s AA and AT of South Shetlands. (CE8AA)

EUROPE — About those Russian QSLs, UK2GAY's card arrived via the bureau route three months after I sent mine via Box 88. (WAØVJF) . . . UK2PAR's QSL popped through six weeks after QSO, unusual speed for Box 88 these days. (WA2TRK) . . . Voice QSOs with SV1DB/a of Mt. Athos can be QSLd via DL7FT, code contacts via DJ6SI. (LIDXA) . . . IT9 stations were using the IT57 prefix in May, suffixes unchanged, and East Germany's DMs use the DT label now and then. (DXNS)

AFRICA — I've been handling QSLs for EL2s DG and DS. I now also do chores for EL2NS, daughter of EL2DS. (WB4SRX) . . . I manage QSLs for EL2DZ including contacts made during the 1973 ARRL DX Contest, self-addressed stamped envelopes appreciated. (W9JVF) . . . Note that I am no longer QSL manager for 7XØWW. (WB2FVO) . . . The Mauritius bureau is run by 3B8AD, to correct your May interpretation of my letter, but QSLs for 3B6-7-8-9DA all go to 3B8DA. (VO1KE) . . . F6BFH collects and forwards mail to TL8LI but does not otherwise manage Andre's QSLing. (DXNS) . . . DK2SI, who signed A2CAL, FHØDL, ZS6AUF, ZS6AUF/3D6 and 5R8AP, will attend to his QSL backlog after he settles down in a job back home. Uli asks all to be patient and promises his cards will be coming in the next few months. (VK4KX) . . . G3SUW manages the QSLs of A6XF beginning with QSOs of April 1, 1973, G3LQP handling chores for Tom's earlier MP4TEE activity. Also note that CR6s switch to the CQ6 prefix at times, suffixes usually the same. (DXNS)

NORTH AMERICA — For reliably rapid pasteboard construction, "QSLers of the Month" CP1EU, CT2BJ, EAs 2IA 5BS, EI9J, EL9A, F9QE, G4BJT, GM3BCL, HB9KC, HI8FED, HP1s ID XMM, HS1AFI, JA1s CWZ HXX NHM, JH1WIX, KC6SK, KG6AAY, KH6s COB EM GJY HIZ IJ, EL7s AIZ EGM FA, KS6DK, KV4s AA CK HW, KX6s BB BU, LU1SH, LX1RB, OA4s AGR, AHA, OH6NN, ON4XG, OY7JD, PAØPFW, PJ2 2HA 9BB 9JT, PYs 1CZH 8ZAI, PZ1AH, TG9EK, TI2s DX WX, TU2DQ, UAØAJ, UK2s GAY PAR, UJ5ØB, VPs IJP 2GAE 2GAL 2LI 2SAB 2ST 5GR 9AF 9HC, WA9VYR/TF, WBØICS/VE8, XE2DL, YU2s HA RBG, ZB2BL, ZD8JT, ZF1SF, ZK1CD, ZLs 1BEG 1ST 3JC, ZP5KA, 4M4AGP, 4S7EA, 6W8GE, 6Y5LB, 8P6FB, 8R1N, 9H3C, 9Q5s EL GE and 9Y4VU, plus QSL agents Ws 2FXA 3HNK 6MAR 7VRO 9MKZ, K7NHV, WBs 2SJQ 4SHB 4SPG, F6AZN and ZL2FA, are roundly applauded in nominations from "How's" correspondents Ws



I6DRF suggests a lively answer to our petroleum pinch so far as mobile DXing goes. No ignition noise, either. Francisco likes to roam the gay Abruzzo countryside with this one-horsepower unit. *(Photo via WB6SBJ-IITLR)*

1RML 2GEY ØNDX, K2HYM, WAs 1NNC 2GMD 2ONO 2TRK 6CPP 6DHM ØVJF, WBs 4WHE 4WRK 5EAY ØGEX, WN6OSS and KH6HRG. Any worthies out your way? . . . Help! Brethren in parentheses require hints and kinks toward grabbing QSLs from reluctants specified: (K4CFB) 9U5KU; (WA3EFH) DU1KA, FY7YG, HBØXUK, SVØWU; (WB4MHK) MP4BIA, YB7AAU; (WBØGEX) HB9AUQ, ON5NT, SM4DUT; (WN6OSS) CE3BF, UAØFG; (VK4KX) AP5HR 1970, HH2G '70, HR1s AT KS '71, TG4SR '72, XZ2BO '69, ZF1SB, ZF1DX '68, ZF1KV '69 and 9G1DL. Any 'alp? . . . We'll accept assignment as QSL managers for overworked DX ops, the rarer the better. (WA1QBH, WB4SRX) . . . QSLs for my Barbados work should now go only to the address of G3JUL, not via the 8P6 bureau. After September they should be sent to my G3RWL home QTH. This also applies to contacts I made as VP2AGA. Cards sent via RSGB also will reach me if clearly marked for G3RWL. My practice is to QSL on receipt, answers going out the same way received. Of course QSLs arriving direct without IRCs are answered via bureau. (8P6DR) . . . Very good returns here using s.a.s.e. for DX stations with APO or FPO addresses, IRCs for others. (WA6DHM) . . . W/Ks can order Canadian stamps at face value from Philatelic Service, Canada Post Office, Confederation Heights, Ottawa, Ontario, KIA 0B5. (WA2EAH) . . . We hold no logs or blank cards with which to handle requests for ZF1VD QSLs. Please advise the gang to try K4SHB direct, not W4HAW. (W4DWK, WPBARC) . . . I still receive QSL managerial mail meant for WA8TDY. (W8TDY) . . . The authorization for Prince Edward Island VEIs to use the CH prefix extends to the end of this year. (W4WFL/1) . . . TIs still become TEs now and then, suffixes unchanged. (DXNS) . . . Now to specifics, but be aware that each suggested postal route is necessarily neither "official," complete nor accurate:

A4XEA, P.O. Box 602, Muscat, Sultanate of Oman
A4s XFB XFE (ex-A4s FB XE), P.O. Box 981, Muscat, Sultanate of Oman
A6XP, P.O. Box 1057, Sharjah, United Arab Emirates
AP2BY, Box 125, Chittagong, Pakistan
ex-C21TL-C29ED (to VK3TL)
CE9s AA AT (via CE8AA)
DU1REX, V. Rex, 20 Zulueta St., Balanga, Bataan C103, Philippines
EA8URE, P.O. Box 860, Las Palmas, Canary Islands
FG-FM-FSØRX (via DJ9ZB)
FL8DS, Box 1279, Djibouti, F.F.A.I.
FM7AP, C. Barlcay, 67 rue Ernext Andre 97232, Lamentin, Martinique, F.W.I.
HP1XMM, c/o Bank of America, Aptdo. 7282, Panama 5, R.P.
JD1s ABX ADI AHO AHQ YAG (via JA1KSO or JH1YMC)
JY6GT, Box 2353, Amman, Jordan
KC6CF, G. Ngirarsaol, Box 18, Doror, Palau, Western Carolines, 96940
MP4BJP, J. Lewis, P.O. Box 116, Manama, Bahrain Islands
MP4BJS, Box 14, Bahrain, Bahrain Islands
PJ9BB, 22 Playa Pariba, Bonaire, N.A.
TI6CBA, Rev. J. Miller, P.O. Box 407, Limon, C.R.
TU2DY, B.P. 54, Port Bouet, Ivory Coast
VK9MC, P.O. Box 512, Port Moresby, Papua
VP1JP, Jane Pinkerton, P.O. Box 415, Belize City, British Honduras
VP2DH, H. Stirns, P.O. Box 138, Roseau, Dominica, W.I.
VP2MKE, Box 45, Plymouth, Montserrat, W.I.
VP2SV, J. Caldwell, Palm St., St. Vincent, W.I.
VP2VAI/KP4, D. Ternent, GPO Box 856, San Juan, P.R., 00936
VQ9D, Box 192, Mahe, Seychelles
VU7GV, G. Venkatasulu, c/o ISPW, Port Blair, Andamans, India
WA5TET/KH6, D. Cummings, NavComAct, Box 200, Pearl Harbor, HI 96610
WA7SJH/CE3 (via K9BQL)
WB2s KFA/VP7 KLL/VP7, H. Reese, Box 105, Governors Harbor, Eleuthera, Bahamas
WB6VGI/VQ9 (to WB6VGI)
WBØICS/VE8 (via WA1PEL)
YN1ZFV/6, P.O. Box 87, Chinandega, Nicaragua
ZD3D, C. Wiltshire, P.O. Box 10, Banjul, Gambia
ZF1s KW RR (via WA2BCK)
ex-ZP5TT, B. Norman, Box 3-1, NMSU-ES, Las Cruces, New Mexico, 88003
4D1D (via CRC, attn.: UVØIP)
9F3USA/1 (via WA5TKC)
9G1AR, c/o U.S. Embassy, P.O. Box 194, Accra, Ghana

A4XFF (via RSGB)
A6XB (via K1DRN)
A6SF (via G3SUW)
CI1UA (see text)
CQ6LF (via W3HNK)
DU1EN (see text)
EI2VDU (to W1HCX)
EIØDMF (via EI2I)
EL2DK (via W5PAQ)
EL2DZ (via W9JVF)
EL2NS (via WB4SRX)
F6BGR/p (via F6KDA)
FL8OM/4W1 (via DJ1TC)
HK4AJF (see text)
HK4DF/Ø (to HK4DF)
HL9VJ (to WA3EJL)
HW3UIT (to F9OE)
IT57ZGY (see text)
IV5VEC (via I5DOF)
JD1YAF (via JH1ARJ)
K4H/DL (to K4H)
K4PGM/6Y (to to K4PGM)
KG6SZ (via KH6IJ)
MP4BJR (via K9KXA)
PYØED (to PY1CNY)
SV1DB/a (see text)
SVØWC (via W3HNK)
TA1TS (via WAØETC)
TE2CF (see text)
TL8ET (to 6W8ET)
UAØAJ (see text)
VK9CC (via W2NHZ)
VKØIN (via VK5WV)
VP2VAK (via K6OF)
VP2VAR (via WA4WTG)
VP8JE (via WA5FWC)
W4WFL/HB (to W4WFL)
XW8EO (via W3HNK)
XW8ET (via JAØGRF)
YJ8WS (via W6ZLB)
YJ8XX (via ZL1AMO)
ZD7SS (to ZD7SD)
ZF1JA (via VE6AYU)
ZF1VD (see text)
ZL1IA (via WB9ETQ)
3B6CF (via JAØCUV)
3E1KC (to HP1KC)
3E1XIS (via KZ5UA)
4A5AA (via W3GHK)
4X25NJ (via WA4WTG)
5U7AZ (via CN8CG)
7X2KX (via ARA)
7XØWW (see text)
8P6DR (see text)
9Q5PA (via W9AAE)

Your QTH advisory committee on this run: Ws 1CW 1RML 2GEY 3HNK 5QKZ 9LNQ ØNDX, Ks 1ZND 2DA 2HYM 9UCR ØIWX, WAs 1NNC 2EAH 2ONO ØVJF, WBs 4WRK ØGEX, WN6OSS, VO1KE, KH6BZF, I5YZ, KA2PJ, VK4KX, 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). Your turn?

Whence:

AFRICA — 3B6CF anticipates a year's stay on Agalega where 3B6CG is also reported available, 14, 260 kHz at 1400 GMT. (VERON) . . . EA9EJ now expects to remain active in the Sahara till late '74. (LIDXA) . . . I've applied for a TJ call for use during my two-year Cameroon tour which begins next month. (WB4WHE) . . . The present ZD9BM operator intends to keep Tristan coming until October. (VO1KE) . . . Seventy-five Canary Islands certifications were mistakenly shipped to K6GAK for U.S. distribution. He's willing to mail them to rightful claimants. If you're expecting one, consult Dick with s.a.s.e. (W9BRD) . . . Logged more than two thousand contacts (and RCC!) from Ascension isle in late '72. The DX end sure beats Stateside hamming. (ex-ZD8TM) . . . EL2DK remains quite active from Monrovia on all DX bands with mike and key. Norm likes contest operation, too, and should be in Liberia till February. (W6PAQ) . . . EA8IB

with CO2FC, ZE1LA and YV4JJ help me sharpen my Spanish near 21,220 kHz. (WB2EKK) . . . EA8GZ goes for Statesiders on 14,207 kHz at 1500 GMT. Since I find it impossible to obtain permission to operate from Cairo I'm postponing my intended autumn visit to SU1IM. (W3HNK) . . . EA8GK & Co. rescheduled their EA9 enterprise for mid-October. K5QHS hopes to try his DX luck from Mali and rarish neighboring areas this month. (DXNS) . . . 5T5CJ writes that Mauretanian amateurs planned to fire up 5T5SOL at Akjoujt on 14 and 21 MHz during last month's solar eclipse. (K4NW) . . . TU2DY, worked on 20 in April, claimed it was his first QSO. (W2GEY) . . . 7P8AC may QSY to 3D6-land around this time. (DXNS) . . . 5R8AG (DL5RI, ex-FM@XF) has another month or so to propagate from Ivato airport. (WCDXB) . . . DJ6QT still is optimistic about showing up from Libya, Iraq or Somalia in the near future. (LIDXA) . . . WB6VGI/VQ9 and colleagues work at a huge NavComSta project which is unrarifying the Chagos. (JDXRC) . . . Ex-VQ8CC blew through Sixland this spring, meeting many California contacts. Steve finished his Congo stint and expects another interesting assignment shortly. (SCDXC)

EUROPE — Coinciding with Radio Society of Great Britain's Diamond Jubilee this month Gs 4BIA 8DNF 8FFG and others will sign a C31 call near the France-Andorra border on all bands 80 meters through 70 centimeters. (G4BIA) . . . I'm retiring as engineering director of Radio Free Europe and will soon be active from California. No Stateside operating since I was W4PN some 22 years ago. Since then I've signed KR6PN, DL4PN, DJ@PN and 5Z4PN while engaged mainly in radio construction, installation and management of international broadcasting projects. (W6PN) . . . GW4BLE's Ten/Ten membership is No. 6058. Stephen still keeps busy on 28 MHz despite generally poor conditions. SP1AGE reports 200 countries confirmed on 10 meters. (G3DME, QUAX) . . . My father is F8SK and my brother is F8RP, a call held by my late grandfather from 1920 to 1942. The Dort family still goes strong for DX! (F2MO) . . . Nice to meet visiting SM7ERX along with W6s LUA SZH and others last winter. WCARS was great for liaison. (WB6UIA) . . . Sent my old 1971 *Callbook* to YU3WO via WN2FCJ. (WB2EKK) . . . On my European vacation this year I used a KW-2000 transceiver and random wire antenna. Pays to be ready for anything! By the way, HB9XJA-type calls for visitors have given way to home calls plus portable designators for amateurs visiting Switzerland. (W4WFL/HB) . . . Spring was good for cw DX in Livorno. Got EP2BQ, FK8KAA, XW8BP and 7P8AB on 15 and 20. (I5YZ) . . . Our Hungarian net meets every Sunday at 1700 GMT near 14,225 kHz and any Hungarian-speaking ham is welcome. Watch for Ws 1PL 9IE, Ks 2JDA 2GI 4ON, HA3MB, LU4ECO, OZ5CK, SM5CLW, YV5CKR, et al. I was delighted to meet LU4ECO (ex-HA2G) personally for the first time in thirty years when Elmer paid a spring visit Stateside. (K2DA, ex-HA3B) . . . I'm QRV from Denmark this summer as OZ2TY watching especially for 21-MHz Novices. At 17 am I the youngest amateur to hold full tickets in two countries? (WB6PZW) . . . SV@WU leaves the Dodecanese after five full years of DX. (W9LNQ) . . . Europeans are workable code-to-voice around 3690 kHz Snagged YU2HA there one night after our early NSN traffic session. (WA2TRK) . . . UW3HY/o began an arctic ice floe venture in March, cw on 14,020 kHz, sideband on 14, 160. (VERON) . . . Russia offers its RAEM CW Certificate to DXers who contact a requisite number of U-stations north of the arctic circle. S.a.e. plus IRCs to Moscow's Central Radio Club should bring back full details. (VERON) . . . OY7JD awaits a Greenland assignment, OY5NS looks for W/K/VEs on 14,207 kHz each Saturday at 1500 GMT, and LX1BW often transmits near 7095 kHz while listening above 7200 around 0500 GMT. Willy also hits 75 near 0200. (W3HNK) . . . Mount Athos merriment by SV1DB, DK5OS, DL5 ICU and 7FT in April as SV1DB/a produced five kiloQSOs on 7 through 21 MHz. (DXNS)

NORTH AMERICA — This QRP stuff is a greater kick than I had expected. Worked fifty countries in my first twenty days of two-watt DXing. It's amazing how little power is really needed for excellent results on cw or ssb. By band I've caught sixteen countries on 21 MHz, 37 on 14 MHz, and the fun is just beginning! (WA3EFH) . . . HH2V, who doesn't go for pile-ups, likes leisurely rag-chewing on 21,325 kHz of a Sunday morning. I note that CM3HG and other sidebanders operating just below 7100 kHz frequently respond to cw calls. As for 28 MHz where I have a 103/64 record, the band has slipped to the point where Stateside signals are now rarely heard. There's still DX in there, though, and Novices should be on the lookout for the consistent signals of WN8MFO/KP4 around 28,150 kHz after 1600 GMT. (WA@VJF) . . . WB2s KEA/VP7 and KLL/VP7, OM and XYL, should be workable from the Bahamas for the next two years. They're usually on 21-MHz sideband. (K9UCR) . . . Announcement of last month's 160-meter transequatorial test led by PY1DVG and EI9J arrived from W1s BB HGT and others a little too late for June *QST*. Slip us earlier word, lads. (W9BRD) . . . My recent poll of a hundred-plus top W/K DX hounds establishes Tibet, South Sandwich, Iraq, Clipperton, Bouvet, China, Saudi Arabia-Iraq Neutral Zone, Kamaran, Mount Athos, Sikkim, Burma, South Yemen, Malpelo, Spratly, Somalia, Tromelin, Heard, Geyser Reef, Albania and Cocos-Keeling as countries most desired in that order. (K6SE/2) . . . After two years and 186/168 worked/confirmed in North Carolina I'm pulling up DX stakes again for Florida. (K4SD, ex-W2DY) . . . I'll be QRT from Barbados by the end of this month for return to G3RWL. (8P6DR) . . . Today's mail brought in QSL No. 100 for DXCC. Seemed like a year between Nos. 99 and 100 although it was only five days! WA1NNC) . . . W6AM's 5BDXCC figures, one of the mightier western totals at present, on 10 through 80 meters are 147-175-351-138-125. At last count the Ten/Ten Club numbered 7650 28-MHz-oriented members. (DXNS) . . . WN4ZYF/KV4 works on a dredge clearing ship channels near St. Croix. (WB2EKK) . . . There's a Prince Edward Island certification offered by P.E.I.'s Amateur Radio League, P.O. Box 1232, Charlottestown. Send s.a.e. plus IRCs for particulars. (ARLPEI)

QST

FO8BX is among Tahiti's more active DX diggers. Coco and friends are not optimistic about Clipperton Island's changes for early DX-peditionary activation. *(Photo via WA2RAU)*

YL news and views

CONDUCTED BY LOUISE RAMSEY MOREAU.* W3WRE

1973 YL — OM Contest Results

THE 24TH ANNUAL YLRL sponsored YL-OM Contest was, in the best Dickens tradition "the best of times, the worst of times," as are all contests depending on the conditions, time available to each contestant, and the score. The winners found it excellent; those who had all sorts of roadblocks weren't quite so jubilant; but to a contest operator, it is always the best of any activity until the next one comes along.

Comments were as varied as the log scores: It was loads of fun but lots of QRM. Always look forward to this contest because it brings out the old friends as well as the new. — WØ JUV. Sure is fun if one doesn't have to recopy the log, and if someone didn't have to check them. — WA8KMT. No YLs on 3.5, 21, or 28 MHz cw! Why? — W4JUJ. Worked 22 of the 24 hours of the phone contest but didn't do so well, my own fault for misreading instructions. — K7TLP. Looks like I should have stayed on low power for the whole contest. I would have had a higher score. — WA2BXX. My first YL-OM. Didn't know about it til I heard K4LMB. — W3MXN. Lost an hour and a half at the start due to a plugged drain in the washing tub. Had to get it cleared for the XYL first. — W6CLM. QRM out here was terrific. — WA6IOG. It was fun but I was quite disappointed at the lack of activity on all bands but 20. — W7EOI. Had a good time and hope the gals did too. — W8KXT. Was on 20 ssb only and noticed more midwest YLs there and very few other call areas. Where were the 8s and 9s? — WA9MZS. Was most disappointed in so few YLs in the phone contest this year. — W9NLF. Please thank YLRL for continuing to sponsor this contest. Enjoyed it greatly. — KV4GQ/MM2. Sri no QSO to USA due to conditions. — DK2QL. French contest at the same time was no good for dual participation. — DL9XN. This is one contest that I am not going to miss in 1974, I enjoyed this one immensely. — WBØFLT. I goofed didn't work my XYL, W5TIK in New Mexico! — K5MAT. Heard and called HC2YL on 21 MHz but she was too busy. — W4ZRJ. Sure enjoyed contacts and look forward to next one. — W5BWM. Had more fun than I have had for a long time. Worked some nice OMs and logged some new states for my 5BWAS. But I seemed to take more time explaining to the OMs what we were doing than I did operating the contest. — WA7MUQ. A time of utter frustration when I was sure the antenna wasn't working and then came a pile up to prove I was doing ok. — WB9GWP. DX conditions were very poor in W3land. — W3TNP. Between having company and cooking for them didn't get much time on the air. Don't like fone, but cw is music to my ears. — W5QWI.

Conditions may have been rotten, but the winners had high scores. YL phone winners were K9LUI, HC2YL, WAØYNC. OM phone winners K4MYC/Ø, K5MDX, W9LNQ. YL cw WA5VJW, WA2CUZ, K1QFD. OM cw winners W5WZQ, W9NLF, WAØTKJ.

It has been suggested that the rules be more widely advertised. For the past twenty-odd years the advance rules have been published in *QST*, "YL News and Views" column, and the dates announced well ahead of time. *YL Harmonics*, and the other amateur radio publications have also carried the rules so the answer can only be read 'em more carefully, they are there.

Congratulations to the winners. The next one will be February and March 1974, see December *QST* for the rules and regulations.

*YL Editor, *QST*. Please send all news notes to W3WRE's home address: 305 N. Llanwellyn Ave., Glenolden, PA 19036.

Christine Haycock, WB2YBA, Assistant Professor of Surgery, member of AMA, will be a speaker at the meeting of MARCO, a group designed to meet the medical electronics, and radio communication in the medical field. Her topic will be on women in amateur radio.

1973 YL – OM Contest Scores

The Winners

YL Phone

K9LUI	44,265
HC2YL	43,056
WAØYNC	27,637.5

OM Phone

K4MYC/Ø	5,750*
K5MDX	4,668.75*
W9LNQ	2,100*

YL CW

WA5DJW	25,740*
WA2CUZ	20,653*
K1QFD	20,268.75*

OM CW

W5WZQ	2,145*
W9NLF	1,520*
WAØTKJ	1,360

YL Phone

W1RLQ	25,234
K1QFD	2,186.25*
K2OYG	6,665*
WA2CUZ	4,676.25*
WA2RRI	3,010*
WA3HUP	17,745
W3TNP	11,590
LU1VAR/W3	5,751.25*
WB4TIV	18,281*
K4HU	16,185
K4LMB	8,478*
WA5ZZA	4,817.5*
WB6QVD	14,945*
K6DLL	6,450*
K7TLP	7,410*
K8ONV	24,747
K8NGR	20,510
WA8FSX	20,393.75*
WB8DQX	10,260
K8TER	4,592
WA8KMT	2,520
K9LUI	44,265
WB9FJT	20,631
WA9TVM	17,920
WB9GWP	5,880*
WA9FRS	2,800*
WAØYNC	27,637.5
WØJUV	13,020*
HC2YL	43,056
DJ1TE	7,308
DI5UAC	1,755
VE5FK	580
VK3KS	276*

OM Phone

W1OKU	225*
W1BNS	176
K2LEG	1,250*
WA2BXK	962
WB2CJN	52.5*
WA3IXF	1,020*
W3MSN	24
WB4RUA	866.25*
W4KMS	800*
W4WSF	609
WA4BXT	607.5*
W4OZF	459
W4LIN	420*
W4JUJ	325*
K5MDX	4,668.75*
WB5HAE	475
W5OB	234
K5MAT	162.5*
WA6PGB	1,334
K6SVL	660
WA6IOG	238
W6CLM	221
K6TU	72
WAØKDS/7	1,012*
W7EOI	759
K7PGL	391
K7UWT	25
W8KXT	700*
W8DM	70
W9LNQ	2,100*
W9NLF	1,435*
WA9BWY	520
K9KKX	432
W9JR/M9	192.5*
WA9MZS	70*
K4MYC/Ø	5,750*
WA3PWL/Ø	1,202.5*
KØETA	573.75*
WAØGZA	558
WBØFLT	520*
K3NEZ/Ø	446.25*
WBØAEW	412.5*
WØAUH	215*
WAØVBW	143
WAØWOV	88
VE3GCO	1,540*
KV4GQ/MM	21,248.75*
VE7AKS	288
DK2LQ	189
YL5BPG	180
VE3GJG	123.75*
DL9XN	104
VO1AW	80
VE7BBL	11.25*

YL CW

K1QFD	20,268.75*
K1NEI	18,531
WA1PIT	5,698.75*
W1YPH	3,318
WA1KMP	425
WA2CUZ	20,653*
WB2PYI	4,410
WA3HUP	17,856
WACDQ	726
K4RHU	10,512.5*
K4VDO	1,118
WN4CFC	300*
WA5VJW	25,470*
W5QWI	1,248.75*
WA5ZZA	432
WN6QFO	4,250*
K6DLL	137.5*
W7QYA	10,143
WA7MUQ	4,227.5*
K8ONV	13,812.5*
WA8USU	11,726.25*
WA8FSX	8,480*
K8NGR	5,670
WB8FJT	12,462
WA9TVM	4,455
WAØYNC	7,965
WAØPDH	3,753.75*
KØGIC	2,210*
WAØESM	1,288
YV5CKR	9,450
IT9GCV	4,687
VE1AMB	4,601
DK5TT	3,978
I3MQ	3,217.5*
VE6ANK	2,294
DJØYL	950
VE3GSQ	690*
YU2CVV	300*
SP5EXA	180*
SP2FF	90*

OM CW

W1PEG	1,080
W1BNS	644
W1ERW	125*
K2LEG	1,240
W1AAU	1,152
WA2BXK	718.75*
W2UAP	227.5*
W2RUK	100
W3ARK	942*
W3GN	121
W4JUJ	483
W4KMS	475*
WA4BXT	162.5*
K4BAI	110
W4ZRJ	20*
WB4WHE/4	5*
W5WZQ	2,145*
K4MAT	1,012.5*
W5OB	728
W5BWM	100
WA6LUU	1,237.5*
W6GBY	1,196.25*
W6ZT	700
WA6PGB	380
W6CLM	225
W6WLV	151*
WØHAW/6	45*
WA7OBL	418
WB4OGW/7	378
K7UWT	20
W8DM	690*
WB8NTY	227.5*
W9NLF	1,520*
W9LNQ	1,087*
WB9DWP	810
W9DU	728
K9DDA	690*
WB9KVN	525*
W9RKP	400
W9PNE	101.25*
W9JR/M9	49
WAØTKJ	1,360
WØAUH	112.5*
WAØWOV	49
VE7BBL	598
SP9CTY	517.5*
VE3EHV	506
VE6UP	500
VE2CO	475*
VE3CJG	272
OK1MPP	263.5*
IT9AGA	195*
OH2LU	70
DL9KP/I3AXD	36
YO8KAN	20
DK4IZ	12
YU1SF	5
VK3XB	1.25*

* Indicates low power multiplier.

Contest Logs mailed before the March 28th deadline, but, due to the delay in mail delivery cannot be considered for competition, were received from Czechoslovakia, and from Poland.

YLRL International Convention Plans

The 7th International YLRL Convention will be hosted in 1976 by the GAYLARCs. Annie Smith, K5JKV, and Francis Smith (no relation, either) WA5MPM, have been appointed to the offices of Chairman, and Co-chairman of the planning committee for this quadrenniel affair. Deanna Mercurio, WA5KRI was selected as Publicity Chairman.

Plans for this convention in the Bicentennial Year are under way and the date will be announced in the near future.

The GAYLARCs, organized 16 years ago is very active in public service activities, and have been official hostesses at several ARRL conventions in their area.

YLRL Certificate Custodians

Every so often "YL News and Views" receives requests for information about the various certificates that are sponsored by YLRL. All such requests should be sent to the custodian of the certificate that is desired.

WAS-YL. Irene Akers, W3RXJ, 5943 St. Clair Drive, Washington, DC 20031.

WAC-YL. Miriam Blackburn, W3UUG, Box No. 2, Ingomar, PA 16127.

YLCC. Onie Woodward, W1ZEN, 14 Emmett Street, Marlboro, MA 07152.

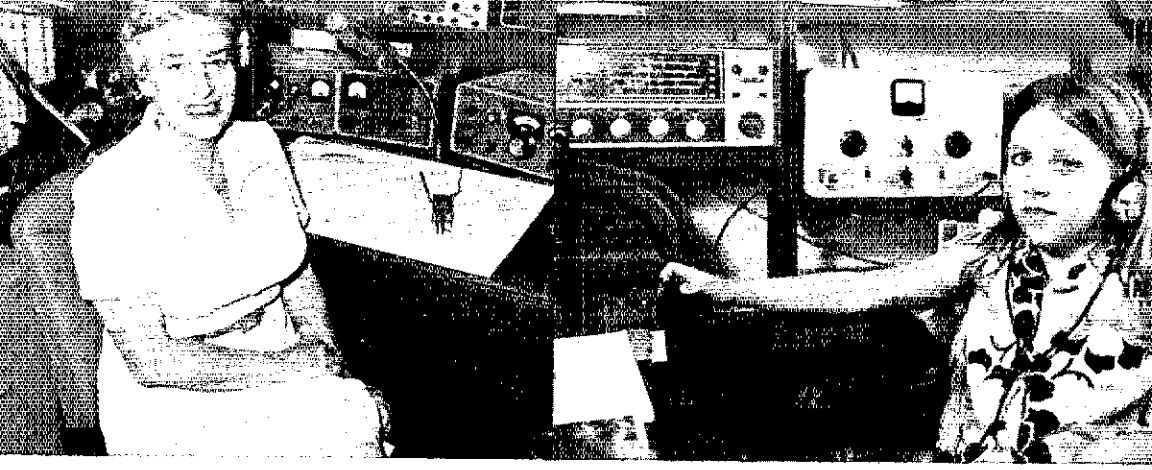
DX-YL. Emma Berg, WØJUV, RFD No. 2, Box 171, Lawrence, KS 66044.

Continuous Membership. Ruth Siegelman, W2OWL, 97-22, 57th Ave. Lefrak, Queens, NY 11363.

DX-YL is restricted to YL participants only. Continuous membership is automatically issued to the members as they meet the requirements and does not require application forms.

3QT Canada's First YL

An error was made in "YL News and Views," *QST*, February 1970, with the statement that 1924



Mary Ryden, K8ONV.

Linda Wells, WNØJTG, is another of the growing group of 9 year old YLs who are very active in the Novice bands. *(Photo courtesy WNØJTH)*

was the date that Canada's first YL was licensed. Madeline Cross, received the call 3QT in 1922. Amateur radio was not only her only interest, for, in 1926, she qualified for a commercial license as a First Class Radio Operator. Madeline worked in various electronics and communications companies since that time, and retired in 1972.

1922 was the year that Madeline in Canada, and Mrs. McKenzie, VK2FV, in Australia, became amateur radio's second and third DX YL operators.

Radio's Oldest YL

Mrs. Minnie Osier, KØPOF, qualified for her license at the age of 75, and has been operating daily for the past 16 years.

It has been said that you are never too young, or too old to be an amateur radio operator. Mrs. Osier recently celebrated her 91st birthday, and so far as we can determine, qualifies as the "grand dame" of YL operators.

K8ONV, Mary Ryden

According to Mary, the family decided that they all needed a hobby because, she says, "The impression was given that mother's brain was in danger of atrophying from lack of use." None of the Rydens had heard amateur operation on any radio, and knew nothing about it but the name; but the OM found a radio store, got all the necessary manuals and kits, and the result was OM, Ken K8OHG, Mary, K8ONV, and their two daughters Sally, K8ONW, and Alice, K8RBB.

That was 1959. Today, Mary is president of Buckeye Belles, and EC for Erie, Huron, and Sandusky counties of Ohio. While they lived in Michigan, she became the first woman to be elected President of the Catalpa Amateur Radio Club. A member of YLRL, ARRL, TASYL, CHC, Buckeye Belles, and YLISSB, she prefers cw operation, but enjoys ssb, and for a while was busy operating RTTY.

Mary likes to hunt DX, and made the Honor Roll. She is busy in traffic activities, and also with phone patch operation between military personnel and their homes. She has earned almost 200 certificates including A-1 Operator, several Public Service Awards for her work in emergencies, as well as some 19 certificates for high score in the YL-OM contests in the 8th YLRL District.

In 1963 the entire family operated VP2MM in the "Ryden DXpedition" to Monserrat. QST

July 1948

. . . A real rumpus is brewing. The Board of Directors has accepted results of a *QST* poll of amateur sentiment on voice bands as concerns a modest expansion of 75, and no phone on 40; but directors decided that an increase at 20 meters would cause international complications out of proportion. History repeats itself?

. . . Sideband interest swings to phase-shift networks. Pioneer W2KUJ describes the practical application for reception purposes. W6DHG details an adapter, to go between the exciter and a final, with balanced modulators providing 90° shift of both rf and af. A new column edited by W1DX, "On the Air with Single Sideband," hopefully will increase interest in and activity with this new "s.s.s.c." mode.

. . . 420 Mc. is coming to life, though slowly. The first VHF Sweepstakes report shows initial activity here, and an article describing conversion of a BC-788 altimeter unit from surplus is bound to create more signals on the band.

. . . FCC finally decided to delete old TV Channel 1 (44-50 Mc.), as it had planned, tho ARRL's alternative proposal of deleting Channel 2 (54-60) instead almost got the nod. Our purpose was, of course, to reduce the curse of TVI from 10-meter second harmonics.

. . . Inflation and greater activity has caught up with ARRL again; dues are raised to $4 per year. – *W1RW*

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. C. NISWANDER, WA1PID; *Public Service*, W. L. MANN, WA1FCM.

Official Observer Notes. Occasionally our Official Observers come forth with some observations intended in general for the operating fraternity. We know of no better way to bring them to the attention to this large segment of amateurdom than via this column. Actually, the majority of these notes are from a single observer, but he cares nothing for publicity and prefers not to be identified.

1) Phone patches in foreign languages. Go easy, unless you're fully conversant in that language. If you don't know what the conversation is about, it's not a good idea to let it be conducted over your station.

2) Speech processing devices. The idea of speech processing is to keep your modulation level constant and to prevent overmodulation with its attendant splatter. Some of them do, some don't, and some that do introduce other defects in speech causing various kinds of distortion or other discrepancies. No matter what kind of gadgetry you use, also use a 'scope to check your speech. Good idea to keep the 'scope in the circuit all the time so you can constantly monitor your speech quality.

3) But a 'scope doesn't indicate all discrepancies in speech quality either. A 'scope is essentially an a-m indicator. Just because it shows a trapezoidal pattern doesn't always mean your signal is perfect.

4) "Cute" identification might entertain your friends, but FCC monitors might not be amused. "W1NJ and a M" may be a clever way of signing "W1NJM," but if an FCC monitor doesn't get it, you may. *An identification that is not readable is not a legal identification.*

5) Section 324 of the Communications Act requires that transmitter power be reduced to that necessary to conduct the communication involved. Most amateurs completely ignore this, but it applies to us, none-the-less. It may seem complimentary when someone tells you how many "db over" S-9 you are, but it really means your signal is louder than necessary. On sideband, turn down your audio gain. On other modes, QRP! You can get cited for unnecessary high power.

6) A loud signal may seem to be broader than a weak one, and also to have worse clicks, chirps or splatter, but this might be because it overloads your receiver front-end. Defects on weak signals are just as illegal as defects on strong ones. To make a strong signal into a weak one (i.e., to prevent overloading), reduce your receiver rf gain. If it's still too loud, remove the antenna. Unless the signal is very powerful and very local (thus maybe getting directly into other receiver components), you'll then hear what it really sounds like.

7) Some sidebanders like to switch sidebands to avoid QRM. This is okay, provided doing so doesn't cause QRM to someone 3 kHz down or up from you, as the case may be – and also provided your carrier frequency is not already within 3 kHz of a band or sub-band edge. If the latter, you could extend outside the band with your sidebands. In fact, even if your sidebands are on the proper side, if your unwanted-sideband suppression is not adequate you could still radiate outside the band. Better to stay 3 kHz in, no matter which sideband you're using, or think you're using. Dsb is not illegal, but out-of-band sidebands are.

8) All rigs have harmonics and most have spurious responses. The trick is to get them attenuated, and the first step is to find them. A great many recipients of OO notices never knew they existed, especially novices. To find out if your rig is emitting any illegal signals, follow the procedure described in 6 above, except keep your audio gain turned up somewhat, so your fundamental signal is good and loud. Now tune all over the spectrum looking for spurious signals, and note their location. Have someone a mile or so away take a listen. If he hears any of them, seek

Well, we warned you guys. If you don't send us good photos we'll just have to show some more of the staff! In fact, here's Communications Mgr. W1NJM (right) presenting Asst. Communications Mgr. W1WPR with his 25-year ARRL membership pin. Chuck is *the* man at W1AW.

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.[2]	.....	← 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]	21/28ssb[8]	21/28cw[7]	21/28ssb[8]	.....
2030	.....	.....	CW BULL.[1]	.....	CW BULL.[1]	.....	.....
2100-2130	.....	7.15 Nov.[5]	21.1 Nov.[5]	7.15 Nov.[5]	21.1 Nov.[5]	7.15 Nov.[5]	.....
2130	.....	.....	RTTY BULL.[3]	.....	RTTY BULL.[3]	.....	.....
2200	.....	CPN[6]	7.095[4] RTTY	3.625 RTTY	14.095[4] RTTY	CPN[6]	.....
2300	.....	.....	CN[6]	RTTY BULL.[3]	CN[6]	.....	.....
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:

July 9: It Seems to Us
July 17: Correspondence
July 20: League Lines
July 26: ARPS
Aug. 1: World Above
Aug. 3: YL News

technical assistance to get rid of them. Do the same things for your harmonics (especially 2nd and 3rd).

9) Reciprocal operators please note. If you are operating in another country under a reciprocal licensing agreement, don't get wise just because you're out of FCC's jurisdiction. You could land in a foreign jail; anyway, not a good image. Don't be an Ugly American. If you're an alien operating in the U.S., don't forget we have sub-bands, and you're subject to FCC rules while you're in this country.

10) Watch out for "tunable" clicks and chirps on cw signals. If they are caused by frequency change alone and have no amplitude change, they

5-BAND AWARDS

(Updating the June 1973 listing)

5BDXCC: (Starting with number 240), W3YIK VK6CT WA2EAH PAØINA KZ5JF WØEXD/4 KP4DLW YO3AC CT1MK VS6DO W2YY SM6CKS.

5BWAS: (Starting with number 147), WA6JVD W4JVM K4CBI WBØCQI.

New A-1 Operators

W2PFQ K3KAJ WB9LHI DM2BJF DM2BYF

will not show up on a 'scope. However, they are usually more audible to the "naked ear" than the amplitude-discharge kind. Also, don't assume, because you can't hear clicks in your receiver, that you have none, or even, necessarily, when you do hear them that you have some. Receiver circuits are full of lag and fast-attack circuits that can make signals sound clicky that aren't and signals sound laggy that actually have clicks.

Enough for the present installment. Our OOs are watching over you, not to pounce on you for

DX CENTURY CLUB AWARDS

Radiotelephone listings follow the general-type "New Member" and "Endorsement" listings – April 1-30, 1973

New Members

JA4ZA	316	W1ETC	163	K4CBI	123	W7APN	108	3B8DA	104	WB9EEF	101
K6BCE	303	W1FCC	157	W3BMX	123	DJ9YZ	107	DJ5ED	103	WAØZNU	101
OH2VB	303	OK1DA	152	W6FSO	120	OK3EQ	107	WB8LSD	103	LX1RR	100
DJ2AA	302	WB9BDH	152	W6JZS	119	JA7AXN	106	WB9DDR	103	VE7TK	100
VK6CT	244	ZD8RR	149	VE3CDK	116	WB5DDI	106	GC3ZIP	102	WA1NNC	100
WØLR	215	EA7AD	147	VP2AAP	112	WB4JXN	105	WB4NMQ	102	WA2SHR	100
WB6URS	202	WA2BOX	147	DK5QH	111	JA4GYL	104	WA7ILC	102	WB2AJK	100
DK9FB	186	LX1ES	143	JA1PMN	110	JH1GTQ	104	DJ7CD	101	W7IOG	100
JA1SKE	165	ZP1BF	128	KX6JX	109	LZ2KML	104	HB9OK	101	WB8IGU	100
VE3GFY	165	W5TFZ	126	WB9CGL	109	W6YKS	104	WA3FXJ	101	WØKC	100
YU1ODO	164	YU2CTF	126	ZC4BI	109	WB9FKD	104	W7JBS	101	WBØGXU	100
										3B7DA	100
W7SGN	325	LX1ES	143	I1WN	121	K9IDO	110	ZL2APM	107	WA4RXS	101
VK6CT	244	I1BRH	138	F6AFA	120	LA2ZN	110	K5JTN	106	WBØCGJ	101
K6BCE	232	VE3GFY	131	LU8FT	118	DJ9FK	108	VE3DOT	105	W1WXZ	100
W1ETC	161	I1YG	128	W4HLY	114	DK4QG	108	DJ1CO	103	WA1FSR	100
OK1KCP	153	DJ1LY	127	WB6KNM	113	W1WQI	108	DJ2FI	103	W3YMB	100
WB9BDH	151	WBØCQJ	127	W5QKR	112	WA5ZWC	108	LA3YO	103	W5GTM	100
ZD8RR	148	DL1KX	126	W6JZS	112	W8IGY	108	WB4NXR	102	WA8WKO	100
W5KXQ	144	W4PW	124	JA1SKE	110	KH6EFU	107	JA4ALI	101	ZS1ANT	100
		WB2AIO	122	K2UFM	110	WA9AUM	107	TU2BX	101		

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.

OH2LA	325	W5DL	300	W3QLW	270	VE5NW	240	DL1RB	180	OH2NM	140
DJ5DA	320	W7KS	300	W6YHT	270	WB4SIJ	240	DL9II	180	OH8OB	140
DL7AH	320	DJ3GG	290	W9UJU	270	WA5ZWC	240	KØSGJ	180	OK1KZ	140
K6GLC	320	K6BTT	290	K4EKJ	260	DL8OH	220	W6INH	180	VE3BZ	140
SM6CKS	315	K8PYD	290	W2UBI	260	VE3DGX	220	WA6OUF	180	VE3DOT	140
W7CSW	315	SM6AFH	290	WA2EAH	260	W4KA	220	YU4HA	180	W1MEW	140
YU2DX	315	SM6CVX	290	W4AST	260	WA4KJR	220	DL7QF	160	WA2EUV	140
DL3OH	310	DJ4LK	280	W5PAQ	260	WB4GMR	220	HB9ASK	160	W4YVK	140
K6HIN	310	OH2SF	280	W7YTN	260	WB5BFZ	220	JA3BRB	160	WB4OXD	140
OZ6MI	310	I2SM	280	W9DDL	260	K2GBC	200	SM5ACQ	160	W7WN	140
W1AA	310	K6OJO	280	YV5BNR	260	K4IJC	200	VE1CD	160	W9ED	140
WA8ZDF	310	W1EW	280	DK3GI	250	PY1SJ	200	VE5CJ	160	WBØCQJ	140
K4CEF	305	W5EDX	280	K8UNG	250	VE3GJH	200	WA2DNY	160	JA3AUQ	120
K6GAK	305	WA8PYL	280	WA5SDT	250	WB2AIO	200	WB2DYG	160	JA6MBH	120
VE3KG	305	W9HZ	280	WB6WIW	250	WB2RSW	200	WA8LVH	160	VE3DOR	120
W4JVU	305	WAØDUB	280	W7ETZ	250	W3GID	200	DK2RT	140	WB2AFS	120
W6AEM	305	CR6AI	270	WAØUFS	250	WA6INK	200	DL1DA	140	WB4DBQ	120
W9ZRX	305	JA2IOD	270	EA6BN	240	WA7BPS	200	JA1QFR	140	WB6BKN	120
PY4LW	300	K1LPL/3	270	OH2VZ	240	WA9TVM	200	JA1QIJ	140	W7CLS	120
SM7BEM	300	K4BBK	270	OH8SR	240	WAØPRS	200	K6SE	140	W9KBZ	120
W4LPW	300	OH2XF	270	SP6BZ	240	DL1DAA	180	OH2BMG	140		
DL7HU	325	CR7IK	280	VO1CU	260	WB4SII	240	WB6URS	200	KH6HDA	160
OZ3SK	320	DJ2AA	280	W4AST	260	WA5WEY	240	W7YTN	200	WA8LVH	160
W5HJA	315	JA1AG	280	WA8PYL	260	CT1ZW	220	W8QAR	200	9Y4MH	160
JA4ZA	310	WA2VEG	280	W9DDL	260	K4BBK	220	ZL1UR	200	K4CEF	140
W1AA	305	W5EDX	280	W9HZ	260	VE3DGX	220	K2AAC	180	K4MEZ	140
W4JVU	305	W7FKM	280	WA9VGY	260	VE5NW	220	KØSGJ	180	OH2VZ	140
W4QAW	305	DJ9ZB	270	DL3VX	250	WA5SDT	220	VE3AJY	180	W2SEL	140
WA8ZDF	305	DL3OH	270	DL7AH	250	WAØHZP	220	W1EW	180	JA6MBU	120
G3WW	300	K4CEF	270	W5IN	250	HK4BNC	200	W1KSN	180	KL7HTO	120
I4ZSQ	300	K6OJO	270	WB6WIW	250	JA7GDU	200	W2HUV	180	VE7PO	120
W9ZRX	300	K8PYD	270	EA6BN	240	K8UNG	200	WA6INK	180	WA3FLU	120
DJ5DA	290	W5QBM	270	VE4JK	240	VE3GJH	200	WØHBH	180	WB4OXD	120
K6BTT	290	JA7JH	260	W3KVS	240	WB2RSW	200	HB9ASK	160	WB6BKN	120
W6ZC	290									WAØWSS	120

chastisement purposes, but to try to keep you out of trouble and avoid giving amateur radio a black eye. Every FCC notification that goes out is a mark against us. When you get an OO notification, take heed, look into it, even if you think the observer is cockeyed -- or cockeared. It could help both you and the image of amateur radio. -- *W1NJM*

MAY 12 FMT RESULTS

The May 12 ARRL Frequency Measuring Test brought in a total of 122 entries representing 1887 individual measurements. Entries received after the announced date of May 23 are not listed. (W1AW began transmitting the official results May 24.) The umpire measured frequencies for the early run at 3535.265, 7039.092 and 14,050.845 kHz. The late run checked out at 3542.413, 7010.951 and 14,061 328 kHz. Interested in an appointment as an ARRL Official Observer? If so, check with your SCM (p. 6, this issue). Plan now to participate in the September 9 FMT, full rules in Operating Events August. -- *W1YL*

HONOR ROLL

This top listing is the standing of the frequency measuring leaders. In consideration of the minimum possible error due to doppler and other unavoidable factors, we accredit as of equal merit all those reports computing 4/10th parts per million (or higher) accuracy. A participant must submit a minimum of 2 measurements to qualify for this listing.

W1BGW W1PLJ K1VHO WA2KSB W3BFF WA3EYZ K3WIK K4KA W4NTO W5FMO W5OS WB6AAL W6CBX WA6CKD K6KA W6ME WB6MZP K6TEZ W7DNQ WA8MSC K9KEP W9MNY WBØ BAM WØIHI WØMDL KØVQM Ireland.

In the following tabulation, error percentage can be determined by moving the parts-per-million decimal point (the figure shown in the parentheses) 4 places to the left. Class I OOs must demonstrate an average accuracy of better than 71.4 ppm. Class II OOs must show at least 357.2 ppm.

(.5) VE5DP W9VOX, (.6) W1IG WA4YVQ W6FB K6MZN, (.7) W5KYD, (.8) W2AJQ W4JUR W6RQ, (1.1) W9KO Mendenhall, (1.4) K6BCT, (1.6) WAØEFN, (2.7) W1AYG, (2.9) K9BZY, (3.1) W1DDO, (3.4) K9WMP, (4.2) WB9AHJ, (4.5) WA8RXM, (5.1) K2AGZ, (5.4) K8RAY VE7TT, (5.7) W4WBK, (5.8) WA7HGB, (6.6) WA4LPX, (7.6) WAØTLT, (7.8) W2BHJ, (8.2) WA8BHR, (8.4) WA5THM/5, (8.7) W3KCM W9IQI, (10.2) WA5SKI, (10.4) K6EC, (10.7) W8CUJ, (11.2) K6CL, (11.5) VE6MJ, (11.7) W4UCL, (11.8) K2RCO W3IN, (12.7) WØLYC/5, (13.8) WØPHY KV4HW, (14.4) K3TNH, (14.6) WB6UAX, (15.9) WA2JRX, (16.0) WBØBIY, (16.1) W7FIS, (17.4) W2JJQ, (20.3) K1EPW, (20.8) WA2MID, (21.2) K8TMK, (21.3) WA5ZBN, (21.4) WB2TFH, (22.1) W8GBR, (23.0) W2JDC, (23.1) WA1PHF, (23.6) W6CBF, (23.8) K2LGJ, (23.9) K4JK, (25.1) WB6IELL, (25.7) WA2EJS, (26.6) K5AZR, (26.7) W1PL, (27 3) W9HPG, (28.3) WA2THV, (31.2) K8HUT, (33.0) K6ASK, (33.5) W9UC, (34.5) WN4UNM, (39.0) W3KEK, (49.8) K6QPH, (50.6) K4VI, (57.7) WA6NDA, (58.7) WA1MWB, (62.0) K4KH, (62.8) WB9BDH, (65.2) WA4AGE, (66.7) WA5LPS, (68.2) WB5IOG, (76.6) K1WMQ, (78.1) K9UTQ, (84.0) W4PKD, (90.0) W9MJM, (144.3) W9MTT, (145.7) WB2CMO, (148.7) K6GG, (187.1) W4TZX, (216.5) W2FFI, (219.0) WAØGGY, (231.8) K9TGQ, (324.2) W5MHY, (381.6) WØDWB, (1443.7) WB4MAZ, (1854.9) W8BU.

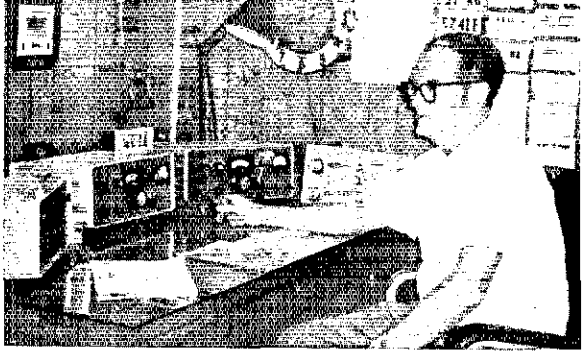
APRIL CD PARTIES

High-Claimed Scores

K4PUZ grabbed the brass ring twice in the April CD bash -- an accomplishment last achieved by K2EIU/5 (now W6PAA) in January 1969. Don garnered the 3rd highest cw score and the 2nd highest phone score ever recorded in an April party.

W7TML/1 has passed along the bad news that he will be moving to Oregon before the next party. We'll all have to scratch harder for a NH QSO now. W6BIP is planning to bring joy to the hearts of many in July by operating in VE8 land again.

Remember, the deadline for RECEIPT of CD Party logs is the 10th of the month after the party.



Last month's listing of 5BWAS award winners shows WØII as holder of award no. 146. What we didn't tell then was that Bob made it on the five bands 160-15 meters! To our knowledge he's the first one to do so. Over 95% of his QSOs were with the 32S1 barefoot. On 160 he ran an old DX-100 until he built a transverter. Bob says he became very adept at thumbing through the Callbook as others called CQ. He says he did not use directional CQs and made only about five pre-arranged schedules -- right at the end. That must have meant a lot of listening time!

Your July "Open" logs must be received on or before August 10 in order to be included in the listings.

The following are high-claimed scores. They read, from left to right: call, score, QSOs, sections, hours of operation. Final scores will appear in the April CD Bulletin. -- *WA1PID*

	CW			
K4PUZ	296,355-	852-69-20		
WA2UOO	280,160-	817-68-19		
WA2SRQ	248,220-	782-63-20		
W9DOB	245,220-	726-67-20		
WB8IIJ	244,530-	736-66-20		
WA2EUO	229,775-	702-65-18		
W7TML/1	224,920-	706-64-20		
WB4SGV	215,808-	658-65-18		
WBØBCZ (WAØOVW, opr.)				
	212,550-	647-65-20		
W2FVS	211,575-	646-65-19		
WB2RJJ	209,550-	635-66-17		
W3IN	207,025-	631-65-14		
W8EDU (WA3BGF, opr.)				
	204,750-	645-63-17		
WA5EEM	198,400-	634-62-17		
K7LTV	194,240-	600-64-18		
WA1NNC	190,575-	600-63-20		
W2EZK	186,050-	603-61-13		
W9PBT	183,680-	569-64-13		
WB4QNP	182,650-	585-65-16		
WB6ZVC	176,240-	491-63-19		
W7GHT	170,950-	520-65-18		
WB4FEC/4	166,400-	514-64-15		
W2AZO	162,240-	502-64-17		
K4IAF	154,700-	471-65-17		
WBØCZR	144,585-	453-63-18		
WA2CNE	142,200-	468-60-15		
K9EDP	136,400-	440-62-16		
W5TNT	132,060-	426-62-19		
WB4RUA	129,015-	417-61-12		
W1GNC	127,735-	431-59-13		
WØONK	126,170-	400-62-13		
WA2RYD	125,050-	405-61-16		
WB9KVN	124,310-	377-62-16		
WBØCOJ	123,000-	406-60-13		
K3OIO	119,475-	400-59-10		
VE3GFN	118,950-	390-61-19		
W3GRM	118,110-	376-62-		
K1QFD	117,160-	400-58-16		
W3ADE	113,400-	371-60-18		
WAØVDX	111,325-	361-61- 8		
K4SXD	111,215-	371-59- 8		
WB2OYV	111,000-	365-60-20		
W1AX	108,885-	350-61- 5		
K3HZL	108,300-	361-60- 9		
K3ANA	108,170-	373-58-11		
W1FBY	107,260-	340-62- 6		
W7GYF	107,100-	350-60- 9		
K3HXS	106,790-	358-59-14		
KØAZJ	106,495-	359-59- 8		
K9DAE	105,950-	370-57-16		
K1ZND	103,800-	339-60- 4		
WA9BWY/9	102,955-	345-59- 5		
W1DGL	102,600-	355-57- 8		
K6QHC	102,000-	340-60- 9		
W9YB (WB2RKK, opr.)				
	100,200-	327-60- 4		
WB9LHI (+WA9EED)				
	183,150-	550-66-17		
	PHONE			
K4PUZ	149,260-	432-68-20		
W9DOB	136,950-	409-66-19		
WA2UOO	114,375-	368-61-13		
WA3RDU	92,400-	326-56-14		
K4RTA	87,730-	280-62-13		
WB8AYC	79,500-	261-60-13		
WB2IEC	71,685-	238-59-13		
WB4QNP	70,675-	250-55-11		
WB9HAD	65,830-	223-58-14		
K3HXS	59,360-	220-53-11		
K4OSL	58,320-	211-54- 7		
W1FJJ	57,240-	210-53- 6		
W6DKQ	56,840-	193-58-16		
K4VFY	52,525-	141-55-10		
WA9BWY/9	48,450-	186-51- 4		
K3UIO	43,680-	177-48- 7		
W3FCS	42,500-	166-50-11		
W6OKX	42,330-	166-51-16		
W5QGZ	42,000-	168-48- 5		
WA1NED	37,125-	159-45- 6		
WB8KXV	35,880-	153-46-14		
WØONK	34,300-	133-49- 6		
K6QPH	33,350-	140-46- 7		
WA2TRK	32,780-	147-44- 9		
WA2RYD	32,370-	161-39- 7		
W2AZO	29,925-	130-43- 4		
K1QFD	28,980-	134-42- 9		
WB5EIN	28,820-	126-44-11		
W6PAA	27,840-	109-48- 1		
WØIYP	27,830-	114-46- 3		
W8NOH	27,600-	110-48- 2		
WA3EYZ (+WA3EUP)				
	43,350-	167-51-14		
W2CXM (WA1LKX WA3HRV)				
	25,270-	133-38- 3		

Operating Events

de W1YL

JULY

1-Dec. 31 Italian YL Club Mini-Contest p. 115 May.

5 W6OWP Qualifying Run (W6ZRJ, alternate) 10-35 wpm at 0400 GMT on 3590/7090 kHz. This is 2100 PDST the night of July 4. 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.

7-8 Oregon QSO Party, p. 117 June. *QRP Contest*, sponsored by the OL cw Activity Group, from 1800Z July 7 to 1500Z July 8 on 80-40-20 MHz. Only single-op, cw operation with PA input below 10 watts. Fifteen hours operation allowed, with a 6-hour pause taken (at most) in 2 parts. Further time outs as one likes. Call QRP Test. Exchange RST, serial number and input 1-9. Add "x" if transmitter is xtal-controlled, for example: 579005/8x. QSOs with all stations valid, in case of a non-contest station it is not necessary to receive a serial number. For your own country 1 point, own continent 2 points, DX country 3 points. Three additional points for a QSO with another QRP station (4-6 points). If one or both stations use below 3 watts input or crystal control both double their QSO points (8-12 points). Each country on your own continent counts 1, each DX country counts 2 multiplier points per band. QSO and multiplier points according to the ARRL DXCC list, but DM counts extra. Separate logs per band. Additional summary sheet required with total score (= total QSO points times total multiplier points), time(s) of 6-hour-pause and rough technical data. Logs to DJ7ST, Hartmut Weber, Am Walde 83, D-3201 Derneburg, Germany, by July 31.

13 WIAW 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 PM EDST) the night of July 12. 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.

14-15 "Open" CD Party cw, p. 65 June.

21-22 "Open" CD Party phone, p. 65 June. *HK Contest*, commemorating the Colombian 163rd Independence Anniversary and the 40th anniversary of their amateur society LCRA; *VHF Space Net Contest*, p. 117 June.

24 City of Cali Foundation, the full 25 hour GMT period, in honor of the city of Cali for 5 QSOs. To earn the award send the QSLs and either 10 IRCs or 1 dollar U.S. by Sept. 30 to the LCRA Seccional Cali, Apartado Aereo 6149, Cali, Colombia, S.A.

28-29 Venezuelan Air Force World Wide CW Contest p. 117 June.

28-30 Kentucky QSO Party, CW County Hunters Contest, p. 117 June.

28-Aug. 11 KJ3BSA and KJ7BSA National Scout Jamboree Activity. See Happenings of the Month, this issue.

29-Aug. 5 HB9S International Jubilee Camp, 50 Years Scouts Centre, Kandersteg, Switzerland, will be on the air from July 29 till Aug. 5 daily on 3.675 7.075 14.325 21.325 28.825 MHz at 0900-0930, 1500-1530, 1900-1930Z. QSL via HB9ALY, c/o Schweizerischer Pfadfinderbund, Administration Jubika 73, Munstergasse 42, CH-3000 Bern 8, Switzerland.

AUGUST

1 W6OWP Qualifying Run.

4-5 Illinois QSO Party, sponsored by the Radio Amateur Megacycle Society, from 2000Z Saturday to 2400Z Sunday. Use all bands cw and phone. The same station may be worked on each band and mode. Ill. stations score 1 point per completed QSO with any station. Stations outside Ill. score 1 point per QSO with an Ill. station. Ill. stations multiply total QSO points by the sum of states (including Ill.), VE provinces and ARRL countries worked (including U.S.A.). All others use Ill. counties as mult. If input power never exceeds 5 watts, multiply score by 3. Additional multipliers may be counted for working the same Ill. county. Each group of 8 contacts with the same county counts as an extra multiplier. (10 QSOs = 1; 16 QSOs = 2). Remember, U.S.A., Canada, Hawaii and Alaska count as country multipliers and Hawaii and Alaska count again as states. Ill. stations give QSO no., RS(T) and county; others use state, province or country in lieu of county. Look for activity near 3560 3735 3900 7060 7125 7260 14060 14275 21060 21110 21360 28060 28160 28660. Phone on the hour, cw on the half hour. Appropriate awards for both single and multiop. entries. Logs must clearly show dates/times in GMT, stations, exchanges, bands, modes and claimed score. Include a separate summary showing name/address of operator in block letters, whether single or multiop., QSO points, multipliers and score claimed. Logs must be postmarked no later than Sept. 15 and sent to: RAMS K9CJU, 3620 North Oleander Ave., Chicago, Ill. 60634. Please include a business size s.a.s.e. with your entry if a summary of the results is desired.

11-12 CQ-WE Contest (limited to Western Electric and Bell Laboratories employees), vht and RTTY portion, from 1800Z to 2300Z. HF portion in October. For rules, logs, etc., contact your local coordinator. *Space Cadet QSO Party* sponsored by the Space Cadets of America, full weekend GMT, open to all amateurs in the continental U.S. and Canada. All bands, phone and cw. The same station may be worked on additional bands/modes. A non-Space Cadet station may work any amateur under the contest rules for a point. However, only a Space Cadet provides a multiplier. Non-members multiply QSOs by the no. of Space Cadets worked. An SCA member just adds his QSOs for his score. Non-members send QSO no., ARRL section and RS(T). SCA members use SCA no. in lieu of section. Logs must include exchange info. plus date, time, band, mode, multiplier list and score computations. Send logs by Sept. 1, to WB9BBC 1109 Sherman Ave., Janesville, Wisconsin 53545. Appropriate awards (just to non-members). Further from WA9ZLU, or better yet, catch their net any day at 2100Z on 7.295 MHz.

14 WIAW Qualifying Run.

18-19 New Jersey QSO Party, sponsored by the Englewood Amateur Radio Assn., Inc., open to all. Times: 1900Z Sat. Aug. 18 to 0600Z Sun. Aug. 19 and from 1200-2300Z Sun. Phone and cw are considered the same contest. A station may be contacted once on each band – phone and cw are considered separate bands. NJ stations may work other NJ stations. Suggested freqs.: 1810 3535 3735 3905 7035 7135 7265 14035 14280 21100 21355 28100 28600 50-50.5 144-146. Phone activity is suggested on the even hours. Exchange QSO no., RS(T) and QTH (section or country). NJ stations will send their county. Out-of-state stations multiply no. of NJ contacts by the no. of NJ counties worked (maximum of 21). NJ stations count 1 point for W/VE/VO QSOs, 3 points for DX contacts. Multiply total points times the no. of ARRL sections (including NNJ/SNJ = maximum of 74). KP4/KH6/KL7/KZ5 count both as 3-point DX contacts and section multipliers. Appropriate awards. Logs must show date/time in GMT, band, emission and be received no later than Sept. 15. The first contact for each claimed multiplier must be indicated and numbered and a check list of contacts and multipliers attached to the entry. Multioperator entries should be noted and calls of participating operators attached. Logs and comments should be sent to the club, EARA, 303 Tenafly Road, Englewood, NJ 07631. A size 10 s.a.s.e. should be included for results. Stations planning active participation in NJ are requested to advise EARA by Aug. 4 so full coverage from all counties may be planned. Portables/mobiles are encouraged. *World-Wide RTTY Contest* sponsored by the Scandinavian Amateur Radio Teleprinter Group, 0000-0800Z Aug. 18, 1600-2400Z Aug. 18 and 0800-1600Z Aug. 19, all bands 3.5-28 MHz. The same station may be worked once on each band for QSO and multiplier credits; only two-way QSOs count. Classes: single operator up to 100 watts input single operator over 100 watts input, multioperator single transmitter (any power) and SWL. Exchange RST and QSO no. QSOs with one's own country count 5 points, other countries on the same continent count 10 points, other continents 15 points. (In the U.S.A. and Canada, each call district will count as a separate multiplier.) Total score equals the sum of the QSO points times the sum of the multipliers. Mailing deadline Sept. 18. Logs must contain band, dates/times in GMT, calls, exchanges, points and mutipliers. Use a separate sheet for each band and enclose a summary showing the scoring, classification, your call, name, address. Appropriate awards. Send logs to: SARTG Contest Mgr., Bo V. Ohlsson SM4CMG, Box 1258, S-710 41 Fellingsbro, Sweden. *Trinidad and Tobago Independence Anniversary QSO Party*, commemorating the 11th anniversary of independence, full 48-hour GMT period (10-75 phone, only). Exchange report plus serial no. starting with 001. A certificate will be awarded to any DX station working 5 or more 9Y4 stations. Contact with the same station may be made on different bands for credit. Crossband not permitted. Logs with date/time in GMT and exchanges required. For the 5-station award the log only is required. For the 5-band award (confirming contacts with 9Y4s on five bands), logs plus QSLs required. If you're eligible

(Continued from page 88)

for an award, please enclose $1 or equivalent IRCs. Entries must be postmarked no later than Oct. 15 and go to the S.T.A.R.C., Box 131, San Fernando, Trinidad, West Indies.

18-20 QRP QSO Party from 2000Z Aug. 18 to 0200Z Aug. 20. Members send report, state/province/country, QRP no. Non-members use power instead of QRP no. Scoring: 3 points per QSO, 4 points if non-W/VE; non-member 2 points per QSO, 3 points if non-W/VE. The same station may be worked only once per band. Multipliers equal total of states, provinces, countries worked on each band. Power mults.: 25-100 watts X 1.5, 5-25 watts X 2, 15 watts X 3 and under 1 watt X 4. Final score equals QSO points X mult. X power mult. Suggested freqs.: cw, 3540 7040 14065 21040 28040; ssb, 3980 7280 14330 21430 28600; novice, 3720 7160 21120. Appropriate awards. In reporting, indicate all the usual log data, equipment used, declaration that rules observed. Deadline for logs is Sept. 15. Send to Jim Hadlock, K7IRE, 3701 S.W. Morgan St., Seattle, WA 98126.

19 American Contest, sponsored by the Radio Club Uruguayo, commemorating its 40th anniversary ; the full 24-hour period GMT' Single operator, 80-10 meters, mixed phone and cw but only one QSO per station. Open only to amateurs in North and South America. Exchange RS(T) plus serial no. starting with 001. Multipliers: two classes; one for each different country, three for each different CX (with a maximum of 10 CXs per band). QSOs between different continents count 4 points, contacts with countries on the same continent count 2 points, QSOs between U.S.A. stations count 1 point, QSOs between the same country's station (other than U.S.A.) count zero points serving only as a multiplier. To score: add all the QSO points multiplied by the addition of different countries plus CX multiplier. On 80, QSO points are multiplied by 5 and on 40, they're multiplied by 3. Trophies and certificates with special grand prize presentation. Logs must include time in GMT, separate logs per band, rig used, call and location plus summary. Logs must be postmarked by Setp. 10, 1973. Send to Radio Club Uruguayo, Box 37, Montivideo, Uruguay.

25-26 All-Asian Contest cw only, from 1000 GMT Aug. 25 to 1600 Aug. 26. Exchange RST plus age (gals get to send 00) Contact only Asians, each worth a point. Multipliers of one for each prefix of the Asian country. (Note, JD1 Ogasawara is Asia but JD1 Minamitorishima is Oceania.) Single band single op., multiband single op. and multiband multiop. categories. Single transmitter only. In logging, use GMT, fill in the prefix/country the first time it is contacted. Use a separate sheet per band and a separate summary. No crossband. Appropriate certificates and medals. Usual rules for disqualification plus dupes in excess of 2% are also grounds. Logs must arrive by Nov. 30 and to the JARL Contest Committee, Central Post Office Box 377, Tokyo, Japan.

SEPTEMBER

6 W6OWP Qualifying Run.

8-9 VHF QSO Party.

8-25 Malta Contest.

9 Frequency Measuring Test.

12 W1AW Qualifying Run.

15-16 Scandinavian Activity Contest cw, Washington State QSO Party, VHF Space Net Contest.

19-21 YLRL Howdy Days, 1800Z Sept. 19 to 1800Z Sept 11, sponsored by the YLRL, limited to licensed YLs. All bands/modes, no cross-band operation. Net contacts do not count. Only one contact with each station will count. Score 2 points for each YLRL member worked and 1 point for each non-YLRL member. (NO mutipliers.) Awards as in previous years. Logs must be received by Oct. 15, 1973. Send to Ella Russell, WA8IBS, 4348 West 223rd St., Fairview Park, Ohio 44126.

22-23 VE/W Contest, SAC phone.

25 W1AW Morning Qualifying Run.

29-30 Delta QSO Party.

Oct. 13-14, CD Party, phone.

Oct. 17-18, YL/AP cw.

Oct. 20-21, CD Party, cw.

Nov. 1-2, YL/AP phone.

Nov. 10-11, SS, phone.

Nov. 17-18, SS, cw.

Dec. 8-9, 160-Meter Contest

QST

April Reports

Net	*Sessions*	*Traffic*	*Rate*	*Avg.*	*% Rep.*
EAN	30	1521	1.240	50.7	100.0
CAN	30	927	.839	30.9	100.0
PAN	30	1096	.900	36.5	100.0
CTN	29	152	.103	5.2	42.3
1RN	60	501	.336	8.4	98.2
2RN	61	550	.674	9.0	100.0
D2RN	29	59	.173	2.0	72.7
3RN	60	492	.497	8.2	95.6
D3RN	30	191	.351	6.4	96.6
4RN	54	710	.487	13.1	87.8
D4RN	13	50	.129	3.8	75.4
RN5	60	679	.382	11.3	96.1
RN6	60	704	.493	11.7	100.0
RN7	57	318	.371	5.6	51.8
8RN	56	353	.331	6.3	73.8
D8RN	21	58	.172	2.8	42.2
9RN	60	429	.452	7.2	92.1
TEN	60	520	.475	8.7	92.8
ECN	61	173	.244	2.8	90.2
TCC Eastern	119[1]	652			
TCC Central	90[1]	523			
TCC Pacific	120[1]	749			
Sections[2]	3108	13774			
Summary	3969	25181	EAN	6.4	–
Record	3225	28426	1.421	19.1	–

[1]TCC functions not counted as net sessions.

[2]Section and local nets reporting (93): APSN (AB); MTN (MB); APN (Mar); Champlain-Mininet GBN ODN OPN OQN (ON); AENB AEND AENM AENO (AL); OZK (AR); IEN NCN NEN Org.Co.40M SCN (CA); CCN SSN (CO); CN CPN Nutmeg-VHF (CT); FAST FMTN FPTN GN QFN TPTN VEN (FL); GaSSB GSN GTN (GA); IMN (ID, MT); ILN (IL); QIN (IN); TLCN (IA); KPN KSBN QKS QKS-SS (KS); KNTN KTN KYN (KY); SGN (ME); MDCTN MDD (MD-DC); EMN EM2MN WMN WMPN (MA); PAW (MN); JC2AN MoSSB MSN WEN (MO); MTN (MT); NJN NJSN (NJ); NLI NLIPN NYCLI-VHF NYS (NY); CNCTN THEN (NC); BNR OSSBN (OH); OLZ OPEN (OK); BSN OSN (OR); GCRN FPA PTTN WPA (PA); SDN (SD); TN TNN (TN); TEX TEX-SS TTN (TX); BUN UCN (UT); VN VSBN (VA); NSN WSN (WA); WVPN (WV); BEN BWN WSBN WSSN (WI).

Transcontinental Corps.

Area	*Functions*	*% Successful*	*Traffic*	*Out-of-Net Traffic*
Eastern	119	91.6	1695	652
Central	90	92.2	1108	523
Pacific	120	87.5	1493	749
Summary	*329*	*90.6*	*4296*	*1924*

The TCC roster (Apr.): Eastern Area (W3EML, Dir.) - W1s BIG EJI NJM QYY YNE, W2s FR GKZ, WA2s CNE ICU UWA, W3s CB EML, K3MVO, WA3OGM, W4s SQQ UQ, K4s FAC KNP, WB4s OMG SGV, W8s IBX PMJ VDA/4, K8KMQ, WA8PIM. Central Area (KØAEM, Dir.) - W4OGG, WB4s KPE YCV, W5s GHP MI QU SBM TNT, WB5FDP, W9s CXY DND, WØs HI INH ZHN, KØDDA. Pacific Area (K5MAT, Dir.) - W5RE, K5MAT, W6s BGF EOT IPW MLF RSY VNQ VZT, WA6DEL, WB6s AKR VKV, W7s BQ DZX EM GHT KZ PI, K7NHL, WØLQ, KØOTH, WBØAXW.

Independent Net Reports (April)

Net	*Sessions*	*Traffic*	*Check-ins*
North American Traffic	25	255	473
7290 Traffic	42	501	1636
20 Meter ISSB	25	1920	373
Young Ladies	4	67	20
Ohio Valley Teenage	36	201	374
IMRA	46	550	1577
Hit & Bounce Slow	23	92	159
75-Meter ISSB	30	416	1557
Clearing House	26	245	365
NY Region RTTY	28	55	167

QST

Station Activities

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. Congratulations to K3KAJ on making the A-1 Operator's Club. Dave is also chmn. of the Delmarva Hamfest Comm. preparing for a good crowd at the Harrington State Fairgrounds on Aug. 19. The Del. Repeater Assn. and Delaware ARC can accommodate all wishing to attend at their new meeting place at Delcastle Recreation Center. W3BHG gave an interesting talk on Oscar 6 at First State ARC with tapes of some of his QSOs. W3ZNF edits another publication "Ker-chunk," newsletter of the Mid Delaware FM Repeater Assn. MDFMRA officers are WA3JWY, pres.; K3RUD, vice-pres.; WA3RIZ, secy., WA3IIX, treas. By press time, their standard SCA RPT-1 should be operating on 19-79. W3EEB is in a chess match via cw with some Mich. hams. DFN QNI 189, QTC 36/33. DEPN QNI 66, QTC 19/16. PSHR: WA3DUM 56, K3KAJ 47. Traffic: WA3GSM 86, K3KAJ 66, WA3QJU 57, WA3DUM 47, W3EFB 31, WA3PKP 31, W3DKX 29, WA3NHW 9.

EASTERN PENNSYLVANIA — SCM, George S. Van Dyke, Jr., W3HK — SEC: W3FBF. RMs: W3EML, WA3AFI, K3MVO, K3PIE, W3CDB. PAMs: K3BHU, WA3PLP. OBS reports from W3CL, W3ID, WA3AFI, K3BHU, WA3KET, WA3QOZ. OVS reports from W3CL, WA3HIT, W3ID, WA3KFT, K3QCQ/3. OO reports from W3CL, K3KCM. PSHR: W3ABT, WN3SZD, WA3ATQ, K3MVO, WA3MQP, K3OIO, WA3OLG. BPLs: W3CUL, W3VR, W3ABT, WN3SZD.

Net	*kHz*	*Operates*	*QNI*	*QTC*	*KM/PAM*
EPA	3610	7:00 P Dy	458	405	K3PIE
PTTN	3610	6:30 P Dy	116	53	WA3AFI
PEN	3960	5:30 P M-F	550	489	K3BHU
EPAEP&TN	3917	6:00 P Dy	405	192	WA3PLP

Mobile Sixers are running a FAX Net Wed. 9:00 P local time 50.550 MHz. A new net for the youth of Phila. area is operating on 21.400 daily at 0100Z. Purpose is to get the youth together on the air. Charter members are WA3PZO, WA3RGG, WA3NNA, WA3QLG, WA3LLK, WA3SOB. Join in for some lively talks. A tip of the Hat to W3ADF for almost perfect attendance on both early and late EPA, WB2FWW, WA3NAZ and WA3IYC are keeping W3ABT at U of P very active. WA3OGM and WA3QOZ seem to pop up at any spot that help is needed local or TCC. A hearty "Well Done" to those who work so hard to keep EPA on top of the pile! Our big guns are back in northern country W3CUL and W3VR; welcome back! W3EML recovering from serious illness back on duty. He reports the propagation is really cutting into operations. K3MVO reports putting all guys on his antenna system, but it didn't change his tist a bit. WA3KKH has been accepted as a Ben Franklin Scholar at U of P another op for W3ABT! The Mt. Airy VHF Club entered the World Wide VHF Contest and took first place! They again went into the National Space VHF Contest and first place? Yep! 432 MHz activity up now that it is a link for the repeaters. WA3CKA reports he never knew what a QRM free QSO was like until he went vhf. W3BNR must have a second home in Calif.! W3GMK still manning the pumps at his QTH. Hope you were all ready for FD and have a swell vacation. Traffic: W3CUL 2109, W3VR 668, W3EML 405, WA3QOZ 398, W3ABT 249, K3BHU 229, WN3SZD 190, K3PIE 186, WA3ATQ 125, K3OXB 119, K3DCB 113, WA3OLG 109, WA3KWD 108, K3MVO 105, K3OIO 98, WA3MQP 69, W3ADF 39, WA3TQB 31, WA3RKH 23, W3OY 21, WA3AFI 17, W3CL 15, W3OMI 13, W3CBH 11, WA3HIT 10, WA3CKA 9, W3BNR 8, K3KTH 8, W3KCM 7, W3VAP 7, W3VA 6, W3HK 5, K3MNT 5, W3WRE 4, W3ATJ 2, WA3BJQ 2, W3EUJ 1, W3GMK 1, W3ID 1, W3LC 1.

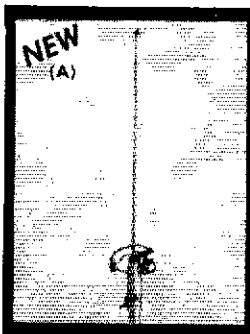
MARYLAND-DISTRICT OF COLUMBIA — SCM, Karl R. Medrow, W3FA — RMs: W4EZT, W3QU. PAM: K3TNM. NCM: W3LDD. WA3RCI achieved his goal of making BPL 12 times consecutively. Nine times as a Novice. WA3SQQ also made BPL in Apr. The MDD-MEPN-MDCTN get-together is July 22 at the Patapsco State Park. MEPN met 21 times with 90 formals, 83 informals and an average size of 26.7. MDCTN held 17 sessions with 45 formals with a 19.3 average net size. The MEPN 100 per centers were W3ADQ, WA3IIV, W3JON and W3LDD. W3OKN has his eye on Penna. real estate. WA3QDH scheduled an FM series on amateur radio for June. W3EOV retired, makes cross country trips his diversion. WA3HEN upgrades from Technician to General and was responsible for the Governor's proclamation of Amateur Week in Maryland. W3FCI sports a new Quad and enjoys the DX world. WA3RDU claims the first HW-202 in Md., and reports the local 13/73 repeater almost complete. W3ZNW likes 10 and 6 in the summertime. WA3IYZ is still talking about his visit to Hq. W3QU made it to Scotland through Oscar and he likes his new TR4C picked up in Dayton. W3TN is covering all local nets. WA3RJS regularly reports his IW activities. WA3SWS is switching to 2-meter fm only. W3BHE reports Novice WN3UMS and YL Novice WN3UQQ the latest in Cumberland. WN3UQQ is a first in the area. WA3UHK upgraded to General. W3CDQ renewed old friendships in the CD party. K3RUQ giving a big assist to Novices in the Denton area. WA3ERL going mobile and gives up that hot MDCTN spot. WA3SCR is mgr. of the new Early Morning Traffic Net, EMTN, on 3715 kHz at 1000 GMT. WA3QIA backs up the MDD CW hot spots regularly. WA3AFQ is planning that automatic contest keyer. W3FZV keeps MDD in line on Tue. W3FCS has the directors meeting for MEPN all organized. WA3PJG has his school Rensselaer all lined up and eyes operation as W2SZ. WA3EHK is coming right down the line at the U of Md. WR2NOM and WA3TOM are the same and report the American Univ. new club call is WA3URV. K3TNM is busy filling those vacant MDCTN slots with volunteers. K3GZK ready for that retirement. WA3IYS plans to commute between New Jersey and DC this summer. W3QU has WA3PJG and WA3QIA on top of the MDD rankings. WA3HEN presented W3FA with the Governor's proclamation of Amateur Week at the Maryland Mobileers club meeting. Traffic: (Apr.) WA3IYS 416, WA3RCI 345, WA3PJG 195, W3QU 164, W3TN 162, WA3QIA 151, WA3SQQ 140, WA3SWS 131, WA3AFQ 65, WA3SCR 60, W3FA 45, WA3IIV 44, W3OKN 38, K3TNM 34, W3ADQ 17, W3FOV 17, W3FCS 17, W3FZV 15, K3GZK 15, WA3EHK 13, WA3HEN 6, W3ZNW 6, W3FCI 5, W3BHE 4, WA3RDU 2, WA3FYZ 1. (Mar.) WA3QDH 11.

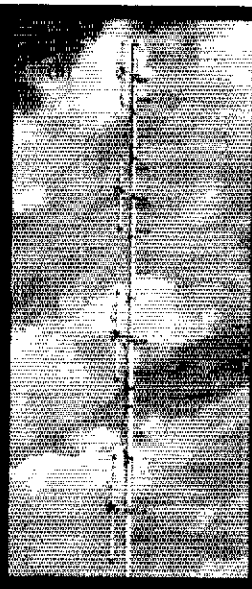
SOUTHERN NEW JERSEY — SCM, Charles E. Travers W2YPZ — Acting SEC: W2YPZ. PAMs: WA2TRK, WB2FJE.

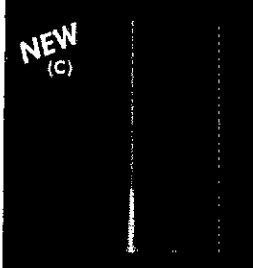
Net	*Freq.*	*Time (PM)*	*Sess.*	*QNI*	*Tfc.*	*Mgr.*
NJSN	3750	8:15 nightly	25	47	19	WA2TRK
NJPN	3950	6 M-S	25	518	181	WA2FVH
NJPON	3930	6 Su	5	69	28	WB2FJE

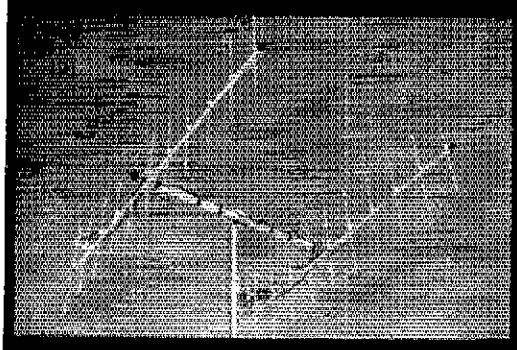
The Englewood Amateur Radio Assn. invites all amateurs to take part in the 14th N.J. QSO Party. Time of the Party is 1900 GMT Sat. Aug. 18 to 0600 GMT Sun. Aug. 19 and from 1200 GMT to 2300 GMT on Sun. Aug. 19. Phone and cw are considered the same contest. Congratulations to K2SNK of the Del. Valley Radio Assn., on completion of his Doctorate in chemistry. WB2FNK reports a change in OBS transmission from 1630 EDST to 1620 EDST. Sun. stays the same. All are on 3695 kHz. WA2KWB received his OPS endorsement - he comes home to the Trenton area on week ends from Newark, Del. K2ARY reports transmitting 7 bulletins during Apr. WA2NKV continues to do yeoman service in the OO field. Recent appointees are WB2DMI as OBS; W2MBC, Cherry Hill HS East ARC - WB2FNK, secy., as OPS. There are openings for appointments. Write the SCM for further information. Traffic: WB2VEJ 228, WA2TRK 199, WB2UVB 99, WB2FJE 37, W2YPZ 21, W2ORS 20, W2ZQ 14, W2MBC 11, W2JI 10, K2PWK 10, W2IU 9, WB2SFX 5, WA2KWB 4, W2ZI 4, W2CDZ 2.

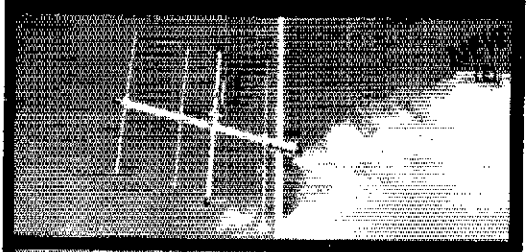
WESTERN NEW YORK — SCM, Richard M. Pitzeruse, K2KTK — Asst. SCM: Rudy Ehrardt, W2PVI. SEC: W2CFP. If all section net mgrs. will send me their net info (days, times, frequencies), I will include this information in a future column. WA2ANE plans on QSYing to a new WNY QTH. WN2KUN will be attending the Univ. of Buffalo in the fall. Congratulations to K2KNV, K2GUG, K2LGJ and WA2HKS on receiving their Satellite DX Achievement Awards. Also congrats to EC WB2EDT on receiving the WNY Amateur of the Year Award at the Rochester Hamfest. WA2ICU QSYs to Norfolk

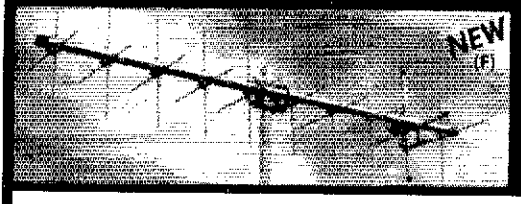












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(B) 4 POLE: A four dipole gain array with mounting booms and coax harness 52 ohm feed, 360° or 180° pattern.

AFM-4D	1000 watts	146-148	MHz	$42.50
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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

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A147-22	1000 watts	146-148	MHz	$49.50

(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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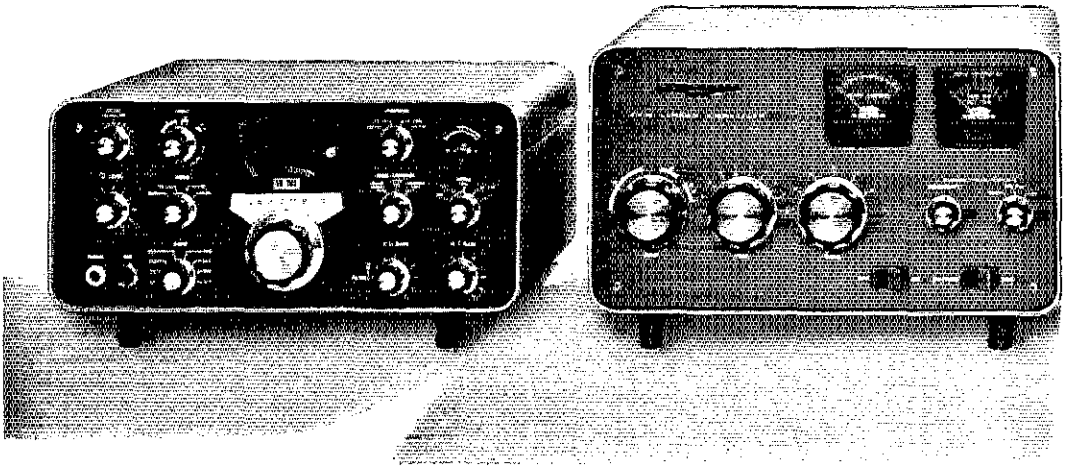

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Kit SB-650, 10 lbs. 179.95*

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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*

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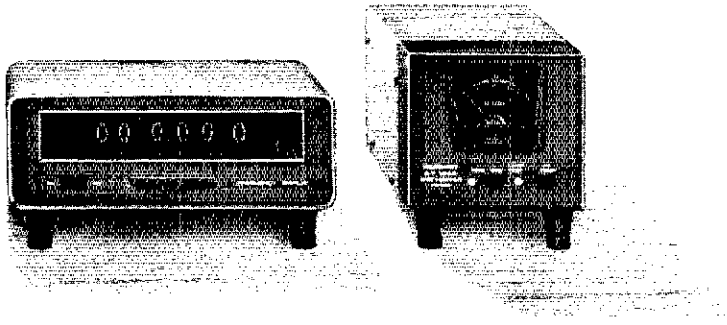

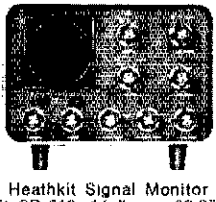

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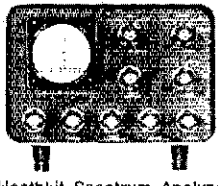

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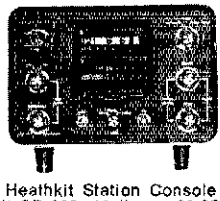

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about the time you read this. NYS reports 701 check-ins handled 369 messages in Apr. WB2LVW received a Public Service Award for his communications assistance concerning an automobile accident in Mich. W2UYE has a nice signal with his new SB-102. WB2NRS has a new inverted vee and is growing a 4-1000A to go with it. W2TGY one of our best "netters" moves to W4 in July. W2GTX has gone mobile with two new rigs. Stereo? W2HB is having a ball with his new S-Line. WA2LCC and WN2FHX of East Aurora are elated with their SS scores. WB2GIN does a nice job as NCS on NYSPTEN. Both K2KIR and K2KTK have joined the two meter fm mobile set with HR-2As. How is your county fixed for emergency communications? SEC W2CFP still looking for EC's in some areas. ESS handled 122 messages in Apr. Don't forget the 1973 Hamburg International Hamfest on Sept. 15. Details from WB2HCL. W4BPD will be there and is a pleasure to talk to. The new EC for the Niagara Frontier is WB2YEM. BPLs this month go to W2OE and WB2ADW. FCCs W4BW gave a very sobering talk at the RARA hamfest banquet. As the summer activity doldrums approach, input to this column decreases. Remember Station Activities is as good as you make it. Send your inputs to either W2PVI or me and the column will be that much better. Traffic with * indicating PSHR: WA2AYC* 218, W2RUF* 217, W2OE 210, WB2ADW 208, WA2ICU* 187, W2FR* 143, WA2BCI 109, WB2NRK 89, W2HYM 82, W2RUT 62, WB2EEX* 54, W2ROF* 52, WA2PUU 50, WA2LCC* 42, WB2VND 42, WN2FHX 40, K2OFV 40, W2MSM 33, W2PNW 32, WA2LUF 19, WA2ABL 17, W2PVI 14, K2IMI 11, K2RTO 10, WN2LKK 9, W2EAF 8, K2KTK 8, K2KIR 6, WA2SMC 2, WA2ANE 2.

WESTERN PENNSYLVANIA – SCM, Robert E. Gawrvla: 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. WPPN meets daily on 3896 kHz SSB at 4:45 P.M. The reactivated Keystone Slow Speed Net has been going great guns. Your assistance is greatly desired. QNI the net. Watch for the Penna. QSO Party to be held Sept. 15 and 16. More details later. Plan to help out especially with one of the rare counties. The Nittany ARC of State College, Pa., became 18 years old during Apr. The Foothills AREC of Greensburg, Pa., is 14 years old this month. K3ILC now operating as I3DEQ from Italy. Clarion County has 911 emergency system, first in the state of Penna. Two Rivers ARC of McKeesport has petitioned FCC for the purpose of obtaining the call of W3OC in memoriam its past owner. It is with deep regret we report the Silent Key of W3VC. The Carnegie Tech Radio Club is adopting his call and establishing a memorial station. WN3UPK and WN3UPJ are new Novices in the State College area. W3ZUH has received the CIA Award No. 140. PSHR activity for Apr. was on the increase with the following stations participating: WA3QOR 57, WA3PXA 56, WA3ROZ 52, W3LOS 39, W3NEM 39, W3CB 34, W3YA 34. WPA CW Net had 30 sessions in Apr. with 444 stations participating and 253 messages handled. Traffic: W3YA 216, WA3QOR 180, W3CB 125, W3NEM 120, W3MJ 92, WA3PXA 91, W3LOS 70, WA3IYA 69, K3HCT 48, W3KUN 33, WA3EJO 24, W3ATQ 18, W3SAY 17, K3VQV 17, W3IDO 14, WA3MDY 13, WA3LDA 7, W3LOD 3.

CENTRAL DIVISION

ILLINOIS – SCM, Edmond A. Metzger, W9PRN – Asst. SCM: Harry Studer, W9RYU. SEC: W9AES. RM: W9MUC. PAMs: WA9CCP and W9PDI (vhf). Cook County EC: W9HPG.

Net	*Freq.*	*GMT/Days*	*Tfc.*
IEN	3940	1400 Su	no rep
ILN	3690	2330 Dy 0400 Dy	202
NCPN	3915	1300 M-S 1800	(27
Ill PON	3915	1430	361
Ill PON	145.5	0200 MWF	(
Ill PON	50.28	0200 M	(
ILNN	3720	0000 Dy	223

K9JTD, W9CN, K9MZN, WA9IZK and W9CRV participated in the County Wide Disaster Drill in Waukegan. The new officers of the CL in Waukegan are WA9LIV, W9ZND and W9TKR. New Novices of the Jefferson Junior High School include, WN9LHT, WN9LIE, WN9LLI, WN9LLJ, WN9LNH, WN9LNZ, WN9LNY, WN9LTU, WN9LTZ, WN9LTT, WN9LUA, WN9LTX and WN9LXG. Our sympathy to WN9HSA and members of his family and friends upon the passing of his father K9GOO. W9SOY's Hawaiian call is KH6HST. WB9HAD has passed his exam is waiting for his Advanced ticket. The Dayton Hamfest was the gathering spot for many of the Ill. section gang with the weather cooperating for many FB eyeball QSOs. WA9ITV gave a talk on Mobile installations at the May meeting of the CLNOIS Amateur Radio Club. The Sullivan Hamfest had a fine turn out and the outing is always an amateur favorite fo

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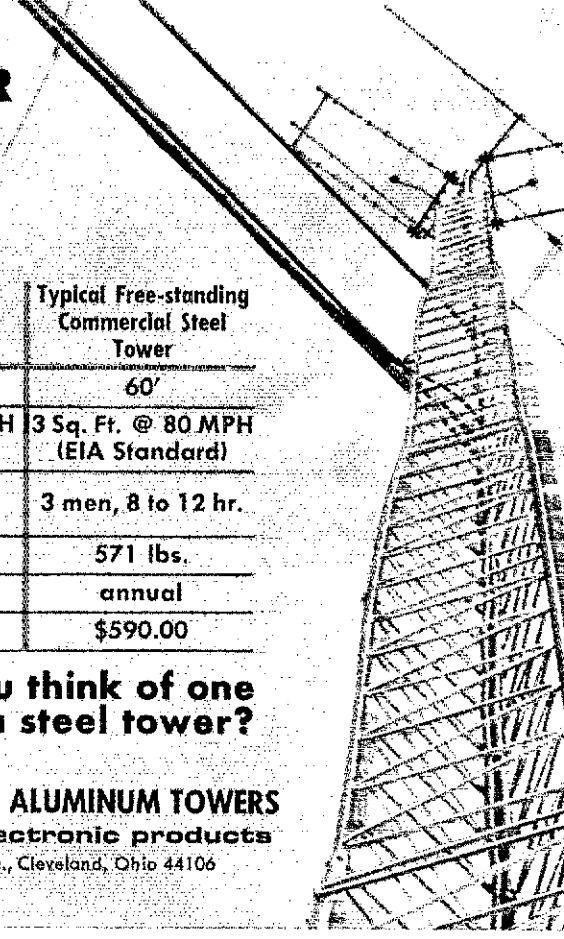

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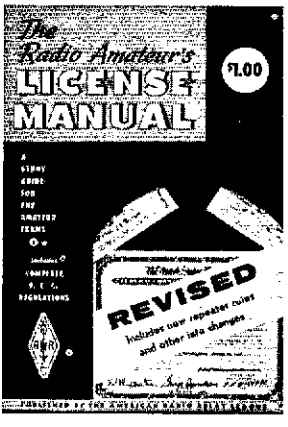

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Central Ill. K9IGZ, WB9LGJ and K9KZK of the Decatur area are sporting new gear and antennas. W9QKE's mother is recovering from surgery and her many amateur friends send their best for an FB recovery. WN9LUI, secy. of LAMARS, (Libertyville, and Mundelein Amateur Radio Society) reports new officers of the club are WB9FYW, W9HOQ, WA9YOY and WA9VOM. The Sangamon Valley Radio Club held their Old-Timer's Nite on their regular meeting held in May. The 11th annual QSO party will be held on Aug. 5, 1973. For further details contact Radio Amateur Megacycle Society, 3620 N. Oleander Ave., Chicago, Ill. 60634. This issue of QST has the complete rules. Traffic: K9MWA 379, W9NXG 269, W9AES 184, W9JXV 164, W9KRR 136, W9MUC 135, WB9JPS 124, WB9HEG 118, W9LNQ 60, W9OYL 55, WA9LDC 48, K9JTD 22, K9KHI 21, WB9ALP 17, WB9HAD 11, W9PRN 10, W9TAL 10, W9HOT 8, WA9LHD 4.

INDIANA — SCM, William C. Johnson, W9BUQ — SEC: WA9YXA. PAMs: WB9FOT (vhf), W9HWR, W9PMT. RMs: W9LHI, W9HRY, WB9KVN.

Nets	*Freq.*	*Time(Z)/Days*	*Tfc.*	*Mgr.*
ITFN	3910	1330-2300 Dy 2130 M-S	447	WB9FOT
QIN	3656	0100-0400 Dy	369	W9LHI
IPON	3910	1300-2130 Dy 2000 S	19	WB9AHJ
IPON CW	3712	0100 Dy	60	WB9KVN
IPON VHF	50.7	0100 M-W-Th	19	WA9ULH
IPON SSB	50.2	0200 Dy	50	W9MHZ
Hoosier VHF			19	W9PMT

With deep regret I report the passing of WB9GIX and K9ACL. Purdue Univ., Calmet has started an ARC with K9VGL, pres.; WA9WCS, vice-pres.; WN9KAM, secy.; WN9LRO, treas.; WB9ANT, act. chmn.; WA9YJK, sponsor. Dayton Hamvention was the largest I have ever seen at Dayton. W9HPG and W9PRN were there. W9HPG was also at the Tri State Hamfest at Evansville May 6. W9EGQ has built an audio Oscillator to be used on the 2-meter repeater. WA9EAU repeater frequency (146.16/146.76). K9HDP has a new keyer. K9OHO says the Central Ind. IPON VHF Net on 50.7 operating on MWF 0100Z reports traffic 11 and are looking for more check-ins. ITN and QIN have set up a liaison station at 2300Z net time to have more cooperation between the mode. Indiana Radio Club Council Hamfest will be hosted by the Tippecanoe County ARC at Lafayette County Fairground Sun. Aug. 19. For more details contact WB9FOT. BPLs: K9HDP, WA9EED, QIN Honor Roll: W9EI, K9HDP, K9HYV, WA9EED, WB9KVN, WB9LHI. Traffic: (Apr.) WA9EED 783, WB9KVN 290, K9HDP 244, WB9FOT 158, WB9AHJ 156, K9EZX 144, W9FWH 84, W9KT 81, WA9TJS 77, WA9OAD 58, K9HYV 57, W9HRY 54, W9BUQ 52, W9QLW 43, W9EI 42, WA9OHX 37, K9YBM 33, WB9CAC 32, W9JBQ 32, K9RPZ 26, K9RWQ 24, K9CBY 22, K9JQY 22, W9PMT 21, W9DZC 20, WA9ULH 19, WA9AXF 17, W9RTH 17, WA9TQD 16, W9KWB 14, WB9BAP 11, WA9OKK 10, K9EQT 9, WB9EEB 7, K9ILK 7, K9PSL 7, W9BDP 5, WA9IDG 5, W9IIOZ 4, W9HWR 3, WA9WME 3, WA9AQW 1, WN9HQU 1. (Mar.) W9EI 73, W9KT 25, WA9YXA 13, WA9AUM 12, K9DIY 12, WB9AMB 2, WB9ECF 1.

WISCONSIN — SCM, Joseph A. Taylor, W9OMT — SEC: W9NGT. PAMs: K9FHI, WA9OAY, WA9QKP. RMs: W9UCR, K9KSA. Net statistics: WSBN QNI 1162, QTC 161; BWN QNI 495, QTC 495; WSSN QNI 51, QTC 8. The Hamfest calendar for the state is now in full swing. Neenah-Menasha, Manitowoc and Yellow Thunder were all well attended. The Ham Band who entertained at Yellow Thunder thanks all who sent letters of congratulations and they hope to do it again soon. Congrats to new Novices in the Green Bay area WN9LLB, WN9LLC, WN9LLD. Thanks also to W9MFG – the Portage Co. area has quite a list of Novices in their area. Congrats to all the newcomers. K9OXY been doing a lot of OVS work on two meters. During the month he added states 10, 11, 12 plus a VE2 with a distance of 916 miles as DX. We have also received during the month several applications for AREC membership. SEC W9NGT reports we have 451 members of AREC within our section. K9JQE now walking around with a touch-tone pad on his standard HT. WB9ICH has a new Mini Products beam and rotator and also invited more stations to QNI the WNN on 3725 kHz at 1200Z. Traffic: K9CPM 431, W9DND 166, W9ESJ 110, W9MFG 92, K9FHI 88, WB9ABF 70, W9AYK 57, K9LGU 52, W9CTI 42, K9JPS 39, WA9OAY 32, W9IHW 30, W9KRO 28, K9XW/9 25, WN9ICH 21, W9DXV 19, WA9AJW 8, WB9DBC 8.

DAKOTA DIVISION

MINNESOTA — SCM, Casper H. Schroeder, WAØVAS — MSN (Minn. Sr. CW Net) no report. MJN (Minn. Jr. CW NET) WAØYAH RM reports sessions 25, QNI 163, QTC 12, NCSs WAØYAH,

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CN-50 (30.5–54.5) 29
CN-144 (7–11) 29
PV-144 Preamp 9
TX-62 VHF xmtr. 75

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2CQ Spkr/Q-mult. 29
2NT Xmtr 109
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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
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VX-35 VOX 9
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SX-130 Receiver 139
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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. 525
SR-400A Cyclone 3 675
P-500AC AC sup. 89
PS-500A AC supply 89
PS-500DC DC sup. 95
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HA-1 Keyer 59

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HQ-215 Receiver 219

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HX-30 6m Xmtr 149
HW-12 75m Xcvr 75
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HW-32A 20m Xcvr 85
HW-16 Xcvr 99
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E T O		
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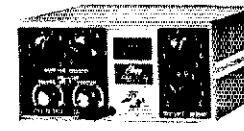
17929 Euclid Ave.: Cleveland, Ohio Phone (216) 486–7330
621 Commonwealth Ave.; Orlando, Florida Phone (305) 894–3238

Clegg FM-27B SAVE $50

Purchase a Clegg FM-27B for the Regular price of $479.00 with No Trade and you may take a $50 credit towards the purchase of any other new merchandise of your choice. Following are some possible suggestions of other merchandise you might take.

* Dycomm 35-0 Amp. 12v	$175.00
* Larsen NLA-150-1K Ant.	$ 79.00
* 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".



Terms on this FM-27B offer are:
- Master Charge
- BankAmericard
- GECC Revolving Charge Plan
- COD (20% deposit)
- Payment in Full with Order

AMATEUR ELECTRONIC SUPPLY

is the Best Place to purchase your new

DRAKE *gear for the following reasons*

TR-72 2m FM Xcvr, 12vdc, 23 ch.	$299.95
TR-22 Portable 2m FM Xcvr.	219.95
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
Rack panel adaptor for DSR-1	125.00
2C Receiver	$295.00
2AC Calibrator for 2C	18.75
2CS Speaker for 2C	22.00
2CQ Speaker/Q-multiplier for 2C	49.00
2NB Noise Blanker for 2C	26.95
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
W-4 RF Wattmeter (2-30 Mc)	61.95
WV-4 RF Wattmeter (20-200 Mc)	73.50
C-4 Station Control Console	395.00
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AL-4 Loop Antenna – BC Band	29.00
AN-5 Short Wave outdoor antenna	8.80
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TV-1000-LP 1000w Low-pass Filter	18.75
TV-300HP High-pass Filter	6.95
LN-4 Line Filter, 120v, 5 amp.	8.00
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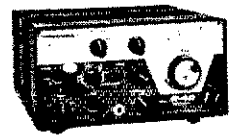
Fixed-Frequency Crystals	7.50
729SRD Microphone with plug	19.95
SPR-4 Programable Receiver	579.00
ACCESSORIES FOR SPR-4	
5NB Noise Blanker	$ 65.00
DC-PC DC Power Cord	5.00
TA-4 Transceive adaptor for SPR-4	25.00
SCC-4 Crystal Calibrator	20.00
RY-4 Teletype adaptor	10.00
DIAL Crystal Selector - plain	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

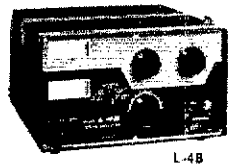
TR-72

TR-22

Order Today
Direct from this Ad



R-4C



L-4B

your
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welcome

- TOP TRADES for your good clean equipment
- STAY-ON-THE-AIR PLAN – Enables you to keep your trade-ins until your new gear arrives – Lose no operating time!
- PERSONAL SERVICE from fellow hams who understand your problems.
- SAME DAY SERVICE on most Orders and Inquiries from our Centrally Located Modern Facilities
- Top Notch Service Department
- LARGE COMPLETE STOCK means Fast Deliveries. United Parcel Service available to most parts of the country. – UPS Blue label (AIR) to the West Coast.
- GECC Revolving Charge Plan. Only 10% Down. LOW Monthly Payments – for Examply: $10 a month finances up to $300; $20 up to $610. Write for complete information and credit application.

SAVE up to $100.

If you purchase any of the new Merchandise listed below at the Regular Price and Without a Trade-in, you may take the "Bonus" Credit indicated below toward the purchase of other merchandise (such as power supplies, antennas, towers, microphones, crystals, linears, accessories, etc.)

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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Ray Grenier, K9KHW
Mgr. Mail Order Sales

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4828 West Fond du Lac Ave. Milwaukee, Wis. 53216
Phone (414) 442-4200

HOURS: Mon & Fri 9-9; Tues, Wed & Thurs 9-5:30; Sat 9-3

IMPORTANT! – Please Be Sure to send all Mail Orders and Inquiries to our Milwaukee store, whose address is shown above. The following Branch stores are set up to handle Walk-in business only.

17919 Euclid Avenue; Cleveland Ohio Phone (216) 486-7330
621 Commonwealth Ave., Orlando, Florida Phone (305) 894-3238

To: AMATEUR ELECTRONIC SUPPLY
4828 W. Fond du Lac Ave. Milwaukee, Wis. 53216

I am interested in the following new equipment:

I have the following to trade: (what's your deal?)

Ship me:

I Enclose $; I will pay balance (if any):
☐ COD (20% Deposit) ☐ GECC Revolving Charge Plan
☐ Master Charge* ☐ BankAmericard ☐ American Express

Account Number:

Expiration DATE *Master Charge Interbank number (4 digits)

Name:

Address:

City & State:

☐ Send used gear list

WAØTFC, WAØVYB, WBØFMR, WBØIST, WBØBQA, WBØELM, KØVMF. Novices: WNØFNA, WNØFMQ, WBØFYW, WBØIBO, WBØIZI. TEN Net rep. WAØRRA, WBØCNM. MSPN Noon Net KØELT PAM; sessions 30, QNI 810, QTC 155. MSPN WAØVYB, PAM; QNI 1123, QTC 117. PAW WAØYVT Mgr.; QNI 3159, QTC 191. Traffic: WAØVAS 1119, WBØFMN 524, KØZRD 129, WAØYVT 109, WAØTFC 92, WBØFTL 86, WØBUC 83, WBØHOX 83, WAØRRA 70, WAØGRX 63, WAØCCA 60, WAØVTZ 59, KØPIZ 53, WBØCNM 51, WØWFA 49, WBØBQA 44. WAØVYB 42, WAØURW 38, WAØMJF/Ø 34. WBØFMR 33, WAØYAH 33, KØZBI 33, KØFLT 26, WAØIIB 26, WAØYGE 17, WBØCYM 14, WBØFMI 13, KØJTW 12, WAØDXU 11, KØEDS 10, WBØFVY 10, WAØMMV 10, WØOPX 10, WAØJPR 9, KØWXH 9, WAØPRS 7, KØZXE 6, WBØDDH 3, WBØEUB 3, KØICG 3, WØUMX 3, WØRIQ 1.

NORTH DAKOTA – SCM, Harold L. Sheets, WØDM – SEC: WAØAYL. OBS: KØPVG. RM: WAØMLL. OO: WØBF, KØPYZ/Ø reports a ten member ham class going strong. Also invites you to his Annual Corn Feed on Aug. 12. The Three Rivers Radio Club were busy making plans for the FD activities at Fort Abercombie. KØITP reports back on the farm. WØECX is also back. WAØHUD off the air for awhile. WAØOVT reports 2-meter fm activity is moving along in Bismarck with several rigs in operation. He has built a six-element beam. KØRTY putting out a nice signal with that HW-12 – another OT on ssb. WBØANH worked some mobile communications to help some cyclists in racing activities north of Fargo. He and WAØJPT have been fone patching into Fargo this winter and spring. WBØIOR received his 25 wpm certificate. Congrats. He would like more ND QSOs on 40-meter cw. KØPZW, Valley Jr. High has a rebuilt duo-bander up on their roof. WAØMLL again made BPL as well as the PSHR. ND stations reported into TEN for 46 sessions. WAØUNA got in with WAØMLL too.

Net	*kHz*	*CDT/Days*	*Sess.*	*QNI*	*QTC*	*Mgr.*
Goose River	1990	0900 S	5	75	–	WØCDO
RACES	3996.5	1830 M-F	40	664	58	WBØATJ WAØSUF
PON	3996.5	0900 S				
		1830 S-S	14	261	10	WAØSJB
YL WX*	3994.0	0730 M-F	10	120	144	WAØGRX

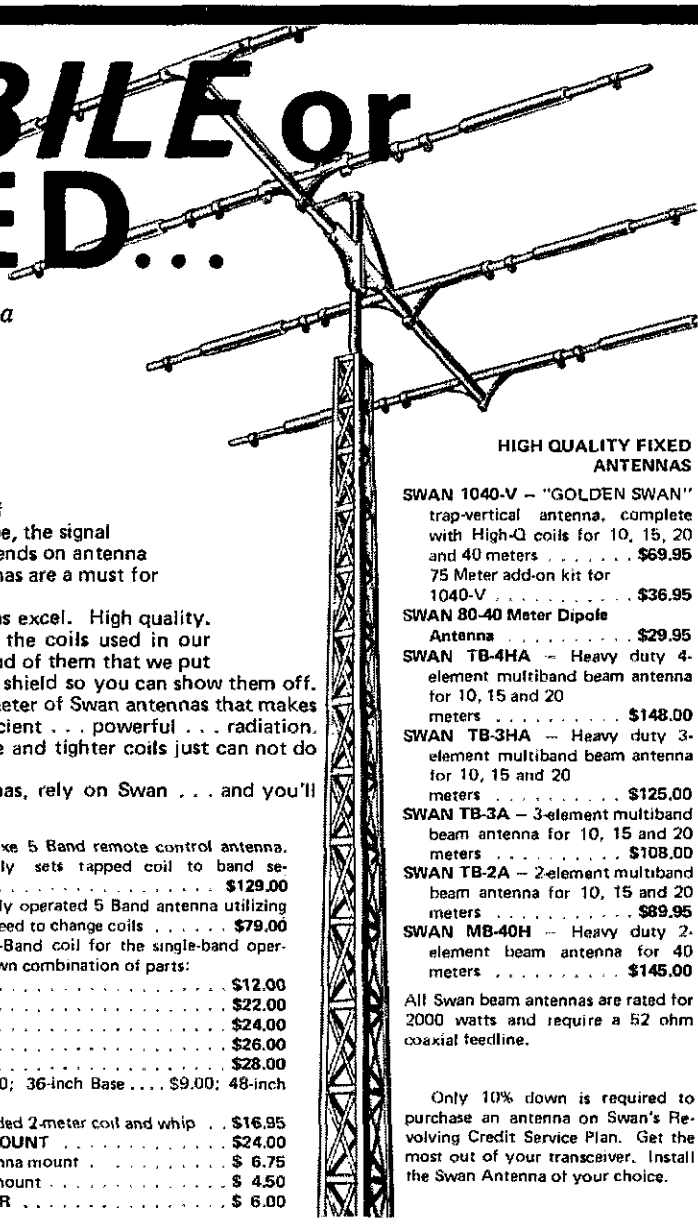
*Discontinued until Fall. Traffic: WAØMLL 297, WAØRWM 143, WAØSUF 23, WBØBCZ 22, WAØJPT 18, WØCDO 11, WØDM 11, KØPVG 8, WØMXF 4.

SOUTH DAKOTA – SCM, Ed Gray, WAØCPX – SEC: WAØOVR. PAM: WAØYAK. RM: WAØTNM. Net Mgrs.: WØHOI, WAØVRD, WAØZXV, WØNEO and WAØTNM. The South Dak. Ham Picnic will be held at Aberdeen on Aug. 4. For more details contact WØOGS, 1017 7th Ave., S.W. Aberdeen, S.D. 57401 or one of the Aberdeen hams on one of the S.D. nets. Your SCM's new address is Rt. No. 3, Salem, S.D. where he has accepted the position of Agricultural Extension Agent for McCook County. Net reports: Morning Net QNI 433 and 212 formals; NJQ 413 QNI and 21 formals. Early Evening 544 QNI and 6 formals; Late Evening 1330 QNI and 14 formals; SDN 178 QNI and 144 formals. Traffic: WØMZI 319, WAØKOK 301, WØHOI 114, WAØNZA 113, WAØUEN 108, WAØTNM 54, WØKJZ 42, WØIG 36, WØDVB 11, WBØDGA 7, WAØVFX 6.

DELTA DIVISION

LOUISIANA – SCM, Louis A. Muhleisen, Jr., WB5ALH – SEC: K5SVD. RM: W5GHP. PAM: WA5NYY. VHF PAM: WA5KND. I hope everyone enjoyed the Baton Rouge Hamfest. I was unable to attend Sun., prior commitments. The La. Council of ARCs, has been formally organized. Thee purpose is coordination of activities and exchange of ideas, etc. Activities already underway include frequency coordination for repeaters, creation of a Field Day award to be given to the club with the highest FD score, and plans to work toward starting a state-wide ham newsletter. Each participating club has two representatives on the council. WA5NYY was appointed PAM and started a state ssb traffic net on June 1 operating on 3910 kHz at 6:45 P.M. CDT daily except Mon. This is a traffic net only, but it is hoped that many La. hams will check in. LAN, the cw traffic net continues, on 3615 kHz at 6:30 and 10:00 P.M. CDT each day and the phone net (LTN) will coordinate with it to handle out of state traffic via the NTS. K5SVD working hard to develop a good emergency communication system within the state. If you can help in any way please contact Bill. New officers of the Twin City Hams are WA5OVN, pres.; WA5MWH, vice-pres.; WA5TRW, secy., WA5YKD, WA5ZCF, state council reps. W5KC invites everyone to check into the LaPON on Sun. at 1200Z on 3915 kHz. See you in Alexandria in Aug. Traffic: W5GHP 252, W5MI 73, WA5WBZ 27, WA5OVN 20, W5LA 8, W5KC 6, WB5IDV 5, W5CEZ 2.

MOBILE or FIXED...



Keep "In Touch" with a SWAN Antenna

Keeping "In-Touch" means a lot, whether we're reaching for a contact on the other side of the world . . . or just chewing-the-rag with a friend in the next state. Regardless of how great a transceiver might be, the signal that's actually transmitted depends on antenna efficiency. High quality antennas are a must for efficient operation.

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SWAN MOBILE 55B – Deluxe 5 Band remote control antenna. Dash control automatically sets tapped coil to band selected **$129.00**

SWAN MOBILE 45 – Manually operated 5 Band antenna utilizing tapped coil eliminates the need to change coils **$79.00**

SWAN MOBILE 35 – Single-Band coil for the single-band operator. Custom select your own combination of parts:

5-foot whip	**$12.00**
15 Meter Coil	**$22.00**
10 Meter Coil	**$24.00**
40 Meter Coil	**$26.00**
75 Meter Coil	**$28.00**

18-inch Base . . . . $8.50; 36-inch Base . . . . $9.00; 48-inch Base . . . . $9.50.

SWAN MOBILE MD-4 – Molded 2-meter coil and whip . . **$16.95**

SWAN DELUXE BUMPER MOUNT **$24.00**

SWAN TMD – Trunk-Lid antenna mount . . . . . **$ 6.75**

SWAN RMD – Roof antenna mount . . . . . **$ 4.50**

SWAN KWIK-ON CONNECTOR . . . . . **$ 6.00**

HIGH QUALITY FIXED ANTENNAS

SWAN 1040-V – "GOLDEN SWAN" trap-vertical antenna, complete with High-Q coils for 10, 15, 20 and 40 meters **$69.95**
75 Meter add-on kit for 1040-V **$36.95**

SWAN 80-40 Meter Dipole Antenna **$29.95**

SWAN TB-4HA – Heavy duty 4-element multiband beam antenna for 10, 15 and 20 meters **$148.00**

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SWAN TB-2A – 2-element multiband beam antenna for 10, 15 and 20 meters **$89.95**

SWAN MB-40H – Heavy duty 2-element beam antenna for 40 meters **$145.00**

All Swan beam antennas are rated for 2000 watts and require a 52 ohm coaxial feedline.

Only 10% down is required to purchase an antenna on Swan's Revolving Credit Service Plan. Get the most out of your transceiver. Install the Swan Antenna of your choice.

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Gentlemen:

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☐ Full payment of $_____ enclosed.

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☐ 20% down payment enclosed, ship C.O.D. ☐ 10% down payment enclosed, charge remainder to my Swan Credit Account # _____

(All antennas shipped Motor Freight Collect.)

Name: _____ Call: _____

Address: _____

City: _____ State: _____ Zip: _____

MISSISSIPPI – SCM, Walker Coffey, W5NCB – PSHR: WB5EIN, WB5DLW, K5YTA, WB5FML. BPL: WB5EIN. Novice Net is setting new records with the hard work of WB5EIN. WN5HYN and WN5HFA are traffic men. OOs are needed in this section. Can you help? Welcome to WB5IRR as new NCS on MSBN. WB5DCY has been chasing Oscar and has DX as well as stateside contacts. WA5BNH trying to get set up with the antennas etc., again after moving. WB5FML building a keyer. He made his first traffic delivery last month. Tombigbee Club recently had FB publicity in several papers and kicked off a new Novice class. We may hear WB5HMY with an SV call soon. Gulf Coast Side Band Supper was super. Our Vice-Dir. W4WBK and XYL were there. ECHO Rptr. Apr. newsletter was great. Editor is WA5FII. Let's all get in July CD Party.

Net	Freq.	Time(Z)/Days	QNI	QTC	Mgr.
MTN	3665	2345 Dy	118	122	WA5YZW
MNN	3733	2400 MWF	119	66	WB5OEK
GCSBN	3925	2330 Dy	–	–	W5JHS
CGCHN	3935	0100 Dy	1300	102	WA5VVV
MSPON	3970	2345 MS	363	49	WAØGVO/5
MSBN	3987.5	0015 Dy	964	174	WB5BUE

Traffic: WB5EIN 215, W5SBM 201, WB5DLW 185, WB5FML 148, WA5YZW 128, W5EDT 97, W5NCB 73, WB5BUE 63, WA5THM/5 54, K5YTA 50, WN5HFA 32, WN5HYN 20, WAØGVO/5 17, WB5BKM 10, WB5DCY 10, WB5AHY 7, WA5BNH 5.

TENNESSEE – SCM, O.D. Keaton, WA4GLS –

Net	Freq.	Time (Z)/Days	Scrs.	QNI	QTC	Mgr.
TPN	3980	1245 M-F 1400 SSuH	30	1630	52	W4PFP
TSSBN	3980	0030 T-Su	27	1359	61	K4MQI
ETPN	3980	1140 M-F	22	644	21	WA4EWW
TCN	3980	0200 Th	4	45	0	W4CYL
TPON	3980	0030 M	4	136	10	WB4BHZ
TN	3635	0000 Dy	30	247	118	WB4YCV
TNN	3707.5	0000 Dy	29	143	42	WB4NIR
ETVHFN	50.4	0000 TThS	13	201	0	W4SGI
FTVHFN	145.2	0000 WF	9	37	0	WB4DZG
ETFMN	29.7	0200 WF	9	42	0	WB4NFI
KVHFN	50.7	0100 T	4	25	0	WB4MPJ
MFTMN	28.8	0200 TF	9	55	0	W4LAY
ACARECN	146.28 146.88	0100 M	4	65	0	WA4BXK

WB4NIR, Novice Net Mgr. requests more participation in the net, which has changed from 3707.5 to 7135 kHz and became effective May 6. Mar. CW Net Honor Roll: WB4NIR, K4CNY, WB4DJU, WB4YCV, W4ZJY, WB4VIX, WN4AVD, WN4BQQ, WB4VIX and WB4YCV have earned TNN certificates. Correction: WB4USG received the Net Mgr. Award instead of WB4YCV as reported. Public Service Honor Roll for Mar. should note W4ZJY who had a score of 38 points. Congratulation to WB4WBO on getting General ticket. Everyone plan to attend the Crossville Hamfest on 21st and 22nd. Congratulations to WB4YCV upon upgrading to amateur Extra Class. Tenn. amateurs say thanks to W4DQS for his help concerning QSL Bureau affairs. Traffic: WB4YCV 198, K4CNY 177, W4OGG 117, WB4DJU 47, WB4WHF 47, WA4GLS 25, W4ZJY 25, W4WBK 24, W4PFP 19, WB4ANX 11, WB4MPJ 11, K4SXD 11, WB4DYJ 10, K4UMW 8, K4SJV 7, W4TYV 3, W4SGI 1.

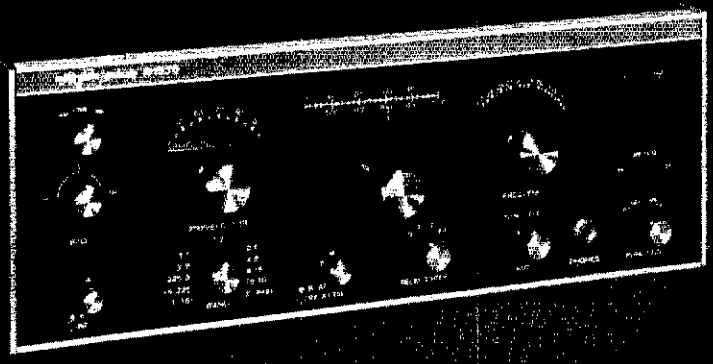
GREAT LAKES DIVISION

KENTUCKY – SCM, Ted H. Huddle, W4CID – SEC: WA4GHQ. Appointed: WB4EOR as PAM. Endorsements: WB4FDK and W4OYI as ORSs; WB4AUN and WA4AGH as OPSs; WA4AGH, WA4ZVL and W8HTQ/4 as ECs. BPL: WB4ZMK.

Net	QNI	QTC	Net	QNI	QTC
KRN	383	26	KYN	275	190
MKPN	605	59	KNTN	169	126
KTN	1130	170	KPON	71	22

Some of the summer hamfest schedules: Somerset July 8, Louisville Aug. 26. W4AQI, WB4IDW, WA4JQS, W4CID, W4OXM, WB4WCM and WB4KUC all made the Dayton Hamvention. K4TXJ's XYL is now WN4EKA. K4HBG and W4OXM have new 2-meter rigs. W4VQA and WA4CKE have been busy readying the Ashland repeater. It will be .34/.94 open. K4MAN has resigned as PAM of KTN. Bob is moving to Fla. and will be turning the net over to WB4EOR. Many thanks for a job well done Bob and good luck to Chet! Traffic: WA4JQS 287, W4BAZ 181, WB4ZMK 164, WB4WCM 117, K4UNW 90, WB4EOR 74, WB4ZML 73, W4CID 71, WN4ZMG 70, WN4YOS 66, K4MAN 63, K4TXJ 62, WB4ZSA 53, WB4AUN 52, WN4CKW 41, WB4HUS 28, WA4VZZ 27, WA4RCD 25, WA4AVV 21, WB4EWG 19, WA4GHQ 19, WB4REN 19, K4YZU 19, WA4FAF 15, W4NBZ 14, W4OYI 13, W4CDA 12, W4BTA 11, WA4ENH 10, K4LOL 8, K4QHZ 8, WB4FOT 7,

First in its class!



Introducing the Galaxy R-1530. A receiver of remarkable performance, the first in its class to combine true professional features and moderate cost. It adds a new dimension of performance to general coverage, monitoring, shortwave listening, commercial and military communications.

Frequency range: 0.1 to 30 MHz continuous (.01 to .1 with reduced sensitivity) • Sensitivity: 0.25 microvolts for 10 db signal plus noise to noise ratio SSB • Intermodulation Distortion: 3rd order suppressed more than 70 db • Front-End Overload: .1 volt for 10% distortion (On Signal)

For additional specifications contact Hy-Gain Electronics Corporation, 402/434-9151, Telex 48-6424.

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Dept. HG, 8601 Northeast Highway Six, Lincoln, NE 68507

WA6KTN/4 7, WB4TNZ 7, WA4AGH 5, K4AVX 5, WB4GCV 5, WA4UMR 5.

MICHIGAN – SCM, Ivory J. Olinghouse, W8ZRT – SPCs: W8MPD. RMs: W8JYA, W8WVL, W8RTN, K8KMO, W8GLC. PAMs: W8GVS, WA8KHB, WB8HQS. VHF PAMs: K8AEM, WA8WVV.

Net	Freq.	Time/Days	QNI	QTC	Sess.	Mgr.
QMN	3663	2200 Dy	1258	429	88	W8JYA
WSBN	3935	2300 Dy	737	104	30	W8GVS
QWN	7124	No report				
BR/MEN	3930	2130 S-F	676	104	25	WA8KHB
UPEN	3920	2130 Dy	745	34	32	WB8HQS
GLETN	3932	0130 Dy	869	74	30	WB8AXL
PON	3955	1500 Dy	975	290	30	K8LNE
PON/CW	3645	2300 M-S	190	23	26	VE3DPO
MI6M	50.7	2300 M-S	186	27	19	WA8VXE
MNN	3720	2130 Dy	208	73	30	WB8JAD

SW Mi. VHF nets – W8CVQ – QNI 98, sessions 5; K8ZWR – QNI 48, 5 sessions; WA8WVV – QNI 86 and 5 sessions. WA8EKJ, WB8EKH, W8IZ and W8EWT are reported as Silent Keys. Do not forget the all Mich. Nets picnic at Midland July 15. The UP Hamfest will be held at Escanaba Aug. 4 and 5. Officers for the BR-MEN nets for 1973 are W8NDI, mgr.; WB8RYB, asst. mgr. and W8FJU, secy-treas. Detroit Metro Area QCWA now have a CW net on 3663 on Sun. at 8:30 A.M. called Tate Memory Net. K8MXC passed the Extra Class exam at Detroit. Congrats to Bob who is blind. W8KBN is now W8QM and Extra Class. WN8PP is new in Wyandotte. WA8RII is now WB4DFU. WA8MOA is building a seven foot dish for 1296. K8ZSM has new Ringo, says it works wonders. W8KUP is on 2 fm with Regency HR-212. K8SWW now is WR8AAA at Milford, the first new repeater license in 8th call area. The J.C. March for Mankind had communication and pick-up furnished by CMARC members K8ACO, W8TXM, WB8LOA, WB8HZS and WA8MVH. CMARC also helped with Ingham County Cancer Drive. Participating were mobile operators W8s FSZ, SQL, VJC; K8s BGZ, DHN, HXW, ILF, ZLP, YRD, ACO; WB8s AAX, LOA; WB4VVA/8. Relay stations were W8ZKC, W8CRP and W8SDB. WN8NCD is waiting for the Postman to deliver his new General Class ticket. WB8DVM has a new Advanced Class tag. Traffic: (Apr.) WB8JAD 258, WA8ENW 185, WA8PIM 156, W8UES 136, W8IBX 123, W8GLC 113, W8ZBT 98, WB8HIB 96, K8LNE 96, K8DYI 90, K3SKL/8 80, W8RTN 60, W8NOH 55, WB8FBG 54, WB8IMI 48, WB8HQS 42, WB8BPY 41, WB8HPZ 36, W8EU 35, W8WVL 35, W8IZZ 33, WB8DKO 31, WA8KHB 31, W8OW 29, W8MO 28, WB8RYB 27, WA8RXL 27, W8NDI 26, WB8DJS 21, K8SDA 18, W8HKL 17, W8IUC 17, WA8EXR 16, WB8APN 15, W8HJI 15, WN8NCD 15, W8CSO 12, K8GXV 12, W8OKW 12, W8SCW 12, K8WRJ 12, W8EOI 11, K8GOU 11, K8JHA 11, W8TBP 11, WB8EEU 10, WA8WVV 10, W8BEZ 9, WA8OJI 9, K8ACO 7, W8VIZ 7, WB8DRT 6, K8JED 6, K8PYN 6, W8QBE 5, W8FZL 4, WB8GWK 4, WA8CUP 3, WB8FUN 3, W8VXM 2. (Mar.) W8JYA 154, WB8KWI 54, K8AEM 4.

OHIO – SCM, William E. Clausen, W8IMI – Asst. SCM: Kenneth L. Simpson, WA8ETX. SEC: WA8COA. RM: WA8WAK. PAM: K8UBK. VHF PAM: WA8ADU.

Net	QNI	QTC	Sess.	Freq.	Time(Z)	Mgr
OSSBTN	2702	904	82	3972.5	1430/2000/2245	K8UBK
BN	532	303	61	3577	2300/0200	WA8WAK
OeMtrN	486	62	30	50.16	0100	WA8ADU
OSN	236	71	30	3577	2225	WA8WAK
BN RTTY	144	69	29	3605	2200	K8NCV
BN NOVICE	74	57	19	3730	2300	WN8OE

New appointees: K8NCV, BN RTTY Mgr; W8GFC, EC Butler Co.; K8RXM, EC Clermont and Brown Co.; WA8JXM, EC Hamilton Co. WB8DIL, EC Warren Co.; WB8NRC, OPS. WN8MZZ reports the Ohio Novice Net now meets at 2230Z on 3740. The Dayton Hamvention broke all records with attendance over 6400. The Ohio Post Office Net meets Tue. at 2200Z on 3952 and Sun. at 1200Z on 3935. OH2RY was a recent house guest of W8WNA. Congratulations to new Extra Class WB8JEL. K8ONA reports the Apricot Net handled communications for the Cleveland Loyalty Day Parade and that the new officers of the Buckeye Belles are: K8ONV, pres.; WA8BWD, vice-pres.; WB8FIC, secy.; WA8QFL, treas. Retiring SEC W8OUU was awarded a plaque by the ECs of Ohio. The Warren Hamfest is Aug. 19. The Miami Valley FM Assn. participated in the search for a missing child and provided communications for Kettering Police and Fire during a park cleanup. Members of the Cuyahoga Falls RC provided communications for the Variety Club Telethon. SW Ohio AREC and the Queen City Emergency Net combined forces to assist in the United Clothing Drive. Westpark Radiops toured the NASA Lewis Research Center. WA8LWH worked Nev. to complete WAS. Lancaster and

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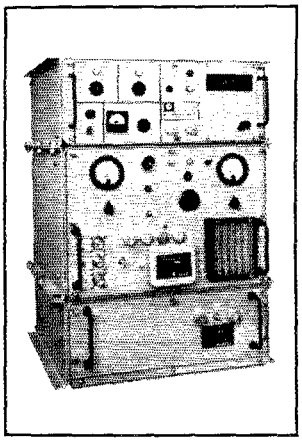

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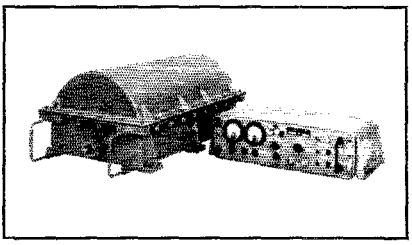

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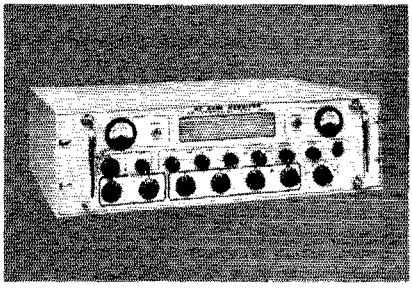

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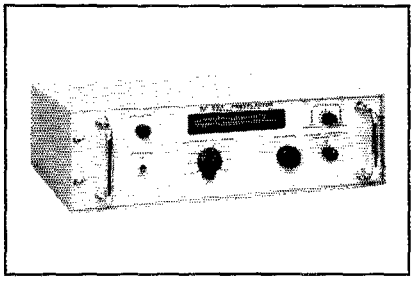

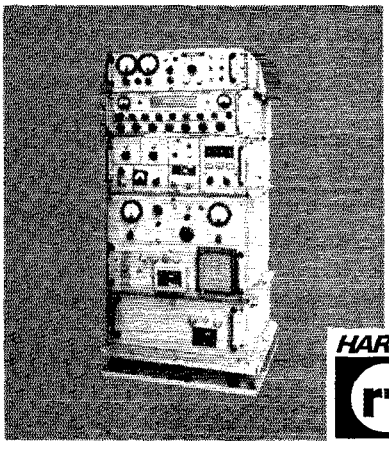

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Fairfield Co. ARC's newsletter reports WA8MNI is NCS of an RTTY Net meeting Wed. at 2200 local time on 50.3. W8MGP has started his twenty fifth year as editor/publisher of the Greater Cincinnati ARA newsletter, Mike and Key. Central Ohio AREC participated in the March of Dimes Walkathon. Toledo area's Ham Shack Gossip reports W8GRT spoke to the Fulton Co. ARC on traffic handling; the Toledo Mobile Radio Assn. Auction was well attended and that K8MYN won the recent 160-meter transmitter hunt. Traffic: WA8MCR 669, W8QCU 286, W8SUS 269, WA8YLW 201, W8CUT 193, W8PMJ 173, WA8HGH 158, W8TJB 158, WA2ASM/8 132, WB8NGA 127, WB8ALU 119, WB8NRC 105, K8MLO 104, WA8WAK 102, K8UBK 94, WA8ETX 91, W8GVX 78, W8MGA 70, WA8SED 68, W8EGD 67, WB8KKI 60, WB8NAB 57, WB8CLF 56, WB8JGW 54, WB8MKZ 54, WB8KXV 53, W8JD 52, WB8AYC 51, W8MOK 49, W8DDG 42, WB8FEZ 42, WA8DWL 35, W8LZE 34, WA8VKF 32, WB8CSH 30, WB8IBZ 30, W8ERD 28, W8WEG 27, WA8ADU 25, W8OE 25, WA8UPI 25, WA8KPN 23, WA8VWH 23, WA8NOQ 22, WA8YIB 22, W8QZK 21, WB8FCT 20, W8ARW 18, WA8ETW 17, WA8BCX 16, K8JDI 16, WA8ZNC 16, WA8FCO 15, K8QVR 15, WA8SSI 15, K8CKY 12, W8GOE 12, K8KWO 11, WA8ZYE 10, W8BHL 9, WB8GGR 9, W8NAL 9, K8EHU 8, WB8FWF 8, WA8MHO 7, W8PBS 7, WB8BLH 6, WA8MIH 5, W8ETU 3, WN8MYA 2, WA8FSX 1.

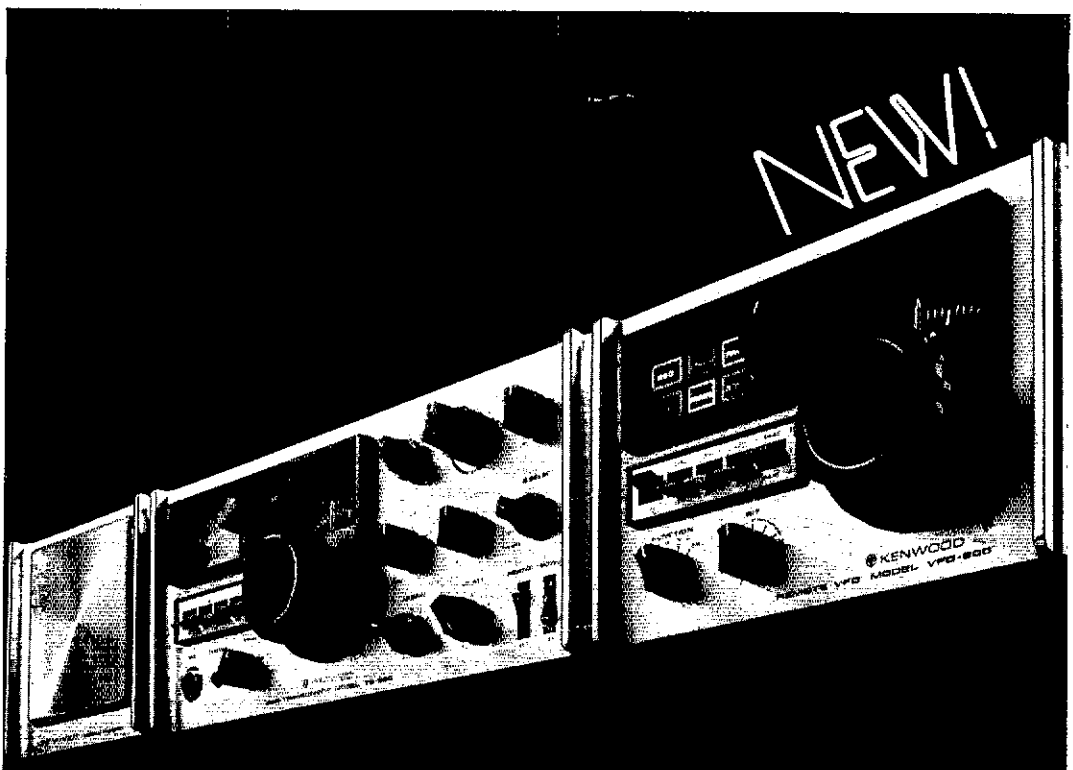
HUDSON DIVISION

EASTERN NEW YORK – SCM, Graham G. Berry, K2SJN – Asst. SCM/PAM: Kenneth Kroth, WB2VJB. SEC: W2URP. RMs: WA2FBI and WB2IXW. RTTY RM: K2DN. Nets: (All EDST – 1 hour earlier) NYS daily at 0001Z and 0300Z on 3.675 MHz; ESS (10 wpm) daily at 2300Z on 3.590 MHz; Novice Training Tue. at 0045Z on 3.677 MHz; NYRTTY daily at 2330Z on 3.613 MHz; Division P/R Net 2nd and 4th Sun. 2200Z on 3.925 MHz; NYSPT&EN daily at 2300Z on 3.925 MHz. Westchester County Novice Net – all welcome – a newcomer Tue. and Sun. 0001Z on 3.725 MHz. First quarter report for New York Phone Net shows 101 hours operation, 4120 check-ins, 629 messages handled (formal only). SEC W2URP hosted get together of ECs, SCM and Director in Kingston in early Apr. for joint discussion of all AREC activities in section; a first? Director K2SJO visiting many clubs in the section this Spring. Picnic time coming: NYSPT&EN and NYS scheduled for Aug. as usual – details from WB2QAP and W2MTA respectively. HARC held meeting of most Asst. Directors and top appointees for problem-airing Apr. 14. Albany ARA heard W2APF on Managua earthquake activities. Harmonic Hills welcomed Director K2SJO for showing of slide film "The Case for Belonging" – a premiere no less. W2FWU chaired June annual dinner. Westchester ARA heard Ed Anderson of Timex on electronic watches. RPI Club Auction Apr. 22. Schenectady ARA heard W2ODC on Repeater "history" and K2SJO on regulatory matters. Communications Club of New Rochelle heard WA2KEC on antenna design. WA2MYK's film "CQ Field Day" now available from Hq. WB2VUK running Bulletins at 1900 local time via K2AVP repeater. WA2EAH now holds 5BDXCC No. 242. "Ham of the Year" awards to WB2OHQ, W2ODC, K2HYL and WA2KPD voted by local club. Congratulations to all four. WN2EOO (got it right this time!) looking for QRP gear. WN2AKK new member New Rochelle Club. WA2VEG at DXCC 280 points. WA2RAU column from CCNR "Communicator" reprinted by DX News and by Worldradio. Hope you all had a good FD '73 – and "just wait until next year". Traffic: (Apr.) WA2CNE 233, W2GPF 137, K2UYK 70, WA2PJL 42, K2SJN 24, WA2WGS 20, W2SZ 18, W2URP 18, WB2LXC 17, WA2RFP 17, WB2AEQ 16, WB2CUH 13, WB2NME 5. K2HNW 4. (Mar.) K2UYK 37, K2DN 33.

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. The following are major AREC/RACES nets; join one!

Bronx	28.64 MHz	50.35 MHz	146.17 MHz
Kings	28.64 MHz	50.35 MHz	146.26 MHz
Richmond			146.88 fm
New York	29.5 MHz	50.48 MHz	145.62 MHz
Queens	29.5 MHz	50.20 MHz	145.62 MHz
Nassau	28.72 MHz		146.10 MHz
Suffolk(West)	28.73 MHz (Hunt.)	50.46 MHz	145.59 MHz
	28.65 MHz (Smith.)		147.21 fm
Suffolk(East)			146.88 fm

Note: Net times between 2000 and 2100 local, Mon. W2ELB reports a change in the Nassau Co. Hq. AREC station call letters to W2FI as a memorial to long time EC Everitt Gibbs. This call will replace K2DHC. WB2FJX reports the "Brooklyn" repeater (.205-.805) WA2ZWP is off the air while looking for a new location. K2HK has been visiting Haiti, – looking for some magic to work some DX I bet! WB2BYY preparing for the smoke test of the QST fm receiver for 2 meters. A new HD-10 keyer is improving the cw



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operation at the QTH of WB2EKK. The Suffolk Co. RTTY Society is looking for individuals interested in teletype. Contact W2INT for details. For those interested in participating in a section RTTY Traffic Net, contact W2INT in Suffolk Co. and myself, K2DGI in Nassau and N.Y.C. area. The section is in dire need of traffic outlets throughout the section, and it is hoped RTTY can provide those outlets to help supplement the small response of the cw and phone section nets. Both HF and VHF people are needed so no one is left out. The VHF RTTY operation will be helped greatly with the operation of the RTTY repeater in Hempstead (147.87 to 147.27) when all circuits are completed. A need for liaison stations will exist, so if you have the capability of CW/Phone/RTTY and are willing to reprogram cw and phone traffic into RTTY, let us know, your services will be greatly appreciated. That Ole' man Murphy has done his thing over WA2CXY's way for 8 weeks. Be advised of a change in time and frequency for the NLI Phone Net: 1730 local on 3928 kHz. Change made because of QRM and help the working man to make the Net. Congratulations to WB2FIG who recently upgraded to General and a CP35 certificate. K2VGD has been "fooling around" with his newly acquired HW-7 QRP rig, and is on his way with WAS 10 and 5BDXCC around the corner! WN2NVJ had the rig warmed and ready when the Postman delivered his new Novice ticket. He had gotten both feet wet by checking into a traffic net. (Bravo!) If you happen to hear K2DGI on RTTY these days it is NOT a bootlegger! He's also "fooling around" with FAX (facsimile). Congratulations again to WB2WFJ on RPLI Traffic: WB2WFJ 804, WB2LZN 267, WB2OYV 164, W2EC 151, WB2CHY 131, WA2CXY 116, WB2LQA 112, WB2ROF 60, WB2DAR 47, K2FE 36, K2VGD 25, K2FV 12, WB2BYY 11, W2PF 10, WA2NCY 9, WA2PLI 9, W2EW 8, WA2LJS 7, WB2JEC 7, WN2NVJ 5, WA2VXN 5, W2DBQ 3, WA2MDX 3, WB2EKK 2.

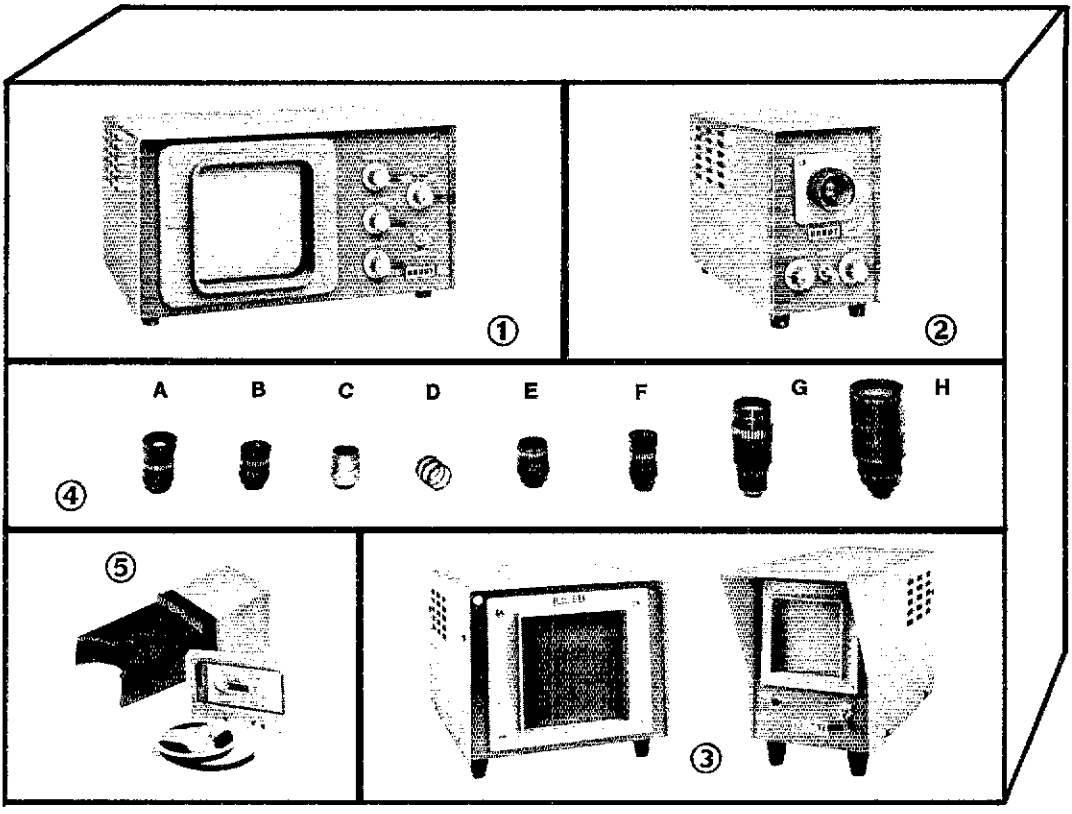
NORTHERN NEW JERSEY – SCM, John M. Crovelli, WA2UOO – SEC: K2KDQ. RM: W2ZEP. PAMs: K2KDQ and WA2FVH.

Net	Hr/Time(PM)/Days	Sess.	QNI	QTC	Mgr.
NJN	3695 7:00 Dy	30	453	210	W2ZEP
NJN	3695 10:00 Dy	30	250	104	W2ZEP
NJSN	2730 8:15 Dy	25	47	16	WA2TRK
NJPN	2950 6:00 M-S	29	518	181	WA2FVH
NJPON	3940 6:00 Su	5	69	28	WB2FJE
PVTEN	145.210 7:00 Dy				K2KDQ

New appointments: K2AGZ as OO; WA2NLP ORS and OPS. Endorsements: W2ABI, K2AGI, W2CVW, WB2DDQ, K2EQP, WA2EUO, W2JDH, W2NKD, WB2WID, W2WOJ, K2ZFI and W2ZZ as ORSs; WA2BAN, WA2BAU, WA2CCF, W2CVW, WA2EPI, K2JTH, K2MFX, W2NKD, WA2NPP. WB2RKK, WA2UZH, WB2WID, K2ZFI OPSs; and WA2NPP as OVS. Glad to have you all back for another year. WB2AEH and WB2NOM passed the Extra Class exam. WB2JWM aced the Advanced. WN2CWS and WN2DVE from St. Peters ARC qualified for their Generals. Congratulations! WB2FWW was reelected pres. of the Univ. of Penna. ARC. WB2JYM making contacts through Oscar while attending M.I.T. (W1MX). The Don Bosco ARC has been issued the call WA2NRD and pres. WA2FXX reports a new 40-meter traffic net on 7113 kHz at 6:45 P.M. Rutgers ARC has acquired an FT-101. Englewood Amateur Radio Assn. Week was proclaimed June 17-24 by Mayor Taylor of Englewood. GSARA is working on having Amateur Radio Week proclaimed statewide by the Governor. WA2JHT was elected vice-pres. and WA2QNT to the executive board of the Penn State Univ. ARC. WN2DWB upgraded to General. OO reports were received from K2BMI, WB2IEC, WB2TFH and W2TPJ. WA2RYD working hard on his new 813 linear. W2CVW is DXing with a five watter. WN2CWS working on a new two meter antenna. WB2TFH has acquired a 75S1 for OO duties and K2BMI is moving to Rocky Hill where he plans exotic skyhooks. WA2EXX reports the Waldwick AREC net meets on 21.111 MHz at 0100Z the first Tue. of the month. WB2YPQ again active after studying hard all winter. WB2AEH recruiting new AREC members in the Holmdel area. WA2RYD looking for help on D2RN. WA2UOO, W2CVW, W2ZEP, WA2FQG and W2IHA attended a meeting of Hudson Division officials at Rye, N.Y. W2CU was a recent speaker at GSARA. Appointees are reminded monthly reporting is a requirement for retention of the appointment. Openings exist for qualified EC and OO applicants. The New Jersey QSO Party will be held Aug. 18, 19. Additional details from WA2CCF. Traffic: (Apr.) WA2RYD 272, WA2EUO 184, WB2AEH 107, W2ZEP 98, WB2NSV 85, WB2RJJ 58, WA2NPP 44, WA2UOO 32, WA2FVH 29, W2CU 28, WA2CCF 22, WA2CAK 20, W2CVW 17, WB2JSH 15, WA2QJU 12, W2WOJ 11, WB2JWM 10, WB2HJW 4, WN2CSX 2, K2OQJ 2, WA2SHT 2. (Mar.) K2OQJ 14, WB2YPQ 2, WA2SHT 1.

MIDWEST DIVISION

IOWA – SCM, Al Culbert, KØYVU – SEC: KØCLI. Hats off to KØLKH for the splendid job of preparing the Iowa repeater (there



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are now 14 in Iowa!) directory which recently was mailed to all Iowa ARRL Affiliated Clubs and repeater sponsors. WBØDTD is moving to Marion where he will be associated with a real estate firm. Those Clinton fellows are really on the ball; WAØEFN was the 4th most active OO during 1972 for the entire ARRL OO program, and KØGXR compiled some neat statistics as Midwest Division leader in both modes in the 1972 Sweepstakes Contest. WBØBPH reports that WØWSV, (the Cedar Rapids Club Station) has a WATS telephone line for message delivery in Iowa and will gladly QSP messages. WAØDYZ is experiencing a problem which is becoming increasingly difficult for the roll-your-own fellows, and that is a reliable parts supply source for the relatively small quantities of uncommon parts used in ham construction projects. WØDSP is still hard at it, with more new hams in Osage; WNØJVO and WNØJVZ. WAØVZH is the new Net Mgr. for the noon session of the Iowa 75 Meter Net.

Net	*Freq.*	*QNI*	*QTC*
IOWA 75 Meter (noon)	3.970	1416	71
IOWA 75 Meter (eve)	3.970	923	49
IOWA Tailcorn (cw)	3.560	131	34
Tri-State Teenage	3.975	87	3

Traffic: KØDDA 261, WAØAUX 229, KØAZJ 85, WAØTAQ 54, WØMOQ 37, WAØVZF 40, WØWSV 17, KØJGI 16, WBØDBG 15, KØYVU 12, WØBW 11, WBØBPH 10, WBØFEW 9, WAØOTQ 9, WAØVZH 7, KØLKH 2.

KANSAS – SCM, Robert M. Summers, KØBXF – I am pleased to see a few more of the Kans. gang becoming interested in what the league is and is not doing for them. Keep the mail coming. All nets reporting for Apr.: KWN – QNI 564, QTC 153 in 30 sessions. KEC – 47 0/4. KSBN – 826/95/25. KPN – 203/16/17. HBN – 407/29/23. QKS-SS – 278/254/30. YLN – 20/67/4. QKS – 310/295/60. Midstates Mobile Monitor Service QNI 1682 serving 84 mobiles handling 106 QTC and 50 calls or patches in 90 hours. All nets could use more checking into by some of the newer hams. In passing through the bulletins received this month I noticed the Grounded Grid of the Wichita Amateur Radio Club, WAØUTT editor, listed the "Amateur's Code". Hamfest time is at hand again. Why not make plans now to get to a few of them this year so some of the gang can see what you really look like. I'll be to most of them and would like to do a little politikin' face to face; you know it's election time again. Traffic: (Apr.) KØMRI 305, WNØGQL 224, WNØGVR 202, WØHI 200, WBØHBM 151, WNØHTR 122, WØFIR 75, WØCHJ 59, WØMA 56, WØGCJ 50, WBØCZR 49, WNØHTF 47, KØJMF 46, KØBXF 44, WAØLBR 43, WNØNTH 42, WNØFSL 41, WBØCUY 36, WBØBIY 35, WØRBO 32, WØPB 30, WAØSWC/Ø 30, WBØFGV 27, KØGII 16, WØFCL 13, WØMCH 12, WØNYG 12, KØVTA 12, KØKU 10, WAØOWH 8, WØFDJ 5. (Mar.) WØPB 29.

MISSOURI – SCM, Larry S. Phillips, KØVVH – Asst. SCM: Clifford Chamney, KØBIX. SEC: KØHNE. New appointments: WAØEMX as OPS; WBØERQ, WØNUT PAMs; WØOVJ RM; KØDEW, WAØSKR, WAØVBG, WØVZK ECs. Appointments renewed: KØDYM as OO; WAØEMS OPS; WAØTAA, WØENW, WØQMF ECs; WAØFMD, KØONK ORSs; WAØITU OBS; KØRPH OPS/ORS/RM; WØRTO EC/ORS/OPS; KØTLM OVS.

Net	*Freq.*	*Time (Z)/Days*	*Sess.*	*QNI*	*QTC*	*Mgr.*
MOSSB	3963	2300 M-S	25	971	73	KØHNE
MEN	3963	2230 MWF	13	266	19	WØNUT
MON	3585	0000 Dy	30	191	91	WØBV
MON2	3585	0245 Dy	30	114	48	WØBV
PHD	50.45	0130 T	5	107	11	WAØKUH
MSN	3703	0030 T-S	25	88	43	WØOVJ
		2100 Su				
WEN	28.6	0130 M	5	35	3	WAØKBH/Ø
JCAREC	146.94	0330 T	5	25	0	WAØRVT
Mar.						
MOPON	3963	2200 M-S	19	275	39	WAØTAA
PHD	50.45	0130 T	4	87	13	WAØKUH

Congratulations to WBØERQ as new mgr. of MOCN and WØOVJ (ex- WNØGWE) as new mgr. of MSN. With deep regret I report WAØMPB as a Silent Key. Congratulations to the new TEN-J ARC with call WBØKCD, WAØAMW, pres.; also to the new K.C. Assn. For the Blind ARC, WAØFQL, pres. Congratulations to new Extra Class KØUTX; Advanced WBØDYV, WBØERI, WBØGQP; Generals WBØEMF, WBØJVQ; Novices WNØJVG, WNØJVH, WN7VMM/Ø. Traffic: (Apr.) KØONK 857, WØBV 152, WAØVBG 108, WØOVJ 84, WAØFMD 77, KØBIX 70, KØPCK 51, KØVVH 48, WØOUD 46, WØEPI 20, WBØCKI 16, KØENH 9, WBØFQM 8, WAØKUH 8, WØGBJ 6, WAØETV/Ø 4. (Mar.) WAØWOC 13, WNØGQP 8, WAØEMX 7.

NEBRASKA – SCM, V.A. Cashon, KØOAL – Asst. SCM: Velma Sayer, WAØGHZ. SEC: KØODF. Appointments: WAØGHZ as RM, ORS and OPS.

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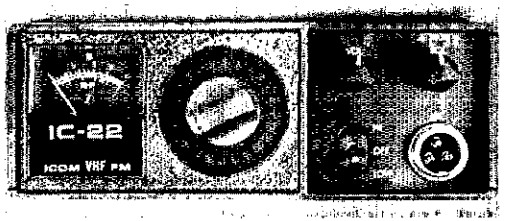

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Net	Freq.	GMT/Days	QNI	QTC	Mgr.
NSN I	3982	0030 Dy	1215	21	WAØLOY
NSN II	3982	0130 Dy	962	28	WAØLOY
Neb. 160	1995	0130 Dy	121	84	WAØCBJ
NMN	3982	1330 Dy	1248	28	WAØJUF
WNN	3950	1400 M-S	573	48	WØNIK
ARCC	3982	1430 Su	217	1	WØIRZ
CHN	3980	1830 Dy	926	36	WAØGHZ
SHN	3950	1930 Dy	210	10	WØDJO
DEN	3980	2100 M-F	352	21	WAØAUX

Our sympathy to KØUWK on loss of his mother. Welcome to new hams K4DJN/Ø XYL WA4ZHT/Ø and harmonic WN4CZO/Ø from Fla. Crete ARC had good turnout for annual pancake supper. WAØDXY operating KWM2 driving SB200 and WAØPCC operating HPM300. 2-meter activity picking up in Norfolk area. WAØGAT has rig perking. Nebr. CW Net (NEB) meets on 3700 kHz at 0100 and 0345 GMT daily. Participation requested to keep net active. WØLJO mobiling in Ariz, regularly reported into morning net. WØKPA back from Tex. WAØHQQ reports RACES to become active in Cherry Co. WNØGTW, GTM and HDG hope to drop "N" from calls. ARRL Midwest Division Convention, Lincoln, Nebr. Oct. 5-6-7. Traffic: WØLOD 93, WAØSCP 90, WBØCAU 51, WAØCBJ 41, WØHOP 33, WØMW 32, WØSGA 30, WØIHA 27, WAØOEX 25, WØRJA 21, WØFQB 16, WØDJO 15, WAØDXY 15, WØIAK 12, WØNIK 12, WBØEVS 11, WØDMY 10, KØODF 10, WØVEA 10, WAØPCC 8, WØCSW 7, WBØGAK 5, WAØGHZ 5, KØMUF 5, WØHBS 4, KØOAL 4, WAØOOX 4, WØUOV 4, WAØYGZ 4, WØAFG 3, WAØJKN 3, WØNHS 3, WØYFR 3, WAØZQC 3, WAØEEI 2, KØPTK 2, WØZNI 2, WAØHFH 1, WAØHQQ 1, WØIRZ 1, WAØLOY 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	60	578	392
CPN	3965	1800 M-S 1000 Su	30	539	194
VHF 2	145.98	2200 M-S	20	52	22
VHF 6	50.6	2100 M-S	20	96	5

High QNI: CN — W1BYW, W1CTI, W1EJI, W1KV and W1MPW. CPN — W1BFY, W1MPW, WA1NLD, W1NQO and WA1QZH. SEC W1HHR reports Section Training Net doing very well and Teams 1, 2 and 3 going strong. ECs are requested to send regular reports to continue their appointment. Director W1QV would appreciate all clubs striving for 100% ARRL membership and be sure your club is ARRL affiliated. CN has two sessions daily and all stations are welcome to check in. CPN extends a welcome to those on phone. A sincere vote of thanks to the Candlewood ARA for another Conn. QSO Party. New officers for Murphy's Marauders: K1DPB, pres.; WA1KID, vice-pres. & act. mgr.; W1RML, vice-pres.; WA1KZE, secy.-treas. With regret we add the calls of W1EEG and W1TEJ to the list of Silent Keys. Oscar 6 is still going strong — information from those active would be appreciated. Satellite Guide available to ARRL members, send 7 x 10 addressed envelope with 16 cents postage with request to ARRL. W1LCJ holding Novice classes in Norwich. Congratulations to: WA1KRG for Extra Class; and to WIMPW again for high QNI on CN and CPN during Apr.! Field Day is here — hope it is another very enjoyable one for all. Join a traffic net now to keep in shape for next year — please provide traffic outlets for all areas. Thanks. Traffic: W1EJI 235, WA1FCM 196, W1EFW 186, WA1GFH 157, WIMPW 132, W1CTI 120, WA1NLD 115, WA1QZH 90, WA1PHJ 69, W1KV 63, WA1HYN 60, WA1KVI 51, K1SXF 47, K1YGS 39, WA1LIR 38, K1EPW 32, W1AW 29, W1GVT 27, WA1NBS 22, WA1PHF 22, WA1GGN 21, W1BDI 20, W1QV 13, W1RML 11, W1CUH 7, WA1OPB 7, W1HHR 3, WA1PPD 2.

EASTERN MASSACHUSETTS — SCM, Frank L. Baker, W1ALP — SEC W1AOG received reports from ECs: WA1s DXI OWO; W1s BAB, UJF; K1s NFW, ZUP. WA1NRT new EC for Sharon. W1CJC, W1JKR, W1KVR are Silent Keys. W1HF would like to know where ex-W1JJY is? WA1GZQ/7 in Seattle, WA. T9 Club held Ladies Night at Marty's Steak House. WA1QAH/5 moved to NM. WN1RWH is WA1OEX's XYL. W8KSO is ex-K1CKE in OH. WA1AOJ has his Tech. W1QV was at the So. Eastern Mass. ARA and presented plaque to WA1BYM. Greater New Bedford Emerg. Net coordinating with Newport County (RI) Red Cross Net on 50.7 MHz. W4WZ sends his 73 to all. OOTC held a luncheon at Valle's in Saugus and W1DFS presented W1NF a 70-year as a ham certificate. WN1RTY operates some at W1BCH. The Somerville ARC, WA1MHN sending code practice on 146.670 MHz on Mon. at 8:30 P.M. K5ZDW, ex-W1HPH, in the Deaconess Hospital. K1TVY, W1ZHC on 2-meter

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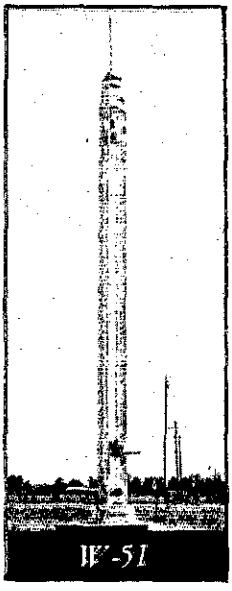

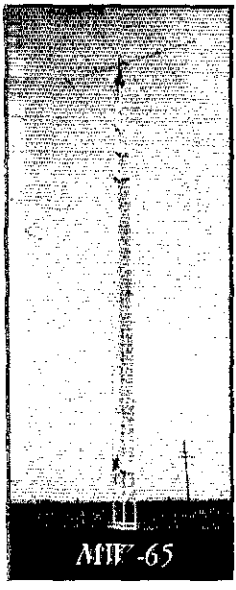

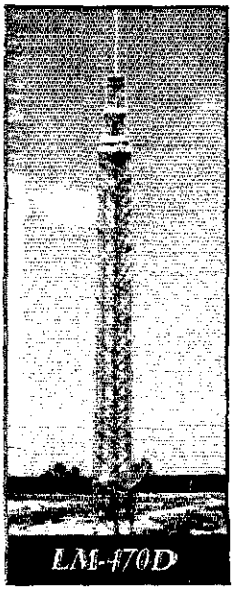

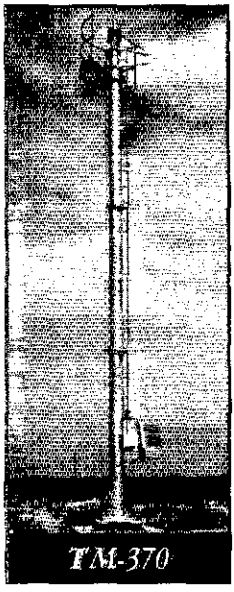

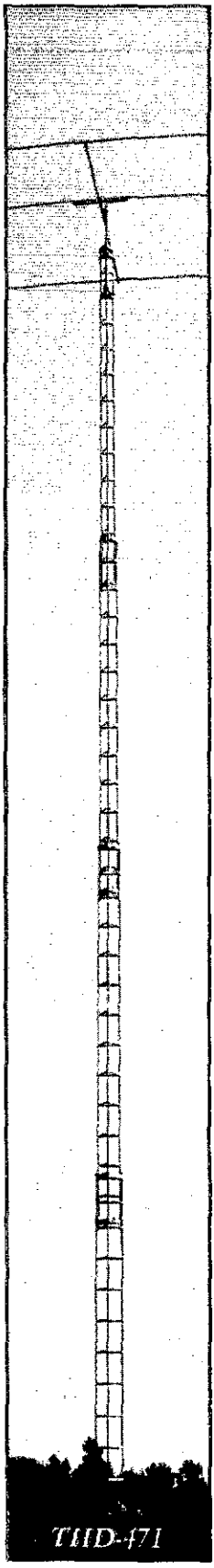

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fm. WA1FYF on 6. W1PEX made BPL. W1OJM home from the hospital. WA1OWQ building 6-meter am rig. WA1MYK has a TR-22 on 2. W1EMG again to Hawaii. W1PL was high scorer in the 1972 SPDX and H-22 contests. WA1FNM has a Cantenna. WN1RFD has an SB-102, also WA1OB/1. WA1KZE is secy.-treas. of Murphy's Marauders. New officers of Norfolk Co. ARC are W1IDV, pres.; W1WTF, vice-pres.; W1IJA, secy.; W1SYC, treas. W1OV and W1ALP attended their annual banquet. WN1OKD on many bands. WN1PGY has an HW-101. W1ALP spoke at the Sharon ARA. Pea Soup Net meets Tue. on 50.5 at 0230. W1BB went to Dayton Hamvention. WA1OUB worked W7VDZ, WA3HWB, VE4MA and K8BBN on 6; WA1GAQ worked K8BBN and WA8BKB also on 6. Quite a gang showed up at South Shore's auction. W1VRK gave a nice demonstration of SSTV at Massasoit ARA meeting. WA1EZB has his Extra Class. WN1RFF has 45 for WAS. Capeway RC met at K1IPB's QTH. WA1NLX completed Merit Badge course to qualify for Eagle Scout. WA1MTI gave a talk on SSTV and FAX at Framingham RC. WA1OAM new OVS. Endorsements: W1AEC as ORS/OPS; WA1OMM OBS/OPS; WA1JYY OBS/ORS; W1AAR OPS; W1PST EC; W1ALP OBS; W1AOG OPS/OVS; W1BB OPS/ORS; WA1DFL OVS; K1ZUP EC. WA1DFL worked 8P6EN on 10 and says aurora was good for 6. New officers of Malden RC: WA1HPS, pres.; K1VTE, vice-pres.; WN1QPR, secy.; K1CKS, treas. W1PM has a new HW-202 transceiver. Chelmsford ARA had speakers from the FAA in Nashua, NH. W1DKD's son wants old ham license plates. W1JMG gave a talk at the Norwood ARC. DL2AA/W1 home after an operation. W1OW has a Drake ML-2 mobile. WA1GSB has a new TR-7 200 mobile.

Net	*Freq.*	*Time/Days*	*QNI*	*QTC*	*Mgr.*
6M2MN	145.8	2000 M-F	145	120	WA1OWQ
NEEPN	3945	0830 Su	109	?	K1EPL
EMN	3660	1900/2200 Dy	325	206	WA1MSK
6MCBN	50.85	1930 M-F (Mar)	30		K1OKF

Traffic: (Apr.) W1PEX 889, WA1MSK 426, W1OYY 230, W1CE 221, WA1OWQ 122, WA1MYK 59, W1EMG 56, WA1EYY 37, WA1NRT 36, WA1OAM 35, W1DOM 20, WA1IFE 18, W1AOG 14, W1MNK 11, K1LCQ 10, W1ABC 8, K1EPL 5, WA1FNM 3, W1PJ 3, WN1RFD 2. W1PL 5 (Mar.) W1CE 103, WA1MXV 45, WA1IOB/1 8.

MAINE – SCM, Peter E. Sterling, K1TEV – SEC: K1CLF. PAM: K1GUP; RM: W1BIG. The PAWA and the Yankee Repeater Assn. held an auction and supper at the Holiday Inn Apr. 23. WA1FCM and his XYL WA1JCN were guests of the PAWA. K1GAX showed a film of Hams Wide World. WA1FCM was the guest speaker for the evening. W1AE is back from Fla. and active on the Barnyard Net. The new summer sked for the Seagull Net is 1730 local time to 1830. We will be going back to the regular Net time when we are on EST. W1MGP is in the process of moving back to his original QTH on North Haven Island. The Northeast Area of Barnyard Net reports 27 sessions, 771 check-ins for Mar. Apr. report is 25 sessions, 628 check-ins. New hams in Maine are WN1RVM, W1GZS, K1MTJ, K1OYB and W1HHO are working DX through Oscar 6. Congrats! OOTC Apr. luncheon at Saugus, Mass. was attended by W1BHA and W1CTR, W1EM and W1GCB also W1BKU, XYL and son. Traffic: K1GUP 24, K1TEV 14, WA1NMW 8, WA1RDX 4.

NEW HAMPSHIRE – SCM, Robert C. Mitchell, W1SWX – SEC: K1RSC. RM: W1UBG. New appointments: K1YSD, WA1QGA as OPSs. Endorsements: W1BYS as OPS; WA1FSZ as OVS. The Concord Brasspounders, W1OC new officials are W1VBX, pres.; W1COE, vice-pres.; W1SHI, secy.-treas.; W1QXZ, trustee. The rare Worked New Hampshire Award sponsored by this club will be handled by W1JB. This report originates from West Palm Beach, Fla. W1BYS reported several accidents on Route 93 via W1ALE repeater to W1NBB during the Apr. 4 snowstorm. WA1QGA helping out as Net Control on the NH AREC Net. WA1JSD building a Heath HW-202 for 2-meter fm. WN1QNK worked two new countries, PJ2JW and WP4DOY. Ex-K1JYI is now WN1R1X and on 80 and 40 from Contoocook. W7TMI/1 has had over 9000 QSOs this past year. Welcome to new hams: WN1RUP, WA1RVI, WA1RVK. WA1FSZ is gearing up for the VHF Contest. WB6TMY/1, on 75 meters, also keeps the broadcast station on the air in Bradford. W1DXB reports the wandering gypsy WA1JTM, alias KG6JBS, now is in Alaska awaiting another call. W1UBG was visited by K1BCS who collects expired ham license plates. Happy 4th of July to all. Traffic: K1POV 117, W1UBG 114, WA1QGA 20, W1FVN 3, W1SWX 2, W1BYS 1.

RHODE ISLAND – SCM, John E. Johnson, K1AAV – SEC: W1YNE. PAM: W1TXL. WN1RIT is building an HG10B VFO and a two watt 40-meter QRP rig. He also worked JH1WIX on 15 meters.

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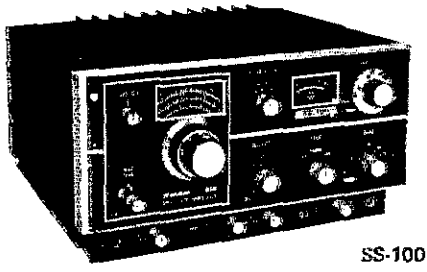

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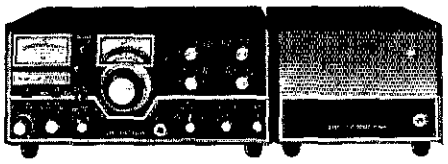
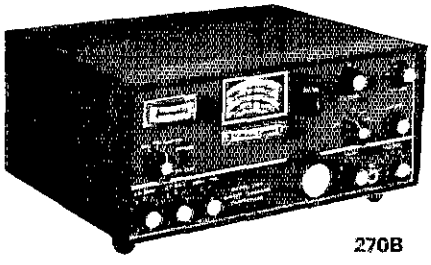
SWAN MB-100 (100 Watt P.E.P.) . . **$139.95**
SWAN MB-200 (200 Watt P.E.P.) . . **$209.95**



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**

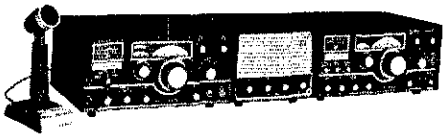


270B

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:

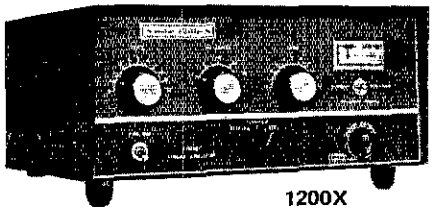
SWAN WM-1500 In-line Wattmeter 5, 50, 500 & 1500 Watt scales. . . **$49.95**
SWAN 600S — Speaker **$21.95**
SWAN 600SP — Deluxe speaker with phone patch **$64.50**
SWAN 600R — CW Filter **$29.50**
SWAN 600R — AM Filter **$39.95**
SWAN 14-117 — DC Power Supply **$139.95**
SWAN 510X — VFO **$53.95**
SWAN 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**

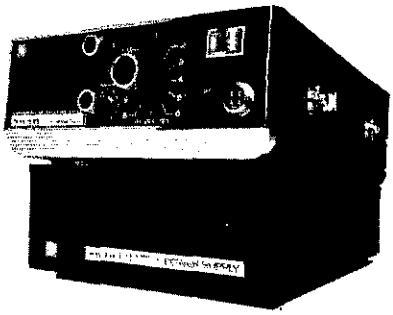
SWAN FM-2X — Operates directly from 12 volts DC. Up to 12 channel operation on 2 meters. Crystals for channels 1, 2 and 3 are included. Provides 10 watts of RF output. Furnished with dynamic microphone **$259.00**
SWAN FM-2X — Snap-on AC Power Supply **$39.95**

LINEAR AMPLIFIERS



1200X

SWAN 1200X — 5 Band Linear Amplifier. 1,200 watts P.E.P. Built-in power supply. **$259.95**
SWAN VHF-150 — 2 Meter Linear Amplifier. 180 watts P.E.P. **$299.95**
SWAN MARK II — Linear Amplifier. 2,000 watts P.E.P. 10 to 80 Meters **$679.95**
SWAN MARK 6B — Linear Amplifier. 2,000 watts P.E.P. 50 to 54 mHz **$679.95**



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**
SWAN VHF-150 — 2 Meter Linear Amplifier. 180 Watt P.E.P. Built-in 117 or 230 volt AC power supply. **$299.95**
SWAN 14C — DC Converter, adapts to SWAN VHF-150 for mobile operation. Also converts 117XC and 230XC to operate with a 12 volt DC source. **$69.95**

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☐ Data on your New solid-state units. I am interested in your
☐ SS-200, ☐ SS-100, ☐ SS-15, ☐ MB-40, ☐ MB-80,
☐ Credit Application, ☐ Other_____

Name:_____ CALL:_____
Address:_____
City:_____ State:_____ Zip:_____

WA1QOG has been working DX on 40 meters. WN1RFT hopes be operating from the URI in the fall. All clubs in the state we prepared for FD and W1AG operated from Lincoln. All clu reported to have three rigs on the air for FD. Traffic: WN1POJ 2 WA1QOG 8, K1QFD 3, WN1RFT 4.

VERMONT – SCM, James H. Viele, W1BRG – SEC: W1VS/

Net	Freq.	Time(Z)/Days	QNI	QTC	Mg
VTSB	3909	2200 M-S 1130 Su			W1Z
VTPO	3909	2200 Su	101	13	K1B(
Carrier	3932	1300 M-S			W2QV
Green Mt	3932	2100 M-S			W1FI
Vt.Phone	3932	1330 Su			W1KK

Welcome to new amateur WN1RUO. WA1KQA has moved to Ess Jct. from NH and operating 20/40. WA1GUV back in Burlingt after five years in the military. WN9KRK looking for sked for WA W1GRE from Hq. spoke at BARC meeting. W1KOO installing n hard line co-ax for better coverage. Traffic: K1BQB 1 WA2DGZ/1 63.

WESTERN MASSACHUSETTS – SCM, Percy C. Noble, W1B – SEC: WA1DNB. CW RM: W1DVW. 75 Meter PAM: WA1I UHF/VHF PAM: W1KZS. The Sun. morning WMEN held sessions with QNI of 57 and traffic 9. NCSs: WA1DNB, W1DV WA1ITL. WMN held 30 sessions with QNI of 123 and traffic Top five in attendance: W1BVR, W1DVW, WA1ITL, W1K WA1OUZ. The afternoon WMPN had a QNI of 193 and traffic NCSs: K1PKZ, K1RGO, W1ESG, WA1ITL. Top five in attendan K1RGO, W1ESG, K1MAL, W1WYS, K1TLV and WA1GXN (t for 5th place). Anyone interested in any of the above nets, dro line or message to one of the officials listed at the beginning of t report. WA1KHC (repeater) was on stand-by alert for 16 hours Apr. 4 for flood conditions (9 stations involved). W1OBA active WMPN and Berkshire Co. AREC. WA1HSO and WA1PGP marr Apr. 13. W1KZS has WAC and YLCC. New Techs: WA1RI WA1RZO. WA1FKF's (14 year old) son WA1PZM now has General and a 25 wpm certificate. K1LDT writes more 6-me activity is being promoted in the Springfield area and are plann on repeater activity shortly (now on 52.525). OO K1VHO sent 12 discrepancy reports during Apr. WA1OUZ has a new TX CMARA: 12 members are participating in the Tech. and Gene courses. HCRA: Homebrew night held May 4. MARC: Held *auction and homebrew night. Memories of the Royal Order of* Wouff Hong were revived by one of their members who joined 1925. Mt. Tom ARA: New members: K1PKZ, K1YCD, W1NPL of Mass. Club put on an amateur radio exhibit at the Cam Center. With regret, we report the passing of K1DZW. NOBA Hamfest, Sun., Aug. 19, at the *Little Red Schoolhouse, Route 7* Williamstown. Repeater seminar will be held. V. of Lincoln: has additional 100 articles on file for their bulletin. Traffic: W1D 75, W1BVR 74, W1TM 21, WA1LNF 17, W1ZPB 14, WA1OUZ W1KZS 5.

NORTHWESTERN DIVISION

IDAHO – SCM, Donald A. Crisp, W7ZNN – The Idaho-Mo CW Net meets at 0130 GMT week days on 3582 kHz but may m *to 40 meters during the summer months. Check with W7GHT* the frequency. The WIMU Hamtest will be held at West Yellowst in early Aug. Watch QST for the dates. W7JE is due home fr Europe soon. W7FHQ and WA7JFC are moving to a new QTH. Thatuna Club (Moscow) officers are W7FIQ, pres.; W7GGH, tre W7IDT, secy.; W7GHY and WA7MIK, dir. WA7HWD report 2-meter repeater is being installed on Moscow mountain. frequencies are 146.22 MHz in and 146.82 MHz out. The repe will be controlled by a 450 MHz link. W7JJA and W7FBL set u ham station for a Scoutarama held at Salmon, Idaho. Idaho Net: 12 sessions, 168 check-ins, 22 traffic. FARM Net: 30 sessi 1009 check-ins, 37 traffic. IM Net 21 sessions, 122 check-ins traffic. Idaho RACES Net: 21 sessions 728 check-ins, 21 traf Traffic: W7GHT 297, WA7BDD 122, W7AXL 53, W7IY W7ZNN 21, W7FIS 5.

MONTANA – SCM, Harry A. Roylance, W7RZY – Asst. S Bertha A. Roylance, K7CHA. SEC: W7TYN. PAM: WA7IZR. Idaho, Mont. Net is off to a good start with 21 sessions, QTC o and QNI of 122. W7MKE vacationing in Europe for a coupl months. W7OIO has been in the hospital. WN7USP is a disa veteran and is living in West Yellowstone. W7TYN reports we 174 members in the AREC at this time. We are hoping to have Thurston and some of the folks from Newington visit us in M *this summer. Plans are underway for the WIMU Hamtest to be* at Macks Inn, Idaho on Aug. 3, 4 and 5. Will see you all th

WHICH ANTENNA WINS THE CONTEST ?

In open competition against thousands of commercial and home-brew antennas, WA1JFG won the New England championship with a Gotham beam, by a margin of 5,982 points! WB2JAM won the sectional award for the Sweepstake contest in 1969 and 1970 with a Gotham 4-element 15-meter beam! Hundreds of unsolicited testimonials from grateful hams are our proof that Gotham antennas give you the best design, and the best materials. Forget our low prices — rely on the results op open, competitive contest. Ask yourself: Why do Gotham antennas win?

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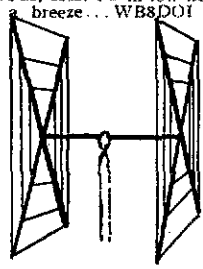
QUADS

Totally satisfied with quad. Worked DK4VJP, SM7DLH, XE1AB, DM4SEE, FL8SR, F6AUM, HK7VB in few hours. Instructions a breeze . . . WB8DOI



CUBICAL QUAD ANTENNAS— these two element beams have a full wavelength driven element and a reflector(the gain is equal to that of a three element beam and the directivity appears to us to be exceptional! ALL METAL (except the insulators) — absolutely no bamboo. Complete with boom, aluminum alloy spreaders; sturdy, universal-type beam mount; uses single 52 ohm coaxial feed; no stubs or matching devices needed; full instruction for the simple one-man assembly and installation are included; this is a foolproof beam that always works with exceptional results. The cubical quad is the antenna used by the DX champs, and it will do a wonderful job for you!

10/15/20 CUBICAL QUAD SPECIFICATIONS

Elements: A full wavelength driven element and reflector for each band.

Frequencies: 14-14.4 Mc.; 21-21.45 Mc., 28-29.7 Mc.

Dimensions: About 16' square

Power Rating: 5 KW.

Operation Mode: All.

SWR: 1.05:1 at resonance.

Boom: 10' × 1¼" OD, 18 gauge steel, double plated, gold color.

Beam Mount: Square aluminum alloy plate, with four steel U-bolt assemblies. Will support 100 lbs.; universal polarization.

Radiating elements: Aluminum wire, tempered and plated, .064" diameter.

X Frameworks: Two 12' × 1" OD aluminum 'hi-strength' alloy tubing, with telescoping ⅞" OD tubing and dowel insulator. Plated hose clamps on telescoping sections.

Radiator Terminals: Cinch-Jones two-terminal fittings.

Feedline: (not furnished) Single 52 ohm coaxial cable.

Now check these startling prices — note that they are much lower than even the bamboo-type:

10-15-20 CUBICAL QUAD	$41.00
10-15 CUBICAL QUAD	36.00
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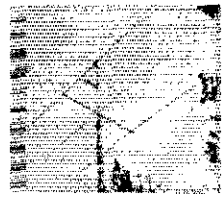
TWENTY METER CUBICAL QUAD	31.00
FIFTEEN METER CUBICAL QUAD	30.00
TEN METER CUBICAL QUAD	29.00

(all use single coax feedline)

BEAMS

"Just a note to let you know that as a Novice, your 3-El. 15 Beam got me RI Section Winner and New England Division Leader in Novice Round-up. See June QST, p. 57 for picture of ant. (below). Tnx for a fine working piece of gear. 73s, Jay, WA1JFG"



Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history! Each beam is brand new! full size (36' of tubing for each 20 meter element for instance); absolutely complete including a boom and all hardware; uses a single 52 or 72 ohm coaxial feedline; the SWR is 1:1; easily handles 5 KW; ⅞" and 1" aluminum alloy tubing is employed for maximum strength and low wind loading; all beams are adjustable to any frequency in the band.

2 El 20	$25	4 El 10	$24
3 El 20	31*	7 El 10	38*
4 El 20	38*	4 El 6	24
2 El 15	21	8 El 6	34*
3 El 15	25	12 El 2	31*
4 El 15	31*		
5 El 15	34*		

*20-ft. boom

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V160 vertical for 160, 80, 75, 40, 20, 15, 10, 6 meters . . $22.95

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GOTHAM, 1805 Purdy Ave, Miami Beach, Fla. 33139

W7OTJ is having his annual picnic on July 15. Two meters i increasing in activity with the coming of spring and better roa conditions. Repeaters in Mont. at this time are Mt. Royal on 34-94 Missoula on 34-94, Helena on 16-76, Butte on 34-94 and Bozema on 28-88. A couple more are to be activated this summer. W7OT and WA7MPH are on 2 from Stillwater Co. Mont. Traffic Net ha 982 check-ins, 68 pieces of traffic and 21 check-ins. Post Office Ne had 333 check-ins, 4 traffic and 25 sessions. Traffic: WA7JQS 60 W7LBK 51, WA7KMP 14, WA7IZR 5.

OREGON – SCM, Dale T. Justice, K7WWR – SEC: W7HLF RM: K7GGQ. PAM: K7ROZ. Section net reports: WA7NW reports for the BSN for Apr. sessions 58, traffic 151, contacts 145 check-ins 1046, WA7GTX reports for the AREC for Mar. session 28, traffic 14, contacts 53, check-ins 340. We thank Bill for hi service as net mgr. and welcome WA7RWM to the position. John reports for Apr. for the AREC net sessions 28, traffic 14, contact 37, check-ins 372. The Central Oregon Hamfest will be held in Ben on Aug. 18. K7QUF has a new TR4-C. Traffic: (Apr.) K7OUF 202 212, K7QEG 175, W7ZB 145, WA7TXV 90, W7DAN 89, WA7NW 64, K7WWR 37, WA7MOK 31, W7IWN 24, W7LT 18, W7MLJ 8 WA7KRH 6. (Mar.) WA7KRH 11. (Feb.) WA7BYP 17.

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	298	190	30	K7OZA
NSN	3700	0200	376	197	30	WA7OCV
AREC	3930	1700(Su)	58	7	5	W7UWT
NWSSB	3945	0130	740	39	30	W7SVV
NTN	3970	1830	1065	88	30	W7PWI

NAMS NTN and WARTS picnic is July 14 and 15 at Lewis an Clark State Park, White Pass. Spokane has new club – Spokan Junior ARC – reports WN7TIC. Communications for the Everet March of Dimes Walkathon were provided by HAMS. AREC no has 317 members and nine active emergency nets going. K7KOT an K7MWC are working on cameras for 432 Ham-TV. W7IEU, EC fo Snohomish Co. has been appointed RO for the County. Th Conconully Hamfest this year will be held in Canada, July 28 an 29. For 50 MHz EME, W7FN has 8 four-element yagi array an worked WB6NMT. K7RBO via Oscar 6 now has 45 states and 336 QSOs with 350 different stations – received ARRL 1000 Awar No. 3. Great going Dave. Washington State Amateur Radio Wee will be Sept. 9 through Sept. 16. Wash. State QSO party sponsore by Boeing BEARS will be final week end of Radio Week. Nice t hear K7TCY back on the air and handling traffic. Traffic: W7P 323, WA7OCV 147, K7OZA 118, W7APS 108, W7GYF 8 WA7HKR 84, K7CTP 82, WA7RCR 49, K7VAS 45, K7OXL 4 W7BUN 38, W7BQ 36, W7PWP 31, W7IEU 23, W7MCW 2 WA7KNW 19, W7AIB 17, W7UWT 7, W7EBU 2, WA7LQV 2.

PACIFIC DIVISION

EAST BAY – SCM, Paul J. Parker, WB6DHH – Many Novices i this section are finding the General Class exam a very excitin challenge. WB6RZX and WB6KGR are new Generals. Congrat WA6VGG is the call of the new Del Valley High School AR WN6VCO is a new Novice in Lafayette. Traffic: W6IPW 36 WB6VEW 18.

HAWAII – SCM, Lee R. Wical, KH6BZF – SEC: KH6BZF. RM KH6AD. PAM: KH6GJN. VHF PAM: KH6GRU. SCR: KH6FO QSL Mgr.. KH6DQ.

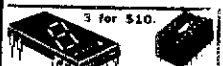
Net	*MHz*	*Time(Z)/Days*
Hey Bruddah	21.295	2000 S/Su
Friendly	7.290	2030 All
Confusion (Patches)	21.400	0000 All
Pacific Interisland	14.305	0800 All
S.E. Asia	14.320	1230 All
Marine Corps	21.430	1900 All

Last month's Hilo earthquake tested the 2-meter interislar repeaters and their links to show a good communications covera of the islands. KH6EQF operated by KH6IDP and KH6HCR w cited by State CD Communications Officer KH6GBX for handli the situation well. Other KH6s involved were DGQ, GKD, GB FNB, EJ and CXJ. A bravo Zulu to all hands. KH6GJY passed Extra. KH6CA is on from Pupukea. KH6GQW reports ex-KH6HT and VS6DR visited Pat. K8HQK/KH6 is stationed at NAVCOMST Wahiawa. KH6GHZ reports PJ8NLO should be named QSLer of t month for such a rapid QSL card. WA8FCI/KH6 a WA6DDW/KH6 are DXing on 1300 GHz. KH6HKZ will have Solid State Detector/Amp replacement for HW-7 printed in Q soon reports proud papa KH6GMM. WØBWJ/JA and XYL visit

'HAM' UHF 400 MC HIGH POWER TRANSISTORS

3 for $10. **$3.95**

By RCA or equal 2N3632. NPN, 28 watts, 3 amps. TO-60 case, with stud mtg. VCEV max 85.



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0.8 plus letters. Snaps in 14-pin DIP socket. .3" x .4" x .3" 5V lumn, with decimal point. Like MAN-1

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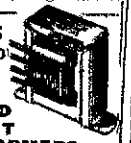

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☐ 115/1/60 in to 24VCT

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☐ SN7409	.35
☐ SN7410	.30
☐ SN7411	.35
☐ SN7413	.95
☐ SN7416	.55
☐ SN7417	.55
☐ SN7420	.30
☐ SN7421	.35
☐ SN7422	.35
☐ SN7426	.37
☐ SN7430	.30
☐ SN7432	.30
☐ SN7437	.60
☐ SN7438	.60
☐ SN7440	.30
☐ SN7441	1.40
☐ SN7442	1.25
☐ SN7443	1.25
☐ SN7444	1.35
☐ SN7445	1.25
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☐ SN7448	1.50
☐ SN7450	.35
☐ SN7451	.35
☐ SN7453	.35
☐ SN7454	.50
☐ SN7455	.35
☐ SN7460	.25
☐ SN7464	.50
☐ SN7465	.50
☐ SN7470	.50
☐ SN7472	.50
☐ SN7473	.65
☐ SN7474	.65
☐ SN7475	1.20
☐ SN7476	.75
☐ SN7478	.95
☐ SN7480	.75
☐ SN7481	1.50
☐ SN7482	.95
☐ SN7483	1.50
☐ SN7485	1.41
☐ SN7486	.55
☐ SN7489	3.75
☐ SN7490	1.30
☐ SN7491	1.50
☐ SN7492	1.10
☐ SN7493	1.10
☐ SN7494	1.10
☐ SN7495	1.10
☐ SN7496	1.10
☐ SN74100	1.49
☐ SN74104	.55
☐ SN74105	.55
☐ SN74106	1.25
☐ SN74107	.80
☐ SN74108	1.25
☐ SN74112	1.25
☐ SN74113	1.25
☐ SN74114	1.25
☐ SN74121	.70
☐ SN74122	.75
☐ SN74123	1.20
☐ SN74140	.50
☐ SN74145	1.40
☐ SN74151	1.25
☐ SN74153	1.60
☐ SN74154	2.10
☐ SN74155	1.55
☐ SN74156	1.55
☐ SN74157	1.55
☐ SN74158	1.55
☐ SN74160	1.95
☐ SN74161	1.95
☐ SN74162	1.95
☐ SN74163	1.95
☐ SN74164	3.50
☐ SN74165	3.50
☐ SN74180	1.20
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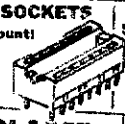

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☐ LM-350	Dual peripheral driver	.59
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☐ 565	Phase lock loops (A)	3.25
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☐ 567	Tone generator (A)	3.25
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☐ 703C	RF-IF, amp, 14 ckts (TO-5)	1.00
☐ 709C	Operational amp (A)	.44
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☐ 711C	Dual diff. comp (A)	.44
☐ 723C	Voltage regulator (A)	.95
☐ 741C	Frequency compensator 709 (A)	.49
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☐ 747C	Dual 741C (A)	1.25
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☐ 748CV	Freq. adj. 741C (mini DIP)	.49
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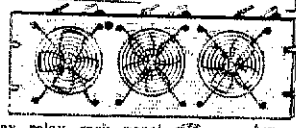

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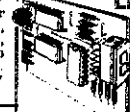

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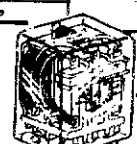

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JARL meeting JA1AN and JA1ADN to name a few. New Novices heard are WH6s IDZ, IEG and IEE. KH6GDE is a new AREC member. Ex-K2HBA/KH6 writes he's now K4IKP. KH6BWT reports KG6SZ/KC6(Nose)(LJ) psyched Wally from Ponape. Something about working Wally on two-meters? The KH6EDY Kure DXpedition (Oct. '72) QSLs arrived from Philadelphia Printers late last month and should be out to all who sent SASEs.

NEVADA – SCM, Harold P. Leary, K7ZOK – SEC: WA7BEU. Ex-K2ZMA now W7IUJ in Las Vegas. Congratulations to W7FJN and K7YXX on Advanced Class license. K4UGL/7 retired from AF May 1. LV Radio Amateur Club in association with North LV CD Communications manned booth at Youth Fair at Convention Center with 2-meter equipment under direction of WA7ESM, WA7GIV and W7ILX. XYL of K7YXX was chmn. of Youth Fair. K7GQD is on extended trip to VE7 and VE8-Land. W7JNG is ex-W8WWT. WA7KVV now active on 2 fm. Cheers to WN7VGN for ticket. Nev. State RACES members met in Las Vegas on May 15, 16. W7GAM, WA7GWP, WA7MKI conducted code and theory class at Nellis AFB – 5 passed Novice exams, others in process. On Apr. 28, 29 Las Vegas Radio Amateur Club assisted with communications to Boy Scout Group on field trip. Send activities reports to me by 1st. Traffic: W7ILX 122.

SACRAMENTO VALLEY – SCM, Norman A. Wilson, WA6JVD – SEC: W6 On Apr. 28, 29 members of the Mt. Vaca RC, RAMS, MARS, SARC and many individuals provided needed communications for the Red Cross, Fire depts. and other agencies during the Roseville disaster. Thanks to all for a job well done. New officers for the John I. Sabin Pioneer RC are W6IAC, pres.; W6GDO, vice-pres.; WA6TZP, secy.; W6VTY, treas.; K6FO and K6TWE, dir. New ORS is WA5KUD/6, a traffic and contest man from Ark. We regret to note the passing of a former SCM, K6CFF. Ship was a charter member of the RAMS. The GEARS had a program on the Science of Breeding Almonds by WB6KAL I didn't think the bands were really that bad. At WA6JVD, 5BWAS No. 147 now is on the wall. At an International DX Conference in Fresno, the section was represented by W6s DZK, KYA, NKR; K6s HTM, OM; WA6s JVD and NYV. A great time was had by all. A special thanks to W6KYA, for 8 fine years as SCM. I only hope I can do as well. A new radio club in Yolo county is organizing under county/RACES sponsorship. Plans include a repeater on 2 meters. The UC Davis RC is reported active from their new location on campus which will allow easier access. Hope you all had a Murphyless Field Day. Traffic: WA6JVD 47, K6KWN 38, WN6RDA 36, WA5KUD/6 24, K6YZU 15. (Mar. error) WN6USM 12.

SAN FRANCISCO – SCM, Thomas A. Gallagher, W6NUT – Asst. SCM: Robert G. Garner, W6EAJ. VHF PAM: WA6PYN. This month's column is being written at 37,000 feet in a DC-10 en route to Miami, Fla., your SCM's boyhood home where he held his first call K4DRO. WA6PYN monitors 50.110 ssb. Mike reports WB6NMT worked W7FN on 6-meter moonbounce and on 220 moonbounce. Louis worked K9MHB twice and participated in transmitting tests to VK3ATN and VK5MC. Louis and W6FZJ have taken 220 and 432 gear to KH6BZF for troppo tests. Has anyone in the section used Oscar 6 yet? The RACES members of the San Francisco Radio Club handled communications for the March-of-Dimes Walkathon as did W6PZE. Marvin can often be found on 2-meter fm. Traffic: W6RNL 48.

SAN JOAQUIN VALLEY – SCM, Ralph Saroyan, W6JPU – The Fresno Amateur Radio Club held their annual Hamfest in Fresno May 5, 6 with approximately 350 in attendance. W6JUK won first prize in the Homebrew Contest with his 2-meter amplifier Our Pacific Dir. and Vice-Dir., W6ZRJ and W6VZT also were in attendance. W6VZT gave a good talk on antennas. W6YEI conducted the FM forum. W6WSI now located in Fresno and operates on all bands with a Swan 500. W6DIY is a Silent Key W6DPD has a new FM-27B. Southern San Joaquin Valley Net meet on Tue. at 1900 on 146.88 MHz. WA6CPP has worked 11 countries. WA6KZV active in Kern Co. working with Novices K6OZL retired from chasing DX after having worked 300 countries He will be in KL7-Land and is still with the Coast Guard. WB6TFI organized the 2-meter gang to assist in the Telethon Mar. 31, and Apr. 1. WN6RXI active handling traffic. K6OER again active i Navy MARS. WA6OIG active on 2 meters fm and flying aircraft WA6RDY active on 2 meters. Summer is upon us, activity seems t fall off a little, but, please send reports no matter how smal Traffic: WA6SCE 91, WN6RXI 31, WA6CPP 8, W6DPD 4.

SANTA CLARA VALLEY – SCM, James A. Hauser WA6LF – SEC: WA6RXB. RMs: W6BVB, W6RFF. Please keep the wee end of Oct. 13 and 14 open for the Pacific Division Convention

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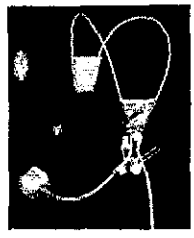

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Santa Cruz. Hope to see you all there. WB6MXI, W6DEF, W6RFF and W6YBV made the Honor Roll this month. W6RSY made BPL. W6RVB reports NCN had 687 ONIs and 339 pieces of traffic in Mar. W6KZJ says that extra work and vacation are cutting into his radio activity. W6AUC visited some Washington, D.C. hams in Apr. WA6HAD reports handling some of the Roseville disaster traffic. WA6PGB operating lots of contests. WA6SDJ adding countries to his DX list. Bulletin Schedules: W6ZRJ each Thur., CW 7:30 local, 3590 and 7129 kHz; SSB 8:30 local, 3815 kHz; RTTY 9:00 local 3615 kHz.

NCN	NTS	3630 kHz	7 and 8:30 P.M. Dy
SPECS	AREC	146 MHz	7:45 P.M. M
SCV	AREC	146 MHz	8:00 P.M. T
Gorilla	AREC	146.25 in 146.85 out	10:27 P.M. Su

Traffic: W6RSY 506, W6BVB 167, W6YBV 138, WB6MXI 80, W6DEF 75, W6KZJ 72, W6RJF 52, W6AUC 32, WA6HAD 20.

ROANOKE DIVISION

NORTH CAROLINA – SCM, Chuck Brydges, W4WXZ. SEC: W4FVN. PAM: WB4JMG. VHF PAM: K4GHR. RMs: WB4ETF, WB4VBM. All EC's please forward monthly reports to W4FVN for inclusion in Hank's monthly report to Hq. Thanks. K4AI, EC for 4 Counties, did his survey by screening a callbook and contacting all licensees for AREC membership. WB4MLI is an active QO and claims using a five-element 75-meter Log Periodic for low-band DX. Speaking of low-frequency activity congrats to K4CIA for obtaining WAC on 160 meters. The Central NC Traffic Net through WR4AAA repeater is averaging 600 plus check-ins monthly on 28/88. NC FM Repeater Assn. board of dir. are WA4JVD, K4GHR, W4BUZ, K4WHO, WB4OCG, K4GMP and WA4ZNA. This Assn. now has 220 individual members, 22 member repeaters and W4IRF is Tech. Editor. K4MSG remains active on VHF from the Outer Banks and is working through Oscar. K4IKG is new arrival in Fayetteville and reports 31/91 repeater about to activate. K4ITL has new harmonic at home. Congrats Danny! Our 7.5 to WB4YOJ, a real contest active, who leaves NC for San Francisco. West Carteret High School has club with call WA4DPR and is recruiting Novices. Congrats to W4YDY who now is treas. of The Amateur Radio News Service, an organization involved with ham public relations. Our sympathy to the family and friends of K4RIS,mgr. of Iredell County, now a Silent Key. Traffic: (Apr.)W4WCG 180, W4OEO 59, WB4OOM 48, W4WXZ 42, WB4UOO 23, WB4BHJ 17, K4VBG 17, WB4URA 12, WB4MLI 10, W4VTR 6, K4EZH 2. (Mar.) WB4OQM 86, WB4VVP 26, WB4MLI 24, WB4VSA 11, WA4KWC 9.

VIRGINIA – SCM, Robert J. Slagle, K4GR – Asst. SCM: A.B. Martin, Jr., W4THV. SEC: WA4PBG. Asst. SEC: WA4JJE. PAM: WB4RZW. RMs: W4HIR, W4SQO, KØPIV/4, W4SH, WB4PNY. WB4DRB writing computer programs for AMSAT. Southern Peninsula AR Klub (SPARK) participated in Leukemia Society Walk-A-Thon. WB4DRC working on HW-101. WN4UUE now WB4UUE! KØPIV/4 tapering off from traffic for 2 fm. Vacation cut into W8VDA's traffic count. Director W4KFC attended Raleigh and worked new country – Mt. Athos, and made BPL! W4LDF is new pres. of Richmond ARC, and WA4EPH new editor of their Richmond Ham. W4JVN received SBWAS. W4YZC nailed VU2JE on 20 cw. W5VZO/4 buzz, buzz, buzz! WB4FDT has new HA-1 keyer. South East Virginia Wireless Assn. prepared for FD. Nothing much going on lately for W4DM. Regret to note passing of W4RGZ. W4KAO is finding a 2 fm kit more than he thought. W4SOO still heavily Europeaning. W4JUJ has another first for Va. in 18 QSO Party. VSBN ONI 1013, OTC 315. W4NPT handled 220 phone patches! I was guest of Vienna Wireless Society. Daytime 4RN on 7233 kHz with 3900 kHz as alternate at 2000 GMT. K4VIG's activity being limited by vacation and work. W4KX also reported. Counties (who is in second place?): WA4WOG 3050, W4JVN 2850, W4JUJ 2848 and WA4EPH 957. VN ONI 398, OTC 489.

VSMN	3947 kHz	0715/1630 local	M-F
VSBN	3935 kHz	1800/2200 local	Dy
BSN	3680 kHz	1830 local	Dy
VN	3680 kHz	1900 local	Dy
VPN	3947 kHz	1930 local	Dy
VRN	3625 kHz	2000 local	Dy
VPON	6905 kHz	2215 GMT	F

Traffic: KØPIV/4 528, K4KNP 517, W4KFC 286, WB4PNY 282, W4UQ 236, K4EBY 179, W4YZC 178, W5VZO/4 148, K4KA 145, WB4RDV 141, W8VDA/4 104, WB4RZW 99, K4GMH 92, WB4SGV 92, K4IAF 71, W4SQO 62, WB4KIT 60, K4GR 58, K4VIG 44, K4JM 32, W4TE 30, WA4PBG 27, W4DM 10, W4KAO 10, W4THV 10, WA4WOG 10, W4IOV 9, WB4GMC 5, K4GTS 5, W4NPT 5, W4LQO 4, WB4FDT 3, WB4UMJ 3, WB4WLK 3, W4JUJ 2. (Mar.) W4UQ 171, K4VIG 49, WA8ZMI/4 14, WB4DRB 7.

WEST VIRGINIA – SCM, Donald B. Morris, W8JM – SEC: WA8NDY. RM: WB8BBG. PAMs: W8DUW, W8IYD, K8CHW. CW Net Mgr.: WB8CYB. Phone Net Mgr.: WB8BMV. WVN Phone Net, 3995 at 6:00 P.M.; CW Net, 3570 at 7:00 P.M. Note correction in Phone Net time. Opequon Radio Society at Martinsburg conducting code and theory classes with WB8EKG, W8AEC and K8QYG as instructors. K8KRU has new Swan 500C. WB8BMV, WA8YCD, W8DUV, W8DUW, WB8LAI, W8JM, WA8NDY, WA8WCK attended LO meetng in Richmond. WB8MZI upgraded to General WB8APH has new 130-ft. tower for 160. WA8NPY quite active in OO work. More OOs are needed in our state. WB8LAI and W8JM attended B and O banquet at Baltimore. WVN Phone Net with 29 sessions, 314 stations, passed 85 messages. WN8MKL organizing 8RN Novice Traffic Net. Monongalia Wireless Assn. of Morgantown have outstanding repeater on 16-76. Bluefield ARC annual hamfest will be held in Bluefield on Aug. 26. W8HZA, active after illness, acts as liaison between cw and phone nets. Roanoke Division Convention, Reston, Va., Sept. 15 and 16. Traffic: W8JWX 66, K8QEW 36, WA8LFW 21, W8JM 19, WA8NDY 18, WA8KCJ 8, WB8AKQ 5, WA8WCK 5, WB8BMV 4, WA8YCD 4, W8CUL 3, WB8EKG 3, W8HZA 3, W8AEC 2, WB8BBG 2, W8CKX 2, W8DUV 2, W8GDP 2, WA8LFW 2, WA8FRO 1, W8LFU 1.

ROCKY MOUNTAIN DIVISION

COLORADO – SCM, Clyde O. Penney, WAØHLQ – SEC: KØFLQ. RM: KØOTH. PAMs: KØCNV, WAØWYP, WAØYGQ. WØONK moved to Ark. in early May. We will miss him on the local nets, but wish him the best at his new QTH. WBØAMJ scheduled a shift in his OBS operations to either 20 or 40 meters in early June. Congratulations to WBØCGJ on receiving DXCC certificate No. 6441. All contacts were barefoot and all on ssb. Congratulations to WBØAXW on receiving a TCC Pacific certificate. Presentation was made by KØOTH at May meeting of Arapahoe Radio Club. WØLRN, WØLYO and WAØYIH are enjoying their newly acquired model 28 ASR teletype units. We are sorry to lose the services of WAØSIG, Net Mgr. for the DNTS in Colo. Our loss is the Navy's gain. We also are sorry to lose the services of W2TPV/Ø who is resigning as Net Mgr. for the CCN, to move to a new Air Force assignment. The newly appointed Net Mgr. for CCN is WØNGA, whom we welcome aboard. Net traffic for Apr.: SSN QNI 390, QTC 172, informals 30, 30 sessions, 821 minutes. Columbine QNI 1158, QTC 50, informals 206, 24 sessions. Traffic: (Apr.)WØWYX 1031, WBØHSZ 180, WØIW 174, WØLRN 117, W2TPV/Ø 107, WBØHCK 99, KØOTH 88, KØJSF 31, WØYCD 29, WAØZPP 29, WAØYGQ 28, WØLAE 25, WØGV 24, KØTIV 24, WAØYCI 20, WØSIN 17, WAØTMA 14, WØGAQ 13, WBØCCB 12, WØJRW 11, WØNZL 10, WAØNFO 7, WØONK 6, WBØCQJ 4, WAØHLQ 2. (Mar.) WAØTRB 29, KØTIV 24, KØFLQ 10. (Feb.) WAØTRB 37.

NEW MEXICO – SCM, James R. Prine, W5NUI – The La Mesa Bean Feed Hamfeast was very well attended with K5ECQ serving green chili of high harmonic content. K5KPS is back in cw traffic after a recess of 32 years. Predictions of Oscar VI crossings with times for New Mexico have been prepared by W5PNY. This data is made available as QSTs on the Roadrunner Net. With Field Day completed don't forget to sort out all the equipment and service the generator for that real emergency. Traffic: K5MAT 230, W5MYM 175, K5KPS 65, W5PDY 41, W5TLK 32, W5YQ 24, W5DMG 14, WA5MIY 5, W5BRV 3.

UTAH – SCM, John H. Sampson, Jr., W7OCX – SEC: W7GPN. RM: K7HLR. BUN meets daily at 1830 GMT on 7272 kHz, 89 check-ins, 48 messages. UCN meets daily at 0130 GMT on 357 kHz, 266 check-ins, 116 messages. The Cedar City Club received it repeater license under the new rules with the call WR7AAA indicating it may be the first repeater license in the 7th call area. The repeater is located atop Frisco Peak at an altitude of 9,670 fee This section is saddened by the death of K7BNZ. Winter storm continue to take their toll of antenna installations. W7HKC pulling out from under a second storm in recent weeks. A new OR is W7UTM. The Ogden repeater group still plagued with problems i its control system. Conditions have been bad on most bands; TW reverted back to its usual winter 80-meter frequency after giving u on 40 meters. W7HKC has renewed his OVS appointment and wit new equipment is looking for schedules on the higher frequencie W7CYH is experimenting with antennas. Traffic: K7HLR 15 W7UTM 115, WA7OAU 112, W7OCX 93, K1TMK/7 81, W7EM 8 W7FYR 33, K7ZVT 27, W7IQU 26, WA7MEL 25, W7DKB 1 WA7HCQ 4, W7HKC 4.

WYOMING – SCM, Wayne M. Moore, W7COL – SEC: K7NQ Another new one in Casper is K7HPV. W7SZZ has a ne transceiver and is back on the air. K7IKO has a new rig and on t

air from Cody. WA7MNC has accepted a job in Yankton, South Dak. Don't forget the hamfest on July 21, 22 in Lander this year – a lot of planning so it should be another fine affair. W7HNI had to coax a bobcat out of an electronic installation before he could enter to work on it – who said the wild west was dead? W7TZK has about recovered after nearly losing his hand in an accident. The division convention will probably be past by the time you read this and if you missed the convention, I know you missed one of the highlights of the year. Traffic: W7SDA 332, K7VWA 136, W7TZK 99, W7HNI 79, W7BHH 44, W7YWW 4.

SOUTHEASTERN DIVISION

ALABAMA – SCM, James A. Brashear, Jr., WB4EKJ – The Birmingham ARC had another fine hamfest on May 5 and 6. It was a real pleasure to have some of our ARRL Officials visit the Ala. section, especially Pres. Dannals and Gen. Mgr. Huntoon. K4DSO K4APF and the son of W4WLG took home prizes. K4UMD didn't lose out entirely – WB4JVY presented him with a turnip green sandwich which he reports was good? He wanted to be sure and thank everyone for their kindness. The method to select the section FD winner was announced as the total number of points divided by the total number of stations. Since we must depend on scores, etc. published in QST, don't forget to have your club secy. let the SCM know the call your club used during FD; also don't forget to send your FD report in to ARRL. K4JK reports his major activity last month was "waiting." WB4SVH reports activity on the AENB Net picked up a little. WA5YOU/WB4WUS says he has reworked his NCX-3 and has it back on the air again and hopes to have a new antenna system up soon. There is only one hamfest left in the section this year – the North Ala. Hamfest to be held in Decatur in Aug. Is there at least one cw traffic handler in the section who can meet AENB and RNS on Fri. nights? If so, contact W4HHK. Endorsed WB4LTD as EC. Traffic: (Apr.) WB4EKJ 169, WB4SVH 102, K4AOZ 50, WB4KSL 22, WB4WUS 8, K4HJM 3, WN4AUN 2, WB4ZOG 2. (Mar.) W4MOQ 22.

GEORGIA – SCM, Ray LaRue, W4BYG – SEC: WA4VWV. RM: WB4RUA. PAMs: K4HQI, W4LRR.

Net	*Freq.*	*Time(Z)*	*QNI*	*QTC*	*Mgr*
GSN	3595	0200/1050/2300	684	218	WB4RU, K4VN
GSSB	3575	0000			
GTN	3718	2200			

I wish to thank those who placed their confidence in me during recent election. Let me assure them and those who are yet to know me, I'll do everything I possibly can to promote and assist in the growth of amateur radio in Ga. Please communicate with me freely. Let me know if you need anything. My new address is: 225 Hudson Drive, Lilburn, Ga. 30247. W4JM received his 75-meter s WAC. W4VSK's XYL is to be commended for her contributions to amateur radio by typing Mac's radiograms. Atlanta Radio Club members provided communications for the Chattahoochee Ra Race. The NE Ga. ARC has been holding highly successful code and theory classes regularly which have resulted in several new Novice and Tech. W4RNL reports the NE Ga. 2-meter FM Net for Mar. sessions, QNI 64, QTC 5. WB4WXX made PSHR. The Ga. Coun of Amateur Radio Societies is publishing a vhf Repeater Guide and Ga. Calendar of Events. The ARC is printing the Calendar in the Directory. Traffic: WB4TVU 147, WB4RUA 120, WB4WXX 5 WA4RAV 45, W4EEP 37, W4CZN 26, WB4UFW 22, W4AMB 2 W4VSK 21, WA4BAA 14, W4JM 12, K4BAI 2.

NORTHERN FLORIDA – SCM, Frank M. Butler, Jr., W4RR – Pensacola: 8R1Y/W4 is now WB4DXN. K4BSS is alternate NC on CAN. W4VR joined Silent Keys. WA4ECY and WB4SKI to part in Fla. QSO Party; K4BSS, KØBAD/4, K4LAN and W4JL were in CD Party. WB4JHQ renewed OBS/OVS; WB4KGW OV The ATV frequency will be 444.0 MHz. WA3ODA/4 and WB4RE departed for new assignments. Fort Walton: K4IJO, electron instructor at OWJC, hopes to set up station and hold license class there. Recent ARPSC activities included Sports Car Rallye a beach cleanup; operation was on 2 meters. K4KJP has a new HW QRP rig. Tallahassee: The TARC received the call WR4AAB their repeater – first in Fla.! WN4BSP passed his General Cl exam. WB4PNJ completed an HW-101. Starke: K4SRA, ex-W3BA just moved here. WB4OMG keeps RCC sked. Jacksonville: WA4V was reappointed EC. About 15 Novices graduated from NOBARS class. Squelch Tale, newsletter of the Range Assn. a RACES, is full of news and pix. Editor is WA4IIY, with help fr WA4OIM, WB4POC, WB4MBD, WA4EYU and many othe VK9ZGM was a recent visitor. The WB4QFL repeater has a n receiver 600-ft. up on WTLV tower, Ocala: K4PCZ received AR OTC certificate. Tavares: K4GDV earned FAST Net certific WN4FBZ, son of WA4CPL, just received his ticket. The Lake A

held its 1000th consecutive meeting on June 5. K4CVO active in Daytime NTS. Orlando: WB4SQA reads OBs on TPTN M-W-F. WA4BXT made PSHR this month. W4NGR moved to Casselberry. Daytona Beach: DBARA held an auction, run by W4OSB. WA4OQX edited this month's Groundwave. WB4JSE relayed report of a serious auto accident to police. Traffic: (Apr.) WB4OMG 211, K4VFY 164, K4BSS/4 140, W4SDR 137, WB4WHK 117, WA4BGW 110, WB4NJI 94, WB9EUZ/4 82, KØBAD/4 82, WA4BXT 65, WB4ZQC 56, WN4BSP 48, WA4VCK 47, W4LDM 41, WA4EYU 37, W4LSR 35, WB4SQA 34, WB4VYU 33, WB4DXN 29, W4RKH 28, WB4EJY 27, WB4ZPC 25, W4NGR 23, K4CVO 21, WA4EJA 21, WB4ADL 20, W4GUJ 17, WA4NAP 16, W4DFP 15, K4OER 12, WA4BPE 11, W4IKB 11, K4FLV 10, WB4SKJ 10, WB4VZF 10, WB4JHQ 8, WB4JSE 8, K4EZE 5, W4GSY 4, WB4PNJ 4, K4RNS 4, WB4HPR 3, WB4BYJ 2, WB4VAP 2, WB4WTL 1. (Mar.) WA4BGW 73.

SOUTHERN FLORIDA – SCM, John F. Porter, W4KGJ – Asst. SCM: Woodrow Huddleston, K4SCL. SEC: W4IYT. Asst. SEC: W4SMK. RMs: K4FAC CW, K4EBE PHONE. PAM: W4OGX. K4SCL made BPL this month. OO reports received from WB4HKP and W4FRL. PSHR from WB4HKP. I feel sure many more are able to make the PSHR listing if they would only take the time to add up their points. What about it guys and gals. New officers of the W. Palm Beach ARC are WB4PPW, pres.; WA4HXZ, vice-pres.; K4FCK, secy.; WB4NXR, treas. W4BRB also was again elected FD chmn. Their Novice classes are still underway. The Daytona Repeater is again back in service thanks to a new antenna and help from WB4TVE. The SE Chapter QCWA had a record attendance in Ft. Lauderdale with 74 present. GN is progressing smoothly under the able leadership of W4EH. WA4NBT is the new net mgr. for the All Fla. CW Net. His term will be for six months, then the Northern Fla. section gets it back. The Central Fla. Repeater Assn. is going great guns. How about the other groups? Drop us a line about your activities. New EC for Collier Co. is W4ESH. Interested in helping Leland out? Drop him a line or better yet drop in on him and discuss the matter. FMTN had a very successful dinner meeting at Orlando Hamfest with W4SDR presiding. Dade County AREC is planning a Manual of Operation to be given free to all members. Now is the time to sign up and do your share. W4BM has reported in 351 times out of 365 on the Gator Net last year. GN still meets daily at 1230 GMT on 7115 or 3615 depending on propagation conditions. WB4ZXX reports a big turnout at Leesburg of the Society of Airway Pioneers Society. Traffic: (Apr.) K4SCL 526, WB4AIW 452, K4WKY 448, K4FAC 392, WA4SCK 349, WB4GHD 266, WA4IJH 144, WB4HKP 118, WB4FLW 110, WB4YIX 102, W4DVO 66, W8BZY/4 64, K4BLM 60, WB4HJW 59, W4EH 51, W4TJM 49, W4IYT 48, K4OCG 48, K4NE 40, W4BM 34, K4EBE 34, WA4IDH 30, WB4AID 29, K4QG 26, W4SMK 25, W4GDK 21, W4KGJ 20, WB4TRT 19, W4WZR 17, W4DDW 14, W4NTE 14, WB4PPW 13, K4IWT 12, WB4PNG 12, WB4QID 12, W4ZAK 12, WN4ZZB 11, W4FFF 10, W4BCZ 9, WB4CPZ 9, W4OGX 8, W4LK 5, K4SJH 5, WA4ESS 4, WB4NSO 3, WA2AFL/4 2, W4MML 2, WA4SXB 2, WA4ALF 1, WB4ALF 1, WB4TUP 1. (Mar.) WB4FLW 123, K4GFW 7, WA4ESS 4.

WEST INDIES – SCM: Pedro J. Piza, Jr., KP4AST – SEC: KP4CB. OBSs: KP4QM, KV4FZ, OO: KV4HW. Two meters activity keeps growing at a tremendous rate; every week end we hear two or more new stations on the air. The KP4AST repeater is ready to go on the air, just waiting for the license. The repeater will operate on 14616 in and 14676 out. Congratulations to KP4TL for his 50 years of ham radio and to KV4HW and GV for winning the TEN-TEN Net Contest for CA and Caribbean area. KP4DHD and AST attended the Dayton Hamvention. Traffic: KP4WT 176.

SOUTHWESTERN DIVISION

ARIZONA – SCM, Gary M. Hamman, W7CAF – The annual Ft. Tuthill Hamfest will be held July 27-29 at The Coconino County Fairgrounds, 5 miles south of Flagstaff. Hamfest chmn. is W7UJF who is planning to make it one of the best. Talk-in station will be handled by Explorer Post 710, using W7IO/7 on 3.992 and 146.94 MHz. The FCC will conduct examinations in Phoenix by appointment only on July 27. Form 610 must be at L.A. office by July 6. The Ariz. Legislature modified the amateur call letter license plate law to make the annual fee $5.00. The annual spring meeting of QCWA was held at Picacho Peak on Apr. 29. It was a great pot-luck with lots of gourmet dishes. Next big meeting will be in Nov; contact K7NTG for details or membership information. Explorer Post 710, sponsored by the Ariz. ARC, operated a station from the Ariz. State Fairgrounds during the Scout-O-Rama on May 5. Participants were WA7NXI, WA7ROF, WA7SIV, WA7TRR, WN7TRS, WN7TWI, WA7TXE, WN7TXX and WN7UQP. The Coronado Trail Amateur Radio Club is becoming more active

Contact K7HGH for more details. If groups that participated in FD will report their scores to W7CAF by July 14, they will be listed in this column in Sept. Traffic: K7NHL 214, K7NTG 164, K7KRU 32, WA7TZO 27, W7PG 19, W7DQS 18, WA7VLA 17, K7NMO 6, WA7IXC 4, W7CAF 3, WA7KQE 2, W7LLO 2.

LOS ANGELES – SCM, Eugene H. Violino, W6INH – Asst. SCM: Leigh S. Jones, WB6OLD. RM: W6LYY. The Lockheed Club 8th Hamfest was a big success. The OCWA's Spring dinner aboard the Queen Mary was a big affair, the largest spring dinner yet. Members enjoyed the tours and we want to thank W6MDO and W6YYV for their original ideas. Lots of So. Calif. hams at the Fresno Hamfest. The DX Club also had a big bash at Fresno, this is where the So Cal DX Club and the northern group get together. W6PZY and the SOWP group now have a cocktail net going on 3945 kHz at 0100 GMT. The Morse Telegraph Club had a very nice get together, many local hams present and W6CK was elected pres. for the coming year. WB6YVP is working antenna for long distance DX work on two meters for the VHF Club of So. Calif. WB6RIV has converted an Ameco TX62 transmitter to 220 MHz using 4CX250 with good success. Thanks to the United ARC of San Pedro for turning in monthly activity reports. W6JSP again active. The Ramona RC had their first T-hunt in several years which was won by WA6NRB and WB6VMM won being first with 43 minutes and 10 miles. No. 2 WB6NGC with 90 minutes and 39 miles. Hi. The TRW RC now has the latest computer system for listing club members and their calls, also their club editor WA6JHD is looking for a suitable mobile rig for Field Day, etc. WA6HOB reports passing the General Class exam with the help of W6QIE's nightly code practice on 3590 kHz at 8 P.M. Congrats to the WESCARS group on running down users of profane language on their net frequency. I am glad to see that they are having success in cornering these culprits. K6ASK has been QRL putting fm mobile gear in his car, expects to do lots of mobile work. W6QIL still is one of the most active hams in the area – teaching two radio classes and also attending two classes per week, besides attending two radio clubs per month. W6EJJ has been showing color slides of the 1970 DXpedition to Haiti, in which he participated, to clubs. W6OHS is building three linears, for himself and brother and also prototype for the Carson High School. WB6ROH has new jr. op. at his house. Traffic: W6INH 348, K6UYK 204, W6QAE 94, WB6ZVC 54, W6USY 48, WB6KGK 37, WA6ZKJ 32, W6OEO 26, K6EA 21, W6NIE 17, W6OAW 14, K6CL 4, W6DGH 4, WB6KXC 3, WB6TPO 3.

ORANGE – SCM, William L. Weise, W6CPB – Asst. SCM: Richard W. Birbeck, K6CID. SEC: WA6TVA. PAM: K6YCI. RMs: WB6AKR, W6BNX. Congrats to WA6JQX on placing first in CW Sweepstakes for Orange section with 502 QSOs and 68 sections. Mark also had 262 QSOs with 64 sections on phone. All that with poor band conditions! WB6VTK on night duty says he sure misses the gang on SCN. WN6THH very active on the Novice Net handling traffic. Congrats! W6KW, W6CPB, K6CID and WA6TVA were guest speakers at the Desert RATS Apr. 10 meeting. WN6VZS and WN6VST are new Novices in San Bernardino. Congrats. Don't Forget – 1973 Southwest Division ARRL convention Oct. 20-22 at the Sheraton-Universal Hotel in East end of San Fernando Valley – CU there. WA6GOJ assisted on WESTCARS during the Sacramento Train explosion. Inyo County AREC Net has moved to the 1st Wed. of each month at 7 P.M. local on 3920 kHz. WA6YWS reports examples of poor operating during recent train explosion. Too many people were using their transmitters when they should have been using only their receivers. Results: confusion and delays of necessary information. Read your booklet on Emergency Operations and don't get caught on the wrong end of your equipment. PSHR: WA6TVA 49, WB6AKR 40. Traffic: (Apr.) K6GMI 161, WB6AKR 126, K5BBM/6 65, WA6YWS 62, WA6TVA 46, K6LJA 42, WN6THH 22, W6LPB 10, W6QBD 1. (Mar.) W6ISC 23.

SAN DIEGO – SCM, Paul C. Thompson, W6SRS – Asst SCM: Art Smith, W6INI. SEC: W6GBF. QST, QST, QST – Elections are to be held for the office of SCM – San Diego section. Candidates are Cy Huvar W6GBF and H.T. Hodgson W6TAI. The AREC Pancake Breakfasts being held on the 2nd Sat. of each month are a great success. Won't you come out and join us. The AREC participated in Litter and Heart Assn. activities and assisted these groups June 2 and 3. NTS activity is high with these stations among them WA6AMK, W6BGF, WA6HQH, WA6HK, WB6LJO, W6LPU, WB6PVH, WB6VKV. New officers for the SDCARC are K6BWT, chmn.; K6QM, vice-chmn.; W6OSD, secy.; K6EC, treas. Our thanks to W6SLF, past chmn. and his officers. All clubs are focusing on Field Day participation. Scheduled sites now are SOBARS-Brown Field, North Shores Fiesta Island, El Cajon-Crest, IVARA-Julian/Laguna, Palomar North County. Look for them June 23-24. K6SDR is changing antennas. WB6IIK works the world with 5-50 watts

QRP. K6ZE, ex-DU1ZAI KG6APJ now active in San Diego. WA6DMB reads Official Bulletins Fri. 1900 local 28,585 MHz. W6YZV is comm. chmn. for Powder Puff Derby. PSHR: W6BGF 42, WR6VKV 34. Remember to vote in the SCM election. Your participation is the ingredient which makes this section operate. Traffic: (Apr.) W6BGF 308, WB6VKV 141, W6VNQ 101, W6DEY 47, WA6IIK 21, WA6BDW 12, WB6CFT 4. (Mar.) W6VNQ 83.

SANTA BARBARA – SCM, D. Paul Gaenon, WA6DEI – SEC: W6JTA. RM: W6UI. PAM: K6FVQ. WB6PGK is our lone stalwart on the Daytime NTS. WA6BQI, WB6HTK, WN6OST and WN6WBP tried out a homebrew QRP rig on their camping trip. WB6DHW has installed a mobile rig and is active on repeater WA6SIN(28/88). WA6GEN built a three-element vertical array for 2 meters; also received his WAC. WB6HTK is new Santa Maria rep. to SCN. EC W6CDN has completed a new Heath fm rig. K6QPH raised his tower to 65-ft. for DX contests. Section clubs have been having some great speakers: WA6FQG from So. Cal. Edison on noise and interference at SBARC and UCARC; W6AM on DX at SBARC and Poinsettia; W6OAL on Satellite operation at MAKRAC and CVARC; WA6DEI on Field Day operating at Poinsettia ARC and W6MZC from Bird Electronics on antenna matching at Poinsettia. Activity has really picked up and membership is growing fast. New appointees are WA6GEN as OBS (slow speed cw for Novices) and W6OAL as OVS and OBS (RTTY). Dave has qualified for the Satellite award and has a 5000 mile contact via Oscar VI from air mobile over Marshall Islands to K7BBO in Washington. WA6UUP is the new MAA for SBARC. WA6IDQ, W6POU and VE7BNE are printing a great paper called "Key Klix" for SBARC. A distant member of SBARC is VQ9B (K6IKE). W6KLR has worked 50 ZL counties WB6TLS is back on the air in SB with a Heath line. CVARC held a week end campout near Ojai complete with Transmitter Hunt. Plan to attend the TRICAR sponsored Santa Barbara section Picnic/BBQ/Auction at Orcutt Hill Park near Santa Maria on July 22. Check into our section net at 3935 at 8 on Wed. for information. PSHR: WA6DEI, W6JTA. WB6PGK. Traffic: (Apr.) WB6PGK 163, W6JTA 104, WA6DEI 91, WA6GEN 16, WB6HTK 15, WB6DHW 11, W6MQF 8, WA6PFF 6. (Mar.) W6JTA 131.

WEST GULF DIVISION

NORTHERN TEXAS – SCM, L.E. Harrison, W5LR – Asst. SCM: Frank A. Sewell, W5IZU. SEC: K5QKM. Asst. SEC: WA5KHE. RM: W5QU. SCM Newsletter sent to NoTex appointees plus ARRL affiliated clubs in northern Tex. Only 37 lines allowed in QST. PSHR monthly QST column intended recognize public service activities other than simple traffic count. Please note front side Form 1 card and fill out. Asst. SEC WA5KHE suggested sample OO commendation form. SCM has responsibility issuing all certificates to appointees. Many appointments may be delegated to RMs, PAMs, SECs and Asst. SCMs. If interested, how's to ask? DARC Dallas units active in March of Dimes include K5AIT, K5LZA, K5SXO, K5YKT, K5RZU, W5QGZ, W5TBQ, W5TEN, WA5RSS, WA5STR, WA5TEM, WA5VOT, WA5WDW, WA5WLA, WA5YJQ, WA5YKO, WA5ZNZ, WB5FDF, WB5FVD, WB5GBR, WB5ILF and WN5JBP. W5ABQ Tex. CW Editor issues FB bulletin. Slow-speed nets are now a matter of record; thanks to WA5KHE. KC-Club FTW reports new ARRL film "Fine Business" is grand. Panhandle ARC May issue bulletin reports results emergency drill shows range limited due to repeater inoperative. New member WN8NZB/5 of Mich. Reunion and Swaptest set for Sat. and Sun. Sept. 15 and 16. OO W5ARV reports W5HSB a Silent Key. Irving ARC code class starts 7:30 P.M., call Hugh 253-2634. Collector and Emitter arrives on time thanks to W5JJ, W5HXL and fine group. 41st West Gulf ARRL Convention now history, registration exceeded 1000; our congratulations to committee for job well done. K5QKM SEC report continues arrive on time. Traffic: (Apr.) W5TI 160, W5QU 150, WA5NSJ 54, K5QKM 47, W5SHN 42, WB5BFW 27, WA5OGE 27, W5GSN 22, WB5BFX 8, W5LR 7, W5YK 6. (Mar.) W5QU 135.

OKLAHOMA – SCM, Cecil C. Cash, W5PML – Asst. SCM/SEC: Leonard R. Hollar, WA5FSN. RM: W5RB. PAMs: W5MFX, WB5CWX and K5DLE. A great time was had by all at the West Gulf Convention in Euless, Tex. If you missed it I believe you missed the best West Gulf Convention ever held. Start now to make plans for the next one. The talk-in frequencies were operated by a couple of very sweet female voices. There were 78 enrolled in the first session of the Red Cross sponsored code and theory classes in Oklahoma City. The classes are designed to take them all the way to General, Advanced, or even Extra Class if they desire. Congrats to eleven year old WN5GTO. Congrats also to Advanced Class WA5NYX and WA5UJF. New General WB5HZZ and Novice WN5JGS. I heard by the grapevine that the GPARC made out OK on their Hamfest. Their club has now grown to 36 members. Glad to hear WA5WRC is

finally going mobile. Sorry to hear W5JJ lost out on his race for Mayor of War Acres. New officers of the Arbuckle Repeater, Inc., are WA5HVK, pres.; W5BLW, vice-pres.; W5KHF, secy.-treas.; WA5NYI, trustee. They have a new solid state repeater under construction. Traffic: K5TEY 644, W5RB 99, W2FIR/5 60, W5MFX 33, W5SUG 30, WB5CWX 23, W5PML 19, WA5ZOO 19, WB5EBY 18, W5FKL 18, WB5AZS 14, WA5OUV 8, WA5WRC 6, K5ZDB 4, WB5FIK 2, W5JJ 1, WA5TWM 1.

SOUTHERN TEXAS – SCM, Arthur Ross, W5KR – SEC: WA5YXS. Rice Univ. Radio Club, W5YG, active on TEX and TEX SS; will be more active after summer vacation; all donations accepted! W7WAH/5 received his WAS; beat problem with DX60 and soon going on 6 meters. WB5FMA made convention at Euless and has new TR switch for break-in; is NCS on TEX 0400Z Fri. WA5VBM has new tone patch. WA5ZBN has new Tempo I; also worked WA5NUZ over a distance of 100 miles from 5000 feet, both using twoers. WA5ISP upgraded to General. AARC bulletin has new name: AARC VARD. McAllen repeater group's application returned for more information. WB5GVO and WB5HEC went from Novice to Advanced. WB5FMA is new EC Williamson County. WA3GBU/5 has new call: WB5IZN. WB5BWV has new keyer. W5LDA built pre-amp for 2 meters. W5LHX experimenting with 1-watt audio ICs. K5MRK was hit of West Gulf Convention with "Man From Mars" get-up: walking mobile with HR2A, motorcycle battery and plastic hard hat with quarter wave whip on top. K5FRK reports FB WX Net with K5FRK, WA7RYP/5, WA5TMJ, WB5BSK, WA5GRT, WB5EDP and W5NYR covering all the way from Temple to Kyle through Austin repeater. El Paso going big for 444.0 MHz with WA5ZLJ, K5CWS, WB2CGG/5 and WB5CMB already on and with WB5HGN, WB5HGA, K5THX, WB5CBD getting equipment ready to go and all working toward a repeater for the area. Wind storm took out the Port Arthur repeater but back on the air in two days. WB5HBM, WB5EZM, WB5QHI and WA5MUM working on 6-meter projects. WB5HBM is pres. of the Tex. Univ. Amateur Radio Club. Traffic: (Apr.) W7WAH/5 188, W5ABQ 179, WB5CUR 135, WA5YEA 128, WA5VBM 109, K5GDH 99, WB5BWV 87, WB5AMN 73, WA5ZBN 68, WA5YXS 53, WB5DBK 47, WB5EDS 44, WA5TJI 40, WB5DQE 32, WB5FMA 30, W5HWY 27, W5JVR/5 24, W5NNK 22, W5BGE 20, W5TQP 20, WA5ZBK 20, K5EFH 19, W5KLV 19, WA5JFZ 18, WB5IZN 17, WA5LNV 17, W5YG 17, W5QO 15, W5TFW 10, W5UKN 7, WA5CTJ 6, K5HVI 6, K5ROZ 6, K5RVF 4. (Mar.) W5NNK 32, W5UKN 16, WB5DQE 14, WA5ZBN 14.

CANADIAN DIVISION

ALBERTA – SCM, Don Sutherland, VE6FK – Asst. SCM: Mrs. Donez Booth, VE6YL. SEC: VE6XC. Because of the large area covered by the APSN it was decided that again this year, the net would convene at the regular time of 0130Z and not revert to DST. Edmonton participation is very poor. Conditions have improved a little in the early part of May but Apr. was poor. Congrats to new Medicine Hat amateurs VE6CAR and VE6CAS. Congrats also to VE6AZR, VE6AMU and VE6ATP on receiving their Advanced ticket. VE6AMU is a real worker for CARA organizing the coming FD effort for the club. EC VE6AXH reports the Hat Ham Club classes were quite successful. VE6ARU recovering from a bout with pneumonia. VE6AW is in the hospital. EC VE6WJ reports the Central Area Emergency Net quite popular on Sun. mornings. EC VE6FM ironing the bugs out of his new repeater VE6RPT. There was pretty good VE6 participation in the last SS contest. Congrats to VE6MP on winning the B Class phone. VE6AXH did an excellent job winning the A Class both phone and cw. Traffic: VE6FK 39, VE6XC 34, VE6BAT 24, VE6ALQ 10, VE6WN 10, VE6WJ 9, VE6ASL 8, VE6YW 7, VE6AM 6, VE6AXH 4, VE6ANR 2, VE6CF 2.

BRITISH COLUMBIA – SCM, H.L. Savage, VE7FB – VE7QO RM: BCEN 3650 kHz is looking for more cw check-ins at 0300 GMT, nightly. OO VE7TT has a Yaesu YC-355D frequency counter. VE7BLO is back operating after breaking his leg, he is a paraplegic and operates with a mouth stick. OBS VE7BBL makes cw tape for bulletin for the BCEN. EC VE7AXI Victoria, is a Navy man and is in the East for a course. Recorded 44 patches for VE/WNWE Navy vessel. VE7DU suffered a serious stroke. Ham-Com '73 in Parksville Oct. 19, 20, 21 program is drawn up; for details write to VE7AFI, Parksville. Traffic: VE7AXI 54, VE7BLO 20, VE7CDF 7, VE7TT 6.

MANITOBA – SCM, Steve Fink, VE4FQ – RM: VE4LG. PAM: VE4FQ. It looks like summer doldrums have set in again, so take the rig to the lake to alleviate the situation. We trust you had a successful Field Day. With all those nasty comments about lack of a VE4 station in many contests, you'd be doing all a great service by getting on if you can. The first graduates of the CNIB course in

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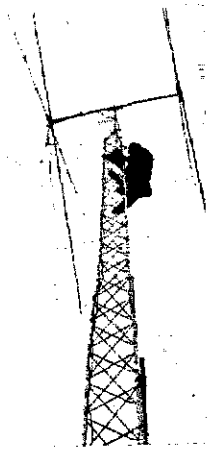

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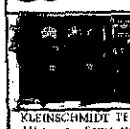

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Winnipeg should be heard on the bands soon. Congratulations to VE4EA who operated VE4RRC to a clean sweep in the last SS Phone contest. We regret to record the passing of VE4CA. VE4EW has returned to Winnipeg after his successful operation from A2CEW. MTN (3660 kHz): 30 sessions, 151 QNI, 39 QTC. MEPN (3765 kHz): 30 sessions, 857 QNI, 14 QTC. Call letter license plate applications go to VE4SE. Traffic: VE4RO 93, VE4PG 56, VE4CR 11, VE4BM 9, VE4WT 8, VE4FK 6, VE4TY 6, VE4LU 5, VE4FO 4, VE4JA 4, VE4RV 3, VE4XN 3.

MARITIME — SCM, W.D. Jones, VE1AMR – RMs: CI1ARB, VO1CA. The Halifax School For The Blind have their club station on the air, The call? VE1HSB of course. New calls to be heard on the air shortly, VE1AAM, VE1AAN and VE1ABF all newly licensed White Cane Operators in Charlottetown, P.E.I., also VE1AVY a new White Caner from the Moncton area, a hearty welcome to them all. Once again, flooding on the St. John river in N.B. called radio amateurs out by the score to supply emergency communications up, down and on the river. Our sympathy goes out to those brave lads who got pushed, squeezed, kicked and stomped while rescuing stranded live-stock. One of the shortages felt was for hand held portable 2-meter gear, the call went out and response was instant throughout the section. Reserve the Labor Day week end for the Charlottetown Convention. The APN on 3654 kHz daily at 8 P.M. local time has been changed to a slow CW (15 wpm) net, join the gang and spruce up your fist and traffic handling ability. APN reports QNI 137, QTC 78 in 30 sessions. Traffic: VO1CA 117, VE1AMR 71, CI1ARB 61, VE1AKB 33, VE1ZH 26, VE1AYJ 7, VE1AWP 2.

ONTARIO — SCM, Holland H. Shepherd, VE3DV – May will probably go down on all Canadian amateur's calendars as something quite unique. At least it will go down on this SCM's calendar as the month he received no complaints from the fraternity on the late arrival of the QST. It arrived on May first! May 4 marks the date that the DOC questionnaire was mailed requesting our opinions on how the US downshift on 75 and 40 metres affected us. As of Dec. 31 we had 13,120 licensed amateurs. The DOC are to be congratulated on this magnificent gesture. VE3ASZ, one of the best cw traffic handlers, may have more time to spend on traffic nets since being succeeded by VE3BFN as pres. of The Ont. Trilliums. VE3ASZ was given a special vote of thanks for the fine job she did for TOT and her untiring efforts in helping new Trilliums get on the air and teaching net procedures. Betty also NCS's the TOT CW Practice Net every Wed. at 2000 EDT 3695-3700 kHz. Why don't you give it a whirl? The Toronto FM Communications Society put out a very well done history on repeater VE3RPT in their fine bulletin. How about other clubs giving your readers, particularly the newer members, the opportunity to enjoy the history of your club. Your SCM is a member of the QCWA and recently had the pleasure of sponsoring VE3LJ to a Life Membership is this august but very active organization. What are your views on organizing a QCWA Chapter in Ont. See you at Kingston Aug. 17-19. Traffic: VE3EHF 168, VE3SB 157, VE3FQZ 128, VE3AWE 96, VE3DPO 92, VE3GJG 72, VE3GFN 69, VE3FRG 63, VE3DVE 55, VE3DV 36, VE3CYR 33, VE3GT 32, VE3EWD 27, VE3ATR 21, VE3DU 21, VE3DOC 17, VE3ASZ 13, VE3VD 8, VE3BGV 7, VE3EBC 6.

QUEBEC — SCM, Joe Unsworth, VE2ALE — SEC: VE2BDM. VE2DI is now VE2GWS in Ottawa. VE2ATL again active and was visited by VE1QJ. VE2UY finished studies and now plans to be more active. VE2APT back after enjoyable visit to DL-Land. VE2s DGX and CH now active at new QTHs Three Rivers. VE2AJD is the newly elected pres. of the Ste. Maurice Amateur Radio Assn. and VE2DCB treas. Will you be VHF mobile in the Montreal area this summer? Note VE2ZO will be 146.280-146.880 while VE2PY will be 146.460-147.060 MHz. Appointment of VE2ALH as ORS. New net controllers for QR Net are VE2AXY and VE2BWL. Congrats to another blind ham in Montreal area VE2AOA sponsor is VE2BP. A RAQI meeting in Montreal retains VE2AP as treas. VE2s ALA and BQN XYL-OM moved to Cornwall, Ont. Hope all Canadian amateurs have answered the DOC questionnaire and returned same prior to the date requested. VE3BAZ plans trip Western Canada shortly. VE2s BGF and BVD back home from studies in VE1-Land. VE2RO moves to mortgage manor soon. VE2DR doining OK after illness and again active. VE2s ABF and JO took a trip down in PA-Land. New call VE2BEH is on 2 meters. Don't forget MARC Picnic in Aug. From 1932 to 1973 MARC has had 29 pres. 7 of which are now Silent Keys; six others had more than one term of office. PSHR: (Apr.) VE2APT 16. (Mar.) VE2APT 18. Traffic: (Apr.) VE2DR 54, VE2BP 36, VE2FC 34, VE2ALE 9, VE2AJD 7, VE2APT 7, VE2UY 1. (Mar.) VE2UN 113, VE2APT 14.

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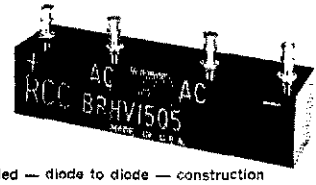

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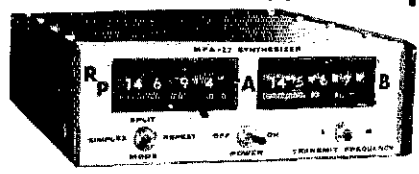

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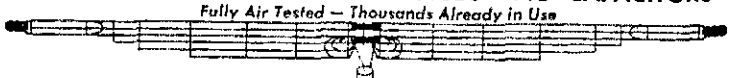

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RUBBER stamps, $1.75 includes postage. NJ residents add tax. Clints Radio, W2UDO, 32 Cumberland Ave. Verona NJ 07044.

QSLs catalog. Samples 35c. Ritz Print Shop, 5810 Detroit Ave. Cleveland OH 44102

200 TWO color QSLs $5.20, stamp for samples. Mark, WB6NKO, 2534 El Tonas Way, Carmichael CA 95608.

HAMFESTERS 39th hamfest and picnic, Sunday, August 12, 1973, Santa Fe Park, 91st and Wolf Road, Willow Springs, Illinois, southwest of Chicago. Exhibits for OMs and XYLs, famous swappers row. Information contact John Raiger K9DRS, 8919 Golfview Orland Park IL 60462. Tickets write Joseph Poradyla WA9IWU, 5701 So. California Ave. Chicago IL 60629.

FINDLAY annual hamfest, Riverside Park, Findlay Ohio, Sunday Sept. 9. Advance donation tickets $1 from C. Foltz W8UN -W.Hobart, Findlay OH 45840

GREATER Indianapolis hamfest August 12, 1973. Gas Co. recreational area 2 miles east of Emerson Ave. on Thompson Rd. P.O.Box 19449, Indianapolis IN 46219.

CANADIANS free surplus parts catalog. Etco, Box 741, Montreal.

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. 1960 Peck St., Muskegon MI 49441. Tel: 616-726-3198

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

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TELETYPE machines by Kleinschmidt. Page printer with power supply, as received from govt. — $59.95; single tables, excellent condition — $19.95; page printer and reperf combination, as received from govt. — $59.95 ea., double tables excellent with Chad Box and Tape compartments for $34.95. Each of the above TT machines cleaned, oiled, and adjusted please add $30 ea. TH-5 converters, transmit and receive on 170 shift — $49.95. Paper winders — $14.95, freight is collect on all orders. Andy Electronics, Inc, 6431 Springer, Houston TX 77017.

NOVICE crystals - new freqs. 24-hr shipment. Free flyer. Nat Stinnette Electronics, Tavares FL 32778.

HAMMARLUND HQ-170; with matching speaker and manual — $130. K3JHX, 207 Haystack Lane, Wilmington DE 19807. (302) 654-0536.

HEATH HW-16 excellent condition plus 10 crystals — $85. D. Reeves 37 Templar Way, Summit NJ 07901.

CLEGG Zeus, interceptor B and alt-bander perfect — $600. W2RQ, 78-20, 74 St., Brooklyn NY 11227. (112) 456-7755.

SELL Collins KWM 2-A, mint, with 516 F2 dc supply, PM-2 ac supply, 312B-4 console mobile mount, cables and manuals, complete — $900. Package only. W. E. Bettis, 33 Offutt Rd., Bedford MA 01730. (617) 274-6171.

DRAKE 2B receiver with 2BQ speaker, Q multiplier and 100 kc. crystal calibrator in good working condition — $150. Ed Juzumas, WA2BIG 88-57 75 St., Woodhaven NY 11421. (212) 642-4144.

FOR SALE: Hallicrafters SX-146 receiver, and HT-46 transmitter. Receiver has all ten-meter crystals, and crystal-lattice filters for both ssb and cw. Transmitter has one ten-meter crystal, and needs three more. Crystal filter type *sideband generation — $135 for each unit, or $250 for both.* firm. You pay shipping. R. L. Gale, WB2TFN. (212) 255-6912.

WANTED: American car radios 1930-50. Not necessarily working. Carl Huether, Hobbs Road, Pelham NH 03076.

COLLINS S-line 75S1, 32S1, 30L1, 516F-2, mint — $1,000; PM-2 p/s, CC-2 case, 180S1 antenna tuner; Kenwood TS511 transceiver ext. VFO, spkr/ps; SP-600JX — $200. WB4LVB/5, 505 Rua De Matta, San Antonio TX 78232. (512) 694-5479.

SIMPSON Model A 2 m fm 9 watts, 146.28-88, 16-76, 34-84, 94-94, 34-76. See Recent Equip QST Oct., 1971 — $140. WA4DAR, Bill Hazard, 3739 Waxford Rd., Richmond VA 23235. (703) 272-8192.

FOR SALE: Hallicrafters SX-100 with speaker new tubes. Johnson Valiant *with new finals will ship UR expense, price* — $125, each, reason for selling, west transceive. Harold Tallman, Box 352, Evansville WY 82636.

SELLING: Heath DX-60B, HR-10B with calibrator, and HG-10B. All in excellent condition with manuals — $170. You ship. Scott Salak, 1217 Horne St., St. Charles IL 60174.

HEATH SB10 — $59; Swan 250 w/117 xc — $295; TV2 — $189; SB610 — $79; HO13 — $59; HA6 6 m transverter — $75; CE20 w/458 VFO mint condition — $68. Sase for list. John Kakstys, 18 Hillcrest Ter., Linden NJ 07036. (201) 486-6917.

WANTED: 4:1 reduction knob for 75A4. W1GRE, 225 Main St., Newington CT 06111.

WANT: Collins MM-2 boom mike/earphone. State price and condition. John H. Deal, 1235 Milano Drive, Naples FL 33940.

SIX meter Knight TR-106 transceiver, complete just built — $65. K2RYE, 5 Partridge Lane, Huntington NY 11743.

WANTED: SX-146, spkr; HA-19. W4BTZ, Box 52701, Atlanta GA 30305.

TA33 Jr beam, Alliance rotor, 30-foot tower — $85 complete; Elco 460 scope — $55; Heath Q Multiplier — $5; BC 348 with ACPS — $15; Heath Audio VTVM - $18; Solar capacitor analyser — $12; Argonne desk mike — $4. Prefer pickup or you ship. Matt Eggert, RD 1, Lafayette NJ 07848.

COMPLETE 2 mtr. station, Clegg 22er, mike, Squalo and Big Wheel antennas. Many other parts and accessories. Also VM Model 726 mono tape recorder. All gear in mint condition. Must sell — best offer. Timothy Stewart, 16 W 705 Mockingbird Lane, Hinsdale IL 60521. (312) 986-1138.

HEATHKIT HW-12, HW32, both — $100. K4WNQ, Box 98, Marshallville GA 31057.

SALE: Heath SB-102/cw filter. Factory checked and aligned. HP-23A, SB-600, HM-15, HyGain 18AVT, Superex phones. All less than 6 mon. old, also Ten-Tec RX-10, Ameco AC-1, 2 mtr. xcvr. Many extras — $675 takes all. John Pavone, WN2IBP, 18 Coconut Dr., Commack NY 10725.

R-390A (serial No. 1830), clean — $525; Hy-Gain Model 18HT (10-80 meters) vertical antenna, you dismantle and haul — $125; Telegraphers' typewriter — Royal, clean — $50; 1920's L.C. Smith typewriter, clean — $30; *complete* Morse (landline) telegraph set, 50+ years old (key, relay, sounder, 3-arm resonator stand) rare item for the shack — $150; precision 24-hour dial seconds pendulum clock with one second and thirty second pulses, oak case — $425. All the above FOB Portland, Oregon. WA7REE, 607 SE Andover Pl Portland OR 97202.

COMPUTER Logic modules (not IC's) 2c each. Sase for list. K5BCQ, 5114 Geneva, Friendswood TX 77546.

SACRIFICE — new Swan Mark II Linear and supply with warranty card — $475; Drake TR4C pwr supply and external VFO 4 months old make offer. Going QRP. Tom Webb, P.O. Box 6, Morganton NC 28655.

FOR SALE: 100 pair stereo headphones, American made, low Z — $5 per pair. H & M. P.O Box 474, Port Hueneme CA 93041.

FOR SALE: 4 EL ant. HiGain rf amp.; Gonset 1132 converter, all 6 meters. 11 EL ant. converter for 2 meters. Lip filter, BC 312D recvr & supply. Best offer. Swan 250C, noise silencer, ac & dc supplies & DL104 mike — $350. K2JPZ, 665-8529. L.I. NY

FOR SALE: Hallicrafter SR400A, 500-watt transceiver with blower. PS500 ac power supply. HA20 DX adapter with remote SWR bridge, speaker. First Cashiers Check — $650. Shipping charges, collect. R. B. Connaughty, 318 Windward Island, Clearwater FL 33515. Phone (813) 447-0276.

WANTED SB401, any condition, give full details. Victor Schorn, Route 5, Box 323B, Florence AL 35630.

GONSET communicator III 2 meters $100, Gonset 3063 2 meter power amplifier $75, package $150. Motorola P33BAC with Nicads 94/94 34/94 $125. Heath HX20 $110, HR20 $75, HP20 $25. HP10 $35. Hustler 80-10 mobile antennas mast mount $35, package $245. You pay shipping W5PNY, 2506A 35th St., Los Alamos NM 87544.

WANTED: *tubes, transistors, equipment, what have you?* Bernard Goldstein, W2MNP, Box 257, Canal Station, New York NY 10013

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WANTED CE200E, HQ180AX, state condition and your lowest price. John Waskowitz, 35-30 73 St., Jackson Hts NY 11372.

DAH-DITTER Electronic keyer. Self completing ac supply, sidetone oscillator, speaker, 5 to 40 wpm, many other features. Wired $44.95. M & M Electronics, 6835 Sunnybrook, NE, Atlanta GA 30328.

WIRELESS sets, parts, catalogs, bought, traded. Laverty, 2815 Geneva St., RD1, Egg Harbor NJ 08215.

GREENE Center Insulators, with or without Balun — A tough number to beat. Free flier Kaufman Industries, Box 817Q, Reeds Ferry, NH 03054.

HALLICRAFTERS: SX101A, HT32A, absolute mint cond., with manuals, must sell pair $350. Jim WA2BZF, 118 Palisade Rd., Elizabeth NJ 07208. (201) 965-0424.

JEHOVAH's Witnesses who are amateurs write Box Ellis WA4UQQ, 160 Lagoon Rd SE, Winter Haven FL 33880 or call (813) 293-3695.

SPEECH amplifier for Heath SB400 and SB401 plug in module. No wiring necessary — just plugs in — easy to install. Model AUS. $14.50 plus postage. *American Sales Company, 5358 Floria* Drive, Swartz Creek MI 48473.

DXers: Tri-ex TM370 Sky needle ant.(70 ft) complete w/work platform, rotator cage assembly, ladder and tilting gin pole $1275. Wilson M340, 3-element full size 40M beam $190. Hy-gain Rotobrake w/control head $135. Spare Hy-gain rotobrake w/o control head $85. Alan Kogerup W9HOG, 9508 S. Knoll Top, Union IL 60180. Tel: (815) 923-4455.

TEXAS hams, the Texas slow speed cw traffic net is now operating every Saturday and Sunday evening at 0200 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.

SIGNAL/ONE, Alpha Seventy, new and used. Also Collins, Tempo, Kenwood, Hallicrafters, Drake, Regency, Hygain, Mosley, etc. A real ham store with complete service department, one of the few left. Write or call Douglas Electronics, W5GEL, 1118 So. *Staples St., Corpus Christi TX 78404.*

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.

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. N.Y.S. residents add 7% sales tax. WA2OLP, *Engraved Sign Co.* 14 Eve Lane, Levittown NY 11756.

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.

HEATH HW-12A with HP-23A & calibrator — $125; Heath HW-16 and HG-10 VFO, complete — $110; Hallicrafters SX-101 xcvr with spkr — $110; ARC-5 40 mtr xmttr. Franklin Davy, 39 Third St., Frenchtown NJ 08825. (201) 996-4447.

THE ideal Novice transmitter — Heath HX-20, 90 watts cw & ssb, built-in VFO — very stable and easy to tune — will drive a linear — $100 with power supply; $75 without. Also a Hewlett Packard VTVM — $30. Earl G. Shuholm, Box 21486, Concord CA 94521. Phone (415) 825-1320.

GE Deskmate base-station, 100-watt output, blower cooled, local and remote control, private line tone — $395; GE-TI table top base, 60-watt output, like new — $325; either of above available 50 Mc. or 146 Mc. Would make xclnt repeaters. Dual head-end revrs, add $25, multi-function remote control add $35. 2-mint T51GGV's with accessories, $85 ea. CE-20A with 458 VFO, QT-1, clean unaltered, $85; new Eimac 4CX350 1/2 price — $30, mint, unaltered DWS-1, new 4CX250B's — $495. 10 kW power plant, self-contained, metered, jeep engine, 152 hrs. since new — $995; HW-32 — $79; Climbers belt, like new — $35. W9DSV, Box 87, Webster WI. 54893

FOR SALE: 400-watt cw and a-m transmitter, enclosed rack panel on rollers triodes T-55's in final, plug-in coils, most bands, built-in antenna tuning. Triplett meters (7) in major circuits. Power supplies 1000-volt and 1500-volt at 500 mA, overload relay in final. Built-in scope. Kenyon transformers throughout — $350 cash and carry. Harold Geise, K4FJS, 9870 55th Way North, Pinellas Park Fl; 33565.

WILL trade Kodak Instamatic Reflex with three lenses for Hammarlund 180A (617)674-9162. Fred Bopp, 1 Shaw St., Fall River MA 02724.

DRAKE 2-NT, excellent condition — $110; Hammarlund HQ-170C, good condition — $150; both — $250. Perfect Novice rig Steve Lane, WB4VBG, 210 Robin Road, Russell KY 41169.

WILL consider trade of your Drake 2-C for my Drake ML-2. K9DHD, 1006 Wilson, Wheaton IL 60187.

VARIACS: 110V/22A — $22; 110V/20A — $20; 220V/8A — $16; Microflex cycle timers — $5; HP500B frequency meter — $50; HP506A optical tachometer — $25. Trammell, 1507 White Oak Ct., Martinsville VA 24112.

FOR SALE: CX7A with 400 Hz cw filter, maint. manual plus two 8072 tubes — $1450, plus shipping. John Hipp, P.O. Box 431 New Milford CT 06776. Tel. (203) 354-3935 anytime.

REWARD: information for recovery of stolen Yaesu FT-101 s/n82G12279/cw, 1.8 MHz, Regency HR-2 s/n03-02030, W4GF, 7216 Valleycrest Blvd., Annandale VA 22003. (703) 560-5229.

SELL: Heath SB301/SB401 — $500; Heath SB620 — $80; Drake W-4 wattmeter — $40; Heath HD15 phone patch $20; Electrovoice 638 mike — $26; Mosley TA33 JR — $60. Howie Haftel, 21 Infield Lane, Matawan NJ 07747. (201) 566-0060.

TRYING to restore Crosley Trirdyn 3R3 and pF Anstiehl Model 7. Help, diagrams, advice? Thanks. WA9UGE, 601 S. Dodson, Urbana IL 61801.

DRAKE R-4A, T-4X, AC-3, MS-4, good condition — $440. Jim Jorgensen. K7RAJ, 1938 South 424 East, Orem UT 84057. (801) 225-5464.

COLLINS S-line for sale. Send sase for full details. K3GEO, 4229 Estates Court, Allison Park PA 15101.

FOR SALE: (4)RT66GRC transceivers and (8)PP109GR 24 V dc power supplies for $200 or $55 for transceiver and two supplies. Shipping extra. Crystal controlled 20-28 Mc., fm voice. Tested ok, excellent condition, buy all get manuals free. Ted, 8 Kenwood, Baltimore MD 21228.

WANTED: Instructograph or automatic code practice machine. W9ZVY, Catlin, 1799 Alcan Drive, Menasha WI 54952.

SWAP HBR-13C receiver and cash for heavy-duty linear. WB2HZL.

FOR SALE: (or trade): Galaxy R530 gen. cov., freq. synthesized receiver, like new, extra filter, manual, original carton — $525; TTL-2A RTTY converter, custom panel all features plus $150; IB-101/IB-102 Heath counter/scaler (Have been used at 220 MHz) — $200. K8NGV. 26496 W. Six Mile, Detroit MI 48240.

CLEGG Mark II — 22er, 2 meter, used approx. 6 hrs, complete with instruction book and in original carton, firm — $200; Heath GR78, just returned from Heath — perfect, firm — $70. K2HAM, Swedgal. (212) BU4-5808.

ACTIVE hams — monthly mailer of reconditioned and new equipment specials. Sell, buy, trade. Write: Associated Radio, 8012 Conser, Overland Park KS 66204.

WANTED: 4 RTTY models in good condition. Tape perforator, 20-meter ham gear — needed for Youth Outreach Program. Tax deductible, receipt written for value. Box 4594, Clearwater FL 33518.

CUBEX two-element quad kit — new unopened box. Heath Apache, works well. Make offer. WA2OAX, 100 Gordon Ave., Dumont NJ 07628. (201) 384-7021.

HR-10B/Cal., excellent — $110. WN9HNA, 4523 Maples Rd., Ft. Wayne IN 46816.

WANTED: Collins 200-cycle, xtal filter for 75S-3B. W4FGF/0, 12343 Jackson, Grandview MO 64030.

RTTY Sell model No. 19 complete with W.E. dual-power supply — $125, no shipping. 1-Electrocom freq. & Shift converter model FSC 250 — with both 850 cps & 170 cps filters & manual — $325. W. Kind, 4 Laverty Court, Succa Sunna NJ 07876.

RETIRED: Sell Heath Seneca VHF1 6/2 meters — $100; Heath Shawnee HW-10 6-meter transceiver — $150, both now in service, manuals. Frank A. Hickey, K2BVK, 105 Watchung Drive, Hawthorne NJ 07506.

FOR SALE: Must sell brand new Signal/One CX7A — $1600. Contact Lewis Grigsby Jr., Farmers State Bank, Pittsfield IL 62363. (217) 285-2194.

SHACK clean out: Bc1031a Panoramic adaptor, 455 kHz i-f — $15; (3) Bc453's — $8 each; Bc696 — $6; R27/arc5 — $4; T22/Arc5 — $4; Bc-312HX — $15. All equip. works, plus tubes. Purchaser pays shipping. Mary Emerson, 3730 Robison No. 14, Redwood City CA 94063.

SRR-13A 2 Mc. — 32 Mc. needs work — $35; Seneca 2 and 6 (has fm) a-m/cw — $95; HyGain 2 mtr 5/8-wave GP — $1495. W6RQZ, 1330 Curtis, Berkeley CA 94702. (415) 521-7340.

WANTED: Swan 270B. (914) 245-1141.

NEW station complete — all 5 mos. old: Collins KWM-2 — 30LI linear 312B4 station cont. 516-F/w cab. — MN-2000 D-104 mike — Waters 1000-watt dummy load wattmeter Inc all cables & manuals — $2200. T.A. Clemente, Call (914) 246-7331. N.Y. collect.

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SELL: Loudenboomer amp 3-400Z with p.s. — $225; Ranger I — $70; Knight T-60 — $35; Hallicrafters SX140 with 6CW4 amp — $55, all very good or better and with manuals; Cushcraft 3 ele, 15 mtr beam with 75-ft. coax — $35; 110 V ant. relay — $15. WA4DCP/9, 105 Cronkhite, Danville IL 61832. (217) 446-0846.

NEW FM-27B Clegg with new Clegg ac supply, with warranty and manual in new carton; Drake M12F complete with popular xtals ac & dc power cords supplied in new condition, for information call or write. M. Marsley 2242 Stevens Avenue, Kalamazoo MI 39008. Phone (616) 342-8838.

SBE-33 ssb xcvr, 80-15 mtrs, 135 wts, ac pwr supply & speaker built-in. With mike, manual, in original carton — $120 or best offer. Livingston A.R.C., 85 Hillside Ave, West Caldwell NJ 07006. (201) 228-4434.

YAESU: Wanted FV-400S external VFO 8.4 to 8.9 MHz model. Sell Heath SB-310 revr., w/SB600 spkr, manual, all filters, includes 21 MHz conversion — $200. I ship any 48 states. WB8BOI, 1951 Burns, Ypsilanti MI 48197.

ANTENNAS — Mosley MP33, 3-element triband beam — $50; Hy-Gain 12AVQ with roof mount — $30; Hy-Gain Hyquad which has suffered a smash, has 3 or 4 tubing sections damaged — $60. WA2BSI, Box 2323, South Hackensack, NJ 07606.

WANT to buy Collins KWM-2 with ac supply or complete S-line also want 30L-1 or 30S-a. Must be clean and priced right. Richard Schark, 417 North Ferry, Ottumwa IA 52501. Ph. (515) 682-5741.

DRAKE T4XB, R4B, AC4, MS4, Excellent inside and out — not a scratch. Original cartons. I ship — $780. Finley, K5SNI/4, 747B Lakeside Dr., Robins AFB GA 31098.

SWAN 260 with ac, dc power supply used as spare base station only — $275. FOB W9DIW, R.R.2, Box 67A, Worthington IN 47471.

JOHNSON Viking Ranger II with manual, Ideal Novice transmitter with VFO — $110. Ninan, 1720 Brooklyn Ave., Los Angeles CA 90033. (213) 269-9131.

WANTED: RX-2 or RX-1 special VFO. WB6UNT, 2025 Cambridge, Cardiff CA 92007.

DRAKE 2B and 2BQ, mint condition, DX60B, professional job. Walter Hughes. WA2NOD, Box 376 South Beacon Blvd, Sound Beach Long Island NY 11789. Phone (516) 744-9064.

TRADE: HVE (1) 4-1000 (2) 4-400 (4) 4-250. Want: Ten-Tec PM2/PM3 or HW-7. WB4RBK, 114 Havron St., McMinnville TN 37110.

SELL: Hallicrafters SX-133 receiver like new — $225. Loudspeaker — $15. WB2BVL, 7 Bowen Place, Stony Brook NY 11790 (516) 751-8792.

WANT: xtal-filter for SR400 2.1 kHz, buy or trade KVG xtal-filter 9 MHz i-f, bandwidth 2.4 or 0.5 kHz. Please help! DK8GD, Hoeriblick 14, D-7753 Dettingen Germany. Zip D-7753.

FOR SALE: Motorola 2-meter fm handie-talkie with extra tubes — $50. WB5CRX, Box 643, Norman OK 73069.

SELL: Hallicrafter SX-100, Ameco CN-144 with P/S 1 power supply — $150. Arthur Stangel, W2JZH, 500 W. 235th St., New York NY 10463.

STANDARD SR-C826m, xtals and gain ant. sell or trade for hf or cw gear, make offer. W7JLS, 3751 So. Nellis No. 63, Las Vegas NV 89121.

2-mtr amp, single 4CX250, QST design — $25; 55-amp Leece-Neville, electronic regulator — $25; mobile supply, 1972 handbook — $50; xfmr 3000 VCT, 300 mA, 100 primary — $5; Lo-Band Pre Prog. Rx, Tx, controls, cables — $15; cash or trade for TPL components. K4EIM/9, 1204 E. Penn. Ave., Urbana IL 61801 (217) 367-4558.

SELL: Aerotron 6N15 2 mtr. 15 W xmtr. xtaled for 760 revr and 340 transmit — $100. D. Klingler, 801 S. 60th St., Harrisburg PA 17111.

WANTED: HQ160 Hammarlund receiver. State condition and price. Ernest Peterson, 500 East 77 Street, New York NY 10021.

COLLINS 30L1 S/N 15794. First certified check for $350. Pickup or ship Railex collect. K2AMN, F. Roberts, Old Mill Road, Nissequogue NY 11780.

DRAKE 2C, 1 AC, 2NB, 2CQ — $220; 2NT — $100. Damon Ginbey, WA5EEM, 4307 Ramsey, Austin TX 78756. (512) 454-1916.

"DON and Bob" new guaranteed buys. Triex MW50 tower — $250; MW65 — $331.50; W51 (FOB Cal.) — $386; Ham-M — $99; TR44 — $59.95; AR22R — $31.95; HyGain TH6DXX — $139; 204BA — $129; TH3MK3 — $114; Mosley CL36 — $149; CL33 — $124; TA33 — $113; MCQ3B — $91; 8401 — $143; MP33 — $90; Belden 8214 RG8 foam coax 17c/ft; 8448 8 wire rotor cable 10c/ft; Mallory 2.5A/1000PIV Epoxy diode 29c; KY65 Ider — $5.95; Write specific needs new panel meters, many stock. Quote Clegg FM27B, Hallicrafters FPM300A; Standard, Regency; Eimac; Midland 2 m fm; Collins and cde replacement parts stock; warranty guaranteed; shipping charges collect. Madison Electronics, 1508 McKinney, Houston TX 77002. (713) 224-2668.

WANTED: Drake TR-4 with AC-4, DC-4, 34NB, MM-3, and MS-4. Call Bob Christmann at (914) 477-2173 evenings or write: Maple St., Greenwood Lake NU 10925.

SELL NCX-3; NCX-1 — $225; KWM-1, 516F-1 — $250, xcvrs mint, supplies VV GD, manuals. Topaz 12 V dc supply w/cables and adaptor, powers either — $50. Hustler mast, 6 resonators in two carrying cases, vy little used — $30, all $500. Want 6000 VCT, 220 V primary transformer. Coupland, W6MNF/0, 7300 E. 100th Terr. Kansas City MO 64134.

WANTED: Plug-in coils for National SW-3 receiver. G.B. Lombard, W6FUO, 5120 Belcrest, Bakersfield CA 93309.

TR4, AC4, MS4, 10 months old, excellent — $485, firm, will ship. WA2DMF. (201) 785-2812.

DRAKE 2-B, calibrator — $155; Eico 723 — $25, both $170, incl. misc. WB5CKI, 8913 James NE, Albuquerque NM 87111.

DRAKE 2NT with 25 Novice xtals — $90; Allied 2516 receiver — $75. William Wurster, WB9IRB, 4815 N. Bell Ave., Chicago IL 60625.

SELL: IC-21, crystalled for 28-88, 34-94. See description p. 52, Feb. QST — $275, postpaid. W1RU phone evenings (203) 658-7307.

QST, back issues, Jan. 1935 to June 1938, bound 6 month volumnes, excellent. Singles Sept., Nov., 1926, Jan., Feb., March 1927. Best offer. WA5ENP, 218 Karen, Lafayette LA 70501.

DRAKE T4 reciter — $200; Heath SB220 Linear — $275; Ameco TX62 transmitter and 621 VFO — $100; Lafayette HA350 HamBand receiver — $70, all in good condition. Philip Schwebler, W9GCG, 4536 N 50 St., Milwaukee WI 53218.

SELLING out — must clear out shack by July first. Includes Yaesu Musen ssb line, fm RTTY, and test equipment. Sase for list. K9ZYS, Jim Taylor, P.O. Box 440, Milwaukee WI 53201.

DRAKE R-4B, MS-4 mint, original cartons — $350. W8KUQ, George Dessert, Rt. 3, Box 228, Parkersburg WV 26101. (304) 863-5405.

FOR SALE: HW-101, HP-23A, mint condition. WA1NZZ, Jerry Dorsky, 348 Gray Road, Falmouth ME 04105.

FOR SALE: Drake TR-3, dc power supply, mike, antenna, speaker, mobile mount — $410, Randall Burg, WB6JLA, 133 N. Swall Dr., L.A. CA 90048. (213) 271-1578.

FOR SALE my huge collection of radio building parts, includes antique 40-drawer cabinet, 8-foot bench with large drawers and upper shelves, every space is full! Lots of meters, dials, tubes, transistors, chasses, transformers, chokes, switches, sockets, capacitors of all types, resistors, oodles of hardware and you name it! Pick-up truck load for $150. WA1IWV.

GONSET G28 — 10-meter transceiver, mint — $100; Lafayette 10-meter transceiver — $35; Clegg 99er, 6 meters — $65; Ampex 7500 color video tape recorder — $550. WB2GKF, Stan Nazimek, 506 Mount Prospect Avenue, Clifton NJ 07012.

SELL: Hammarlund HQ180C — $200; Johnson Valiant — $200; or best offer. Both perfect condition. Fred Schupman, K4JXZ, P.O. Box 749, Florence SC 29501.

FOR SALE: R4A with spkr and extra crystals for full 160-10 coverage — $250. (813) 886-4602. WB4KUR, 8412 Woodbrier, Tampa FL 33615.

FOR SALE: Hammarlund HQ-110A — $100; Galaxy V — $250; Photos on request, shipping paid. No. 9 Colonial Village, Brookings SD 57006.

HEATH DX-60B, Realistic DX-150A, Globe VFO, Ten-Ten Audio Filter, Speaker — $175. WN6QGH 43-812 King St., Indio CA 92201.

SELL: Digital Synthesizer, MFA-2, R. P. Electronics, new, never connected — $100. P.P. Latourell, W6IG, 7350 W. 87 St., Los Angeles CA 90045.

PC Boards, cw time identifier — $12.50, RTTY speed converter — $5, TT decoder — $6.50; 300 MHz decade scaler — $1.95. All boards sent PPD & drilled. Many others available. Charles R. Sempirek, K8WDC, Rt. 3, Box 1, Bellaire OH 43906.

DREAM QTH for sale by owner. Deluxe home on three landscaped acres, surrounded by farmland, yet ten minutes from super shopping center, one hour to downtown Chicago and airports. Fully equipped shack, 120 ft. tower, big beams rotator, cables, 85 foot poles. Three bedrooms, dining and living rooms, stone fireplace, family room with set bar. Basement, 20 X 40 heated concrete pool, 28 X 36 garage — $75,000. K9CSM, Rt. One, Monee IL 60449.

SIGNAL/One: Mint CX7A — $1295, new last series — $1895, full warranty, trade. Payne Radio, Box 525, Springfield TN 37172. (615) 384-5573, nites (615) 384-5643.

Prog-Line 30-watt mobile, xstr supply, 12 xmtr oscs with 94, 88, 76, 46, 34, 28, 22, 16 *xtals, 4 rcvr oscs with 94, 88, 76, 82 xtals,* 20" case, clean and extremely reliable — $200; 14" Prog-Line case — $10. K4EIM/9, 1204 E. Pennsylvania Ave., Urbana IL 61801. (217) 367-4558.

WANTED: Multiturn inductor tuning knob for Collins 180S-1. Entire mechanism (knob & plate) from KWS-1 would also work. Please write advising price to CWO Paul M. Anton, HL9VL, H & Hd 4th Sig (GEMS) APO SF 96483.

SELL: Swan Sygnet model 260 — $270, plus shipping. Herb Smith, W8AIU, 31099 Pinetree Rd., Cleveland OH 44124. Phone (216) 831-8484.

SALE: HQ-170 — $100; Apache with ssb adt — $100; 4-1000A w/ 4X1000A socket — $50. WA2RZE, Box 189, Westfield NJ 07091.

DUE to Silent Key, sell entire station. TR3-power supply speaker, mike. SB200 Mosley TR33 beam, hinged base tower. Ham "M" rotor, complete with all connecting cables Misc other *items, first $650 takes all. Mrs. Schuler, 126 Solomon Ave.,* Inwood Ll NY 11696. Tel (516) CE91239.

SELL: Drake R-4 — $225; T-4X — $250. Paul Loafman, 2101 South Rankin, Edmond OK 73034

FOR SALE: SW-3 and Grebe CR-9. Wanted: any receiver by Parkin Mfg Co., Speeper Radio Corp., other old receivers and misc. parts Horvath 522-Third St., San Rafael CA 94901.

HEATHKIT HG-10B VFO — $25; DX-60B — $49; HR-10B — $49; Knight P-2 SWR — $8; Knight Deluxe VTVM — $20, all mint, WB4PUE, 5200 Mawood, Fayetteville NC 28304.

ALL Heathkits professionally crafted, laboratory alligned, unequivocally guaranteed. Write for immediate quotation. Ralph Watkins, WB5FJB, 1107 Gillette Dr., Little Rock AR 72207.

FOR SALE: Drake R4A, T4X, AC4, and MS4. Reconditioned 3 *months* ago. Asking $525. *Alvin Schmitt, 147 Brentwood Blvd.,* Bulport MI 39501. (601) 896-4062.

HOSS Trader Ed Moory says he will not be undersold on Cash deals! Shop around for your best price and then call or write the "HOSS" before you buy! New Regency HR-2B two-meter fm transceiver, 15 watts amateur net — $229; Demo Drake TR-4 — $475; new demo L-4-B — $595; new Gonset 2 kW linear, regular — $560; cash — $339; new Rohn 50 ft. heavy-duty fold-over tower, prepaid — $255; new Mosley CL-33 and demo Ham-M rotor — $215 used equipment! Demo Ham-M — $89; T4-XB — $359; R4-B — $339; TR-4 — $375; mint KWM-2 — $595; 328-3 — $649; FPM-300 — $475. Moory Electronics Co. P.O. Box 506, DeWitt AR 72042. Tel: (501) 946-2820.

HY-Gain TH-2 MK3 excellent condition — $59.95; Hy-Gain Mod. 23 2-meter — $8.95; SRR-134 2-32 MHz general coverage (needs work) — $39.95. Wanted: Ameco CN220. W6RYZ, 1330 Curtis, Berkeley CA 94702. (415) 526-7345.

NATIONAL NC300 with speaker and 2-meter converter — $130; National HFS receiver no speaker or power supply, make offer; Johnson 275-watt Matchbox with coupler — $50; Collins 310B1 CW exciter — $55; Baldwin "C" phones, misc. old tubes, crystals, transformers, chokes, capacitors, meters etc. mags, callbooks, handbooks, other publications, some old. Sase for list. Cannot ship NC300 or 310B1 but will meet you within 75 miles. Horace B. Goss, W1AB, Crosstrees Hill, Essex CT 06426.

KENWOOD TS-511S with power supply, autronic keyer, mike TVI filters, SWR bridge, dummy antenna — $450 firm. J. Lauman, W6VPK, 851 Diamond, Laguna Beach 92651. (714) 497-1376.

MINT Hammarlund HQ-170C with manual — $125; solid-state Realistic DX-150A receiver perfect — $75. Robert Dial Rt. 1, Box 63, Biggs CA 95917.

WANTED: QST for July 1947, state price H.O. Pattison, Box 737P, RD2, Tucson AZ 85715.

SELL: 2 C.E. 20a with VFO one — $50, one — $75. W0PQP, Box 128 Valley NE 68064.

SELL: Galaxy GT550, power supply-speaker, VOX, calibrator Like new with only 5 total operating hours! Also Waters Keyer and misc. fine test equipment. Priced to move fast! Write W3NV, 8258 Brittany Place, Pittsburgh PA 15237 for prices and list.

DRAKE 2C xtal calb. with 2C and Drake 2NT xmtr — $292, like new. My address is: Bart Burne, 1725 Wyoming Ave , Scranton PA 18509.

COLLEGE bound — must sell!! Heathkit HW-100 xcvr w/power supply; Drake 2B rcvr; Johnson Matchbox. All mint condx! Package deal — $405. WB2ITO. (516) 561-0983.

CLEANING shack. Hallicrafters HT-37 transmitter — $140; HT-41 linear — $140; Johnson Ranger I with PTT — $80; Knight *R-100A receiver with crystal calibrator, speaker, S-meter* — $50. All units in good operating condition with manuals. You pay shipping. Bill Short, WB2USK, 109 Cammot Lane, Fayetteville NY 13066. (315) 637-6565.

REGULATED Variable dc voltage supply, output adjustable from 2 to 18 volts, current limited at one amp, ripple only 10 mV p-p; kit — $29.95, assembled — $31.95. Includes metal cabinet. Add $2 shipping. Moneyback guarantee. L&F Electronics, Box 2186A, Riverview MI 48192.

HEATH HX-30 plus 144 Mc. heterodyne unit and A6 and 2 meter amplifier using a 4X150 complete package — $175. Will Power, 35 Sunset Ave., W. Trenton NJ 08628. (609) 882-7956.

DUMMY load good up to 500 W PEP 52 ohm complete w/ oil — $7.95; HW16 & transceiver — $90. Wanted VFO SWR bridge keyer and paddle Matchbox phone patch. Dowkey relays. John Kukstys, 18 Hillcrest Ter., Linden NJ 07036.

SELL; SBE-34, mic. VOX, xtal-calb — $230; Gladding-25 ac-supply, many xtals — $225; Kiwvy Bruce TIS 97 Saint Stephen Street, Boston MA 02115. (617) 261-3261.

WANTED: Collins 32S-1 xmtr with 516F2, must be mint. Paul Capetz, 701 Bubbling Well Drive, Glendora CA 91740.

220 Mc. fm, TRC-8, receiver, transmitter 5W out; power *amplifier 75 W out., 4 X 150; including 117 V power supplies,* rec & xstr are converted, P.A. need cavity extension — $100. Delivery 50 M or EOB. K1BOX, Warren Harding, 23 Richards Rd., Southborough MA 01772.

NEED RCA 9861, 7,500 volt transformer to restore 1940 TRK-120 TV. Horace Brokaw, W2ACC, Neshanic Station NJ 08853.

TRANSMATCH Junior Millen — $60 new — Simpson model 380 wavemeter & modulation indicator coils 10-80 charts — $35. Motorola tuning meter P 8100 fm communication equipment — $25. W2FG.

HEATH SB401, SB301, cw filter, SB600 speaker for sale — $395 takes the package! Sell separately. Jim Lee, 100 Edgewood Circle, Southington CT 06489. (203) 621-3307.

COLLINS 75A-4, 0.8 and 3.1 kHz filters, manual, original carton, one owner, clean! W1FLM, Roger Kaul, 10 Fox Den Road, Glastonbury CT 06033. Area code (203) 633-4903.

WANTED: Drake TC2, W7IQF Box 228, Seahurst WA 98166

SELL: TH6DXX new crated — $150, plus shipping. Want Heath SB/HW series and accessories. Alpine, 415 Demarest Ave., Closter NJ 07624. (201) 767-0123.

BIBLE translators in Africa need amateur equipment, especially used transceivers, beams, linears and split units. Please help if you can. Donations of equipment tax deductible. Rev. Otto Hintzer, Professor of Missions, Concordia Seminary, Box 366, Springfield IL 62702.

FOR SALE: Collins 18S-4 (ARC-59) hf rcvr-trans — $20; AN/URR-13 uhf rcvr — $20; Northern Radio two-tone RTTY channel filter pair for 170 Hz FSK (1955/2125 Hz) — $2 pr; Kay Electric Ligna-Sweep Model SKV (935B) — $100. FOB. Larry Laitinen, WA6JYJ, 217 Orchard Rd., Felton CA 95018. (408) 335-7549.

R.A.L.-7 perf condx, manual — $75. QST Aug. 68-72, CQ Aug 68-Jun. 72, H.R. Aug 70-72, 25c/copy. WAØUDJ, Box 156, Artas SD 57423.

WANTED 500 kc mechanical filters for Collins 51J4 receiver. F500R-14, —31, —60. Cash or swap. Frank Johnson, WB2ASV, 45 Frederick Pl., Keansburg NJ 07734. (201) 787-0275.

DX-60B (with T-R switch) — $70; HG-10 — $30, excellent. Can demonstrate. WA2DLV, Joel Rosen, 6 Elm, Woodbury NY 11797. (516) 692-6571.

TWO meters: GE pre-prog 30 W base — $125; Regency HR-2 — $150; Allied Hi-lo band monitor model A-2589 — $35. FOB. W8FAX, Box 182, Allen Park MI 48101.

FOR SALE: Drake R4A, T4X MS4spk/pwr SB200 Doc Gibbens, Box 497, Garrison ND 58540.

WANTED: buy, borrow, manual NLS voltmeter, 4305. Tom Way, Route 2, Mebane NC 27302.

SELL: Yaesu FTDX560 with cw filter — $425; 18AVT/WB — $40. W1RML, 31 Midwell Road, Wethersfield CT 06109.

SELL: Poly-Com 6 and 2 meter transceiver with mid and built-in 117- and 12-volt supply — $125; Eico 753 ssb-cw-a-m transceiver — $120, both in good condx and with manuals. Gene Elfstrom, WB2NIE, 3 Franklin Pl., Lakehurst NJ 08733.

CRYSTALS airmailed: general purpose, MARS: Novice calibrators, accurate FT-243 pairs for QSO and calibration (3703-3747) — $3.95 (7103-7147) (7035-7065), (7027-7048) — $2.95/pair. Novice, active, FT-243, all frequencies, minimum five 40 m, 15 m, 10 m — 99c each. 80 m — $1.59. Cover bands inexpensively — rock solid. Less then five 80 m — $1.75 other — $1.50. General purpose: FT-243 .01% 32 pF, 3500-3600 — $1.90 each (five $1.75), (nets, ten same $1.45), 1700-3499, 8601-13000 fundamentals, 10,000—30,000 overtones — $2.95, 50c each for .005%. 75c for HC-6/u above 2000. Airmail 15c/crystal — 1st cl. — 10c. Free order listing. Bob Woods, WØLPS. Since 1933, C-W Crystals, Marshfield MO 65706.

SELL: Hallicrafters SR42 2-meter transceiver including Ameco Model PV preamplifier, spare tubes and crystals — $100. FOB. WB6DZN, J.P. Gehegan, 4750 Conrad Avenue, San Diego CA 92117.

HQ-129X with instruction manual — $95, good condition, modified slightly by only owner. No ship, will deliver within 125 miles. Byron Goodman, W1DX, 75 Holland Lane, East Hartford CT 06118.

AIL Automatic NF Indicator No. 74, variable input — $175; HP Signal generator and test gear, swap for ham equipment. List s.a.s.e. W4API, Box 4095, Arlington VA 22204.

FOR SALE: Heathkit SB220 linear, only 10 hours use — $345; Swan 500 w/ps, factory aligned 4 mos ago — $395, both like new — no scratches. Going QRP, Heathkit HP-10 Electronic keyer — $35 & Swan phone patch — $38.50, both never been used. Dana B. Wood, K6AHM, 11325 Isleta St., Los Angeles CA 90049. (213) 472-5001.

HEATH HG-10 VFO with power supply — $35; 80-meter 50-watt 807 final cw transmitter with triplet meter — $25. CB & Amateur Novice crystals — $1.50 each. Lee Soroca, 513 Walnut Ave., Syracuse NY 13210.

MOBILE Ops — Write for info on shielded ignition systems and noise suppression components. Summit Enterprises, 36 Winchip Road, Summit NJ 07901.

NCX-3, NCXD mobile supply, excellent condition — $175. K3UKZ. (717) 455-8132.

WANTED: Heathkit SB series external LMO for use with Heathkit transceiver. Will buy or trade. WA9YXH, Box 482, New Carlisle IN 46552.

COLLINS S-line receiver, transmitter and accessories in like new condition. Send s.a.s.e. for details. D. Reid, 108 North 130, Seattle WA 98133.

WANTED: (1) instruction book for 1M36B/URM-6 or circuit diagram (2) URM 25D or later series (3) low-frequency coils for HR060. Hall, 40th Floor, 299 Park Avenue, New York NY 10017.

CLEANING shack s.a.s.e. for list. WB2MRA, 212 No. Jerome, Margate NJ 08402.

WANTED: Case for HQ180A receiver. Will consider junk receiver for same. Also need kW matchbox. Johnson, Millen, Murch, etc. W4MVM, 5801 Shadesview, Mobile AL 36608. (205) 342-9041.

WANTED: E. H. Scott communications receiver, also any pre-1932 E. H. Scott radio. J. G. Halser, 2438 So. Howell Ave., Milwaukee WI 53207.

DRAKE SW4-A & 2-C either — $150; National HRO-500 original carton new condition with speaker and manual — $900; Tektronix 514 AD — $200. M. Brody, 66-43 171 St., Flushing NY 11365. (212) 445-0275.

WILL trade Cushcraft A21-4 (4L15M) beam for 18 AVT vertical. WB6SQW, 820 Mooney, Monterey Park CA 91754. (213) 280-1517.

Index of Advertisers

Alltronics-Howard Co. . . . 164
Amateur Electronic Supply . . . 128, 134, 154, 165
Amateur License Instruction . . . 167
Amateur Wholesale Electronics . . . 159, 160
American Radio Relay League
FM-Repeaters . . . 124
Gateway . . . 145
Handbook . . . 176
League Emblem . . . 136
License Manual . . . 125
Membership . . . 162
Publications . . . 163
Operating Manual . . . 173
VHF . . . 140
Amtech . . . 165
Andy Electronics . . . 165
Ascom . . . 125
ATV Research . . . 160

Bauman Sales . . . 168
Bitcil . . . 152

Collins Radio . . . 2
Command Productions . . . 166
Crystek Company . . . 168
Cubex Co. . . . 154
Curtis Electro Devices . . . 165
Cush Craft . . . 121

Dames, Ted . . . 158, 161
Deane, Wm. . . . 164
Drake, R. L. . . . 153
DX Engineering . . . 161

Ehrhorn . . . 5
Eimac . . . Cov. IV
Electronic Distributors . . . 165

Fair Radio Sales . . . 159
Fluke . . . 157

Gotham . . . 149
Gregory Electronics . . . 156

Hal Communications . . . 175
Ham Radio Center . . . 156
Ham Radio Magazine . . . 148
Harrison Radio . . . 148
Heath Co. . . . 122
Henry Radio . . . Cov. II, Cov. III
Hildebrand, Dean Co. . . . 161
Hy-Gain . . . 133

Icom . . . 141
International Crystal Mfg. . . . 7

Jan Crystal . . . 155

Kaufman Industries . . . 164
K. E. Electronics . . . 161
Kenwood . . . 137
Kirk Electronics . . . 138
K W Electronics . . . 158

Luttin Radio . . . 159
Link, John . . . 168

MFJ Enterprises . . . 159
Military Electronics . . . 164
Millen Mfg., James . . . 174
Mini Products . . . 161
Mobiliers . . . 153
Mor-Gain Inc. . . . 167
Mountain Men, The . . . 167
Murch Electronics Inc. . . . 157

National Radio Institute . . . 126,155

Omega-T . . . 160

Palomar Engineers . . . 166, 168
Payne Radio . . . 157
Polygon Co. . . . 150
Poly Paks . . . 151

Radio Amateur Callbook . . . 132
Rectifier Components Corp. . . . 167
Regency Electronics . . . 127
R. F. Communication . . . 135
Robot Research . . . 149
R. P. Electronics . . . 167
Ruggles & Associates, David M. . . . 168

Savoy Electronics Inc. . . . 1
Signal Systems . . . 167
Skylane Products . . . 166
Swan Electronics . . . 131, 146

Tri-Ex Towers . . . 143
Trigger Electronics . . . 130

Unidilla Radiation Products . . . 155
Unique Products . . . 153

Van Gorden Engineering . . . 166
Van Sickle . . . 168
Vintage Radio . . . 144

Weinschenker, M. . . . 142
World QSL Bureau . . . 165

Yaesu Musen USA, Inc. . . . 4
Y & C Electronics . . . 152

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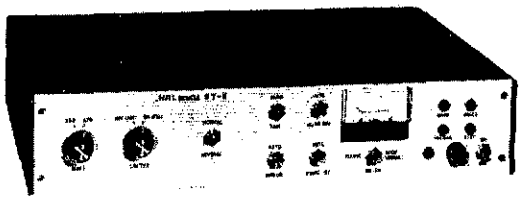

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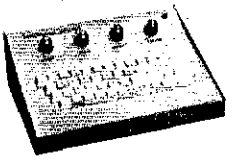

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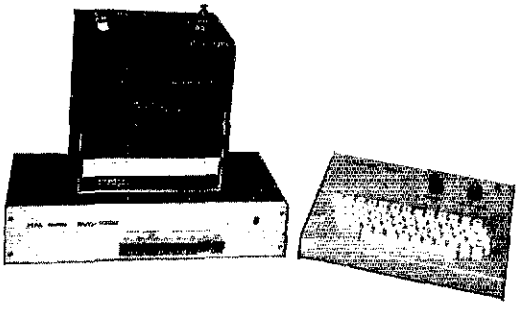

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TOP QUALITY...WITH THE HAL RKB-1 TTY KEYBOARD. Gives you typewriter-easy operation with automatic letter/number shift at four speeds (60, 66, 75, and 100 WPM). Use with RVD-1002 video display system, or insert in loop of any teleprinter, for fast and easy RTTY. Completely solid state, TTL circuitry using G10 glass boards, regulated power supplies, and transistor loop switch. RKB-1 assembled, only $275.00.*

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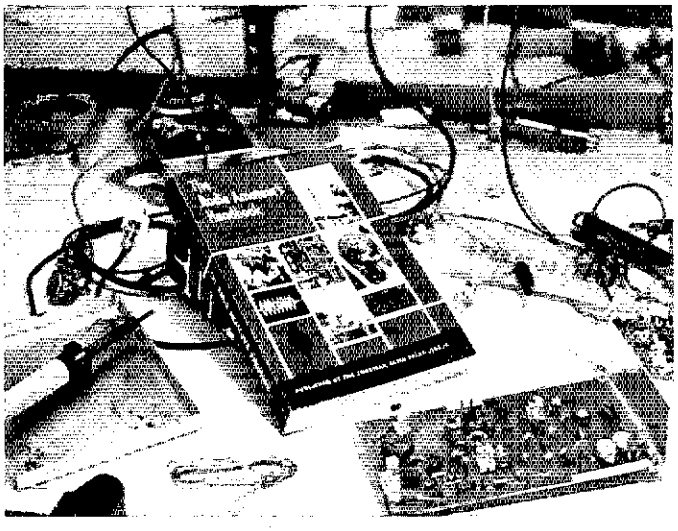

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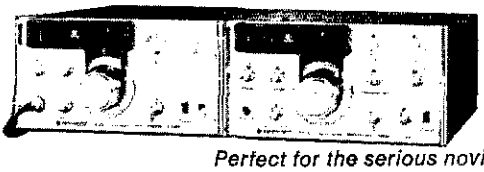

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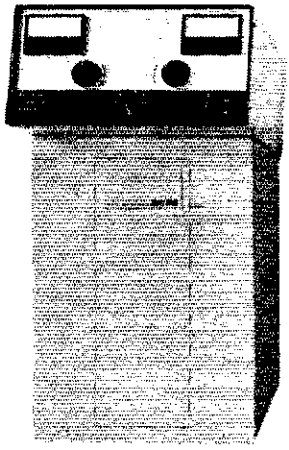

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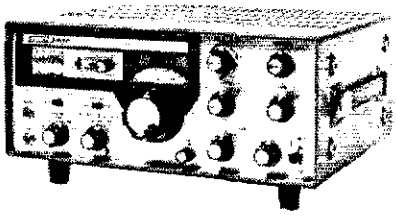

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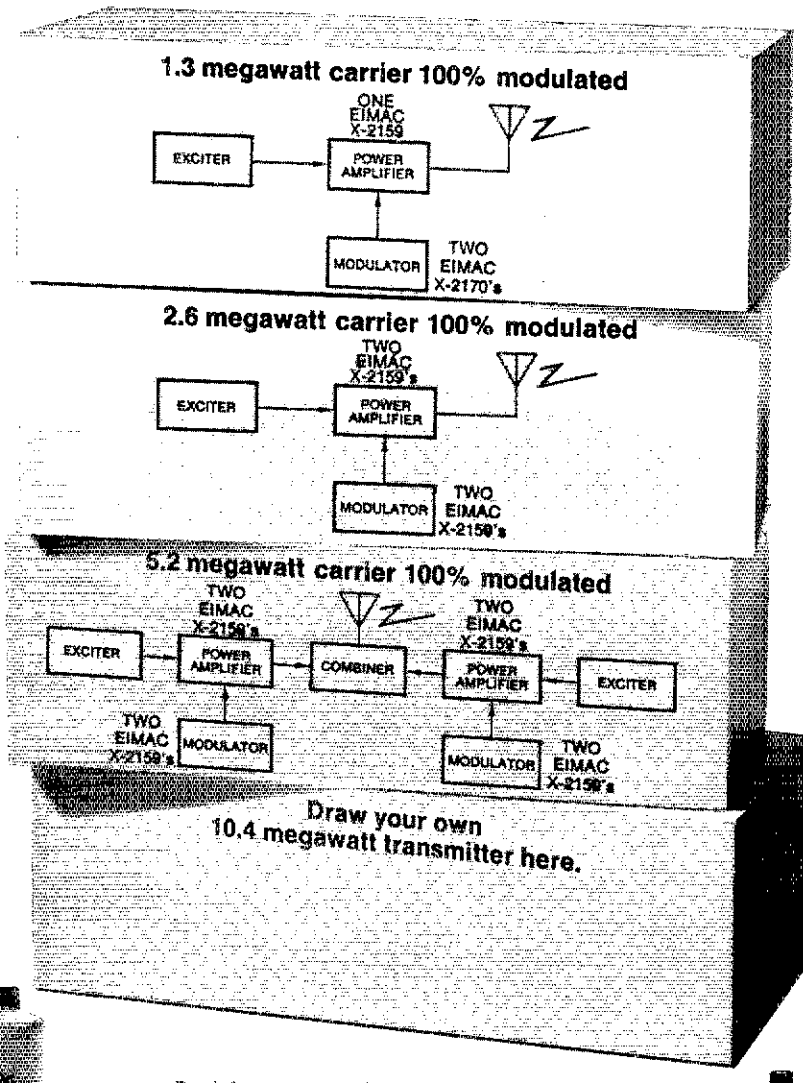

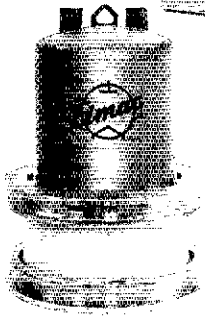

X-2159

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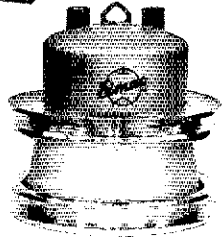

X-2170

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