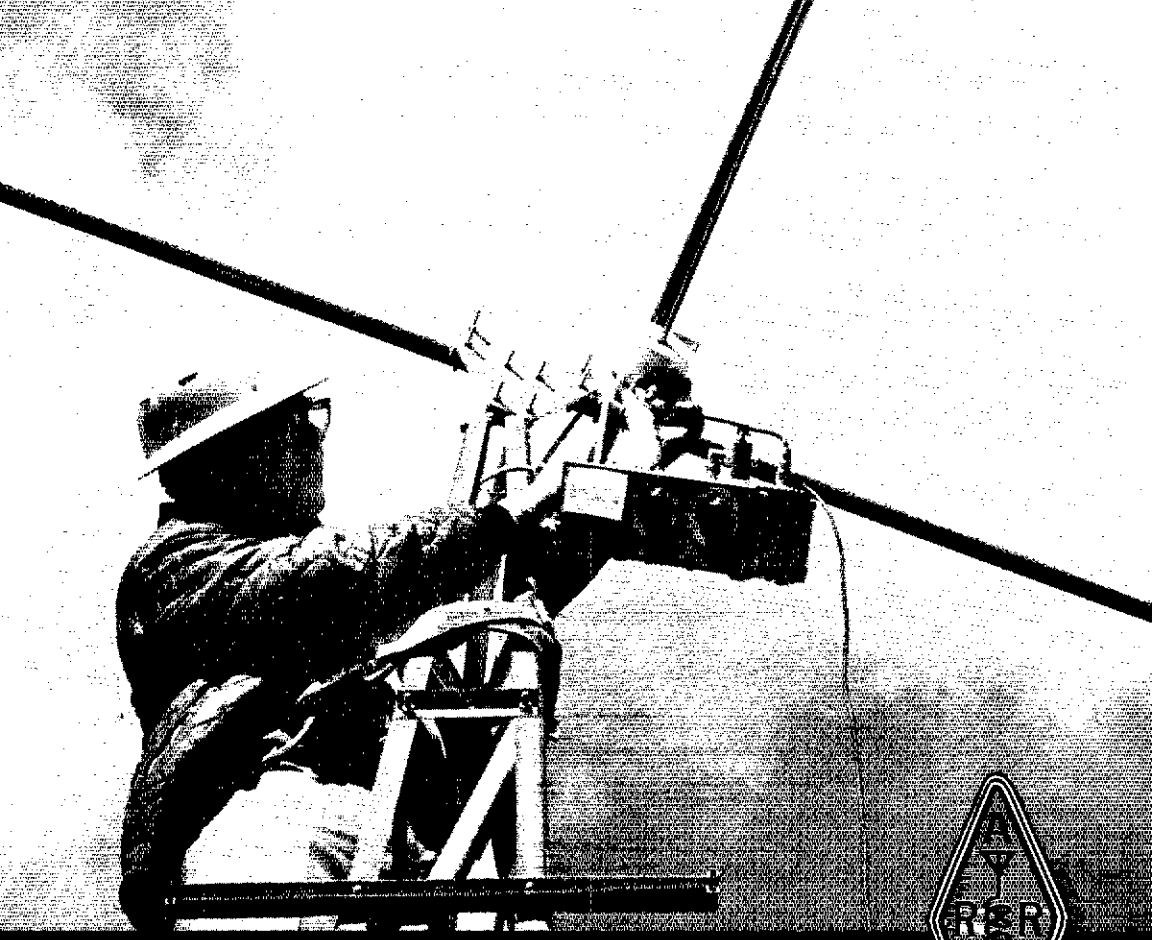


January 1972  
75 Cents

# QST

devoted entirely to

# amateur radio



OFFICIAL JOURNAL OF THE ARRL



As a further service to our amateur friends, Swan now offers a Revolving Credit Plan that permits you to purchase any Swan equipment, and charge it!

If you wish, you can pay your charge each month within 25 days of your billing date with no finance charge. Or if you prefer, you can spread your payments over a number of months, and your monthly payments will be adjusted accordingly depending on your balance.

Now it's easier than ever to purchase Swan equipment. Just order your equipment from the factory, our East Coast branch, or one of our participating dealers, and say, "Charge it!". Once your account has been opened, you can add to your account at any time.

An important fact to remember is that this financing is available directly from Swan. We handle your account from start to finish. Unlike many credit plans offered today, Swan WILL NOT sell your account to some finance company.

Mail the adjacent coupon in today, and we will send you complete information and your Swan Credit Application by return mail, and your account can be opened in just a few days.

# INTRODUCING A NEW SERVICE FOR HAM

# SWAN

# Revolving

# Credit

# Service



**SWAN**  
**ELECTRONICS**

A Subsidiary of Cubic Corporation

**SWAN FACTORY**  
305 Airport Road  
Oceanside, CA 92054  
Phone: (714) 757-7525

**EASTERN OFFICE**  
P.O. Box 2288  
Ocean, N.J. 07712  
Phone: (201) 531-4114

Gentlemen:

Please send me:

- Complete information on your Revolving Credit Plan.
- A Swan Credit Application.
- The 1972 Swan Catalog.

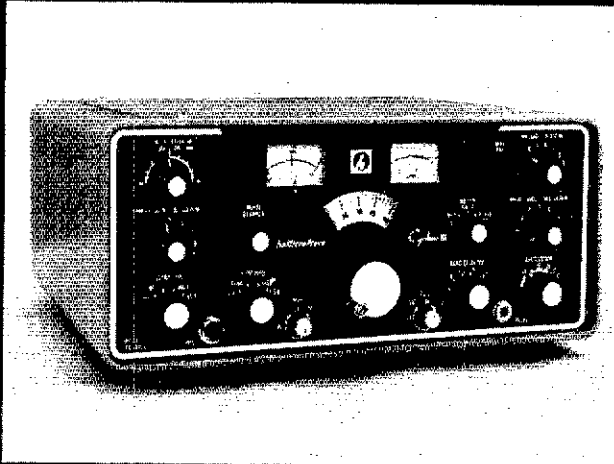
Name \_\_\_\_\_

Address \_\_\_\_\_

Call \_\_\_\_\_ City \_\_\_\_\_

State \_\_\_\_\_ Zip \_\_\_\_\_

# HALLICRAFTERS' NEW SR-400A HAS INCREASED POWER TO 550 WATTS P.E.P. WITH IMPROVED RELIABILITY FOR CONTINUOUS DUTY OPERATION.



The incomparable new CYCLONE III features:

**A.** Increased SSB input and output power with Hallicrafters' engineered exclusive Power Amplifier tube balancing adjustment. It provides matching and peaking of tube gain for continuous, maximum power output.

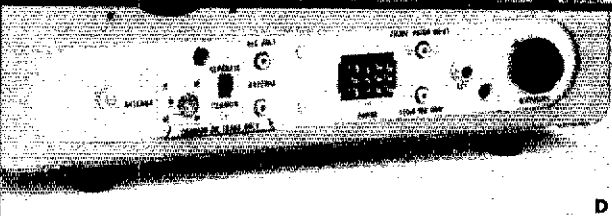
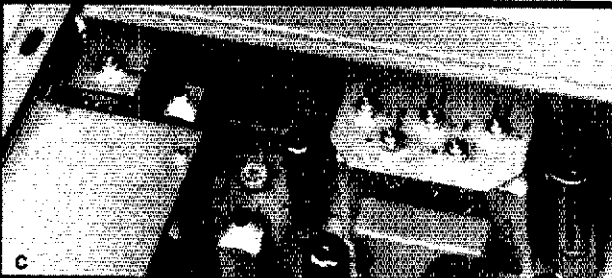
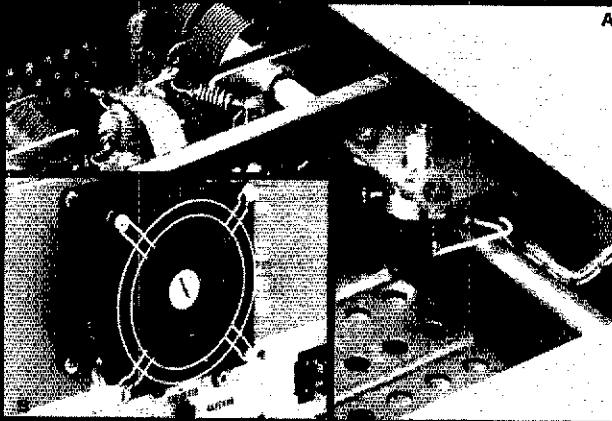
**B.** Improved reliability through optional HA-60 heavy duty, high efficiency cooling fan (6.4 CFM rated) for Power Amplifier. Permits continuous duty operation in either SSB or CW modes at high power levels with greater reliability.

**C.** Easily accessible internal adjustment panels include AGC attack, Carrier balance, (3) VOX controls, S-Meter adjust and CW side tone volume for interface with various types of microphones, tube aging and general performance adjustments.

**D.** Rear panel input/output terminals and connectors for phone patch, accessories, power supply, antenna plus provision for common or separate receiving and transmit antennas, or linear amplifier operation.

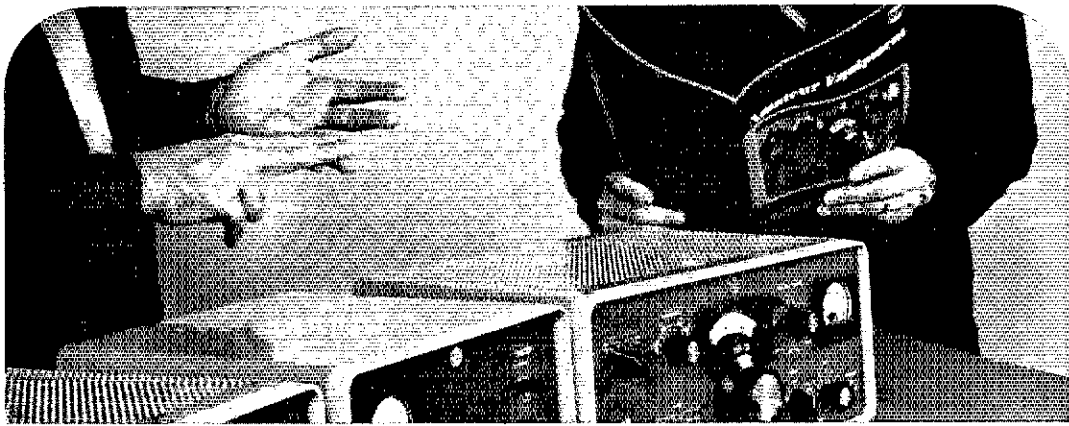
Of course, the new Hallicrafters SR-400A also has semi break-in CW, RIT, AALC, VOX, USB/LSB, < 1 KHz readout, noise blanker plus many more exclusive features.

Ask for it at your local Hallicrafters' distributor.



**hallicrafters**

600 Hicks Road  
Rolling Meadows, Illinois 60008  
A Subsidiary of Northrup Corporation.



## talk with an expert

He will help you plan your amateur station . . . give you detailed information on products and services . . . and assure you of complete satisfaction.

Talk with an expert . . . your Collins distributor.

### ALABAMA

Birmingham—Ack Radio Supply Co.

### CALIFORNIA

Anaheim—Henry Radio Company, Inc.  
 Burlingame—Ham Radio Outlet  
 Fresno—Dymond Electronics  
 Los Angeles—Henry Radio Company, Inc.  
 San Diego—Western Radio  
 San Jose—Quement Electronics

### COLORADO

Denver—Burstein-Applebee Co. of Colorado

### CONNECTICUT

Hartford—Harty Electronics

### FLORIDA

Miami—Amateur Radio Center, Inc.  
 Pensacola—Grice Electronics, Inc.

### GEORGIA

Atlanta—Ack Radio Supply Co.  
 Atlanta—Specialty Distributing Co., Inc.

### HAWAII

Honolulu—Honolulu Electronics

### ILLINOIS

Peoria—Klaus Radio & Electric Co.

### INDIANA

Indianapolis—Graham Electronics Supply, Inc.

### IOWA

Council Bluffs—World Radio Laboratories

### KANSAS

Overland Park—Associated Radio  
 Communications, Inc.

### LOUISIANA

Metairie—Thomas J. Morgavi Electronics

### MARYLAND

Wheaton—Electronics International Service  
 Corp.

### MASSACHUSETTS

Reading—Graham Radio, Inc.

### MICHIGAN

Ann Arbor—Purchase Radio Supply  
 Clawson—Radio Supply & Engineering  
 Co., Inc.  
 Muskegon—Electronics Distributors, Inc.

### MINNESOTA

Minneapolis—Electronic Center, Inc.

### MISSOURI

Butler—Henry Radio Company, Inc.  
 Kansas City—Burstein-Applebee Company  
 St. Louis—Ham Radio Center

### NEW HAMPSHIRE

Concord—Evans Radio, Inc.

### NEW YORK

Amsterdam—Adirondack Radio Supply, Inc.  
 Farmingdale—Harrison Radio Corporation  
 Jamaica—Harrison Radio Corporation  
 New York—Harrison Radio Corporation  
 New York—Harvey Radio Company, Inc.

### NORTH CAROLINA

Asheville—Freck Radio & Supply Co., Inc.

### OHIO

Cleveland—Farr Electronics Co.  
 Dayton—Srepco Electronics

### OREGON

Portland—Portland Radio Supply Co.

### PENNSYLVANIA

Drexel Hill—Kass Electronic Distributors  
 Pittsburgh—Cameradio Company

### SOUTH DAKOTA

Watertown—Stan Burghardt

### TEXAS

Abilene—Howard Radio  
 Corpus Christi—Douglas Electronics  
 Dallas—Electronic Center, Inc.  
 El Paso—McNicol, Inc.  
 Houston—Madison Electronics Supply

### WASHINGTON

Spokane—HCJ Electronics  
 Tacoma—C & G Electronic Company

### WISCONSIN

Milwaukee—Amateur Electronic Supply



**STAFF**

JOHN HUNTOON, W1RW  
*Editor*  
E. LAIRD CAMPBELL, W1CUT  
*Managing Editor*  
DOUG DE MAW, W1CER  
*Technical Editor*  
GERALD L. HALL, K1PLP  
DOUGLAS A. BLAKESLEE, W1KLF  
ROBERT M. MYERS, W1FBY  
*Assistant Technical Editors*  
EDWARD P. TILTON, W1HDO  
*V.H.F. Editor*

LEWIS G. McCOY, W1ICP  
*Beginner and Novice*  
THOMAS McMULLEN, W1SL  
WALTER WOOTEN, W1NTH  
*Editorial Assistants*  
ROD NEWKIRK, W9BRD  
WILLIAM SMITH, K8CER  
LOUISE MOREAU, W8BBO  
JOHN TROSTER, W6ISQ  
*Contributing Editors*

MARK W. DANE, W1FJX  
*Advertising Manager*  
EDGAR D. COLLINS  
*Advertising Assistant*

I. A. MOSKEY, W1JMY  
*Circulation Manager*  
JOHN H. NELSON, W4DRE  
*Assistant Circulation Manager*

**OFFICES**

225 Main Street  
Newington, Connecticut 06111  
Tel.: 203-666-1841

Subscription rate \$7.50 per year post-paid, U.S. funds, in Canada and U.S.; \$8 elsewhere. ARRL Membership, including QST, available only to individuals with a bona fide interest in amateur radio: \$5.50 per year, U.S. funds, in Canada and U.S.; \$7 elsewhere. Single copies, 75 cents. Foreign remittances should be by international postal or express money order or bank draft negotiable in the U.S. and for an equivalent amount in U.S. funds.

Second-class postage paid at Hartford, Conn. and at additional mailing offices. Copyright 1971 by the American Radio Relay League, Inc. Title registered at U.S. Patent Office. International copyright secured. All rights reserved. *Quedan reservados todos los derechos.* Printed in U.S.A.

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

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



**OUR COVER**  
K1PLP tunes the matching network of an experimental antenna with the Macro-matcher, a simple bridge for measurement of complex rf impedances. See details on page 14.

**QST**

**JANUARY 1972**

VOLUME LVI NUMBER 1

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

**-CONTENTS-**

**TECHNICAL -**

An Easy Road to 220 MHz . . . . . Thomas McMullen, W1SL 11  
The Macromatcher . . . . . Jerry Hall, K1PLP, and John Kaufmann, WA1CQW/1 14  
The Simulmonitor - A New Approach to Repeater Inputs . . . . . Gil Kowols, W9BUB 21  
A 144-MHz Amplifier Using the 8874 . . . . . Raymond F. Rinaudo, W6ZO 24  
Gimmicks and Gadgets:  
A Crystal Filter for the Drake R-4 . . . . . David Sumner, K1ZND 30  
A Helically Wound Vertical Antenna for the 75-Meter Band . . . . . Gary L. Ellingson, WA0WHE 32  
Simple Approach to Circuit Boards . . . . . R. L. Morgenstern, WA2EAW 34  
The Modern Teleprinter Local Loop . . . . . Frank Merritt, VE7AFJ 40  
Transistors and ICs in a Phase-Locked Local Oscillator . . . . . Kenneth W. Robbins, W1KNI 43  
A Simple Sweep Generator for FM Receiver Alignment . . . . . Arthur F. Furr, WA6JLJ 48  
A "Universal" HF Receiving Converter . . . . . Douglas A. Blakeslee, W1KLK, and Peter Zilliox, WA3EQK/1 51  
Technical Correspondence . . . . . 56  
Recent Equipment:  
Dycom PSU-13 VHF Scaler . . . . . 58  
The Heath HW-101 SSB Transceiver . . . . . 59

**BEGINNER AND NOVICE -**

Why A Beam Antenna? . . . . . Lewis G. McCoy, W1ICP 36

**OPERATING -**

Annual ARRL Novice Roundup Announcement . . . . . 69  
A Daytime Supplement for NTS? . . . . . 71  
Section Emergency Coordinators of the Amateur Radio Emergency Corps . . . . . 78  
1972 ARRL Simulated Emergency Test Announcement . . . . . 79

**GENERAL -**

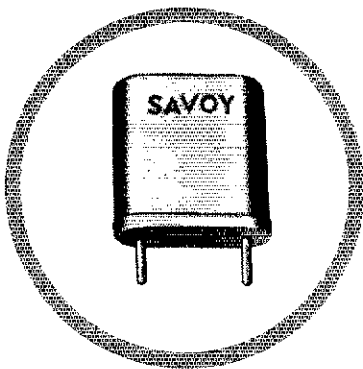
What You Always Wanted to Know About SSTV . . . . . Eugene H. Hastings, W1VRK 61  
Need An Audio Filter? Use Your Head! . . . . . Melville M. Zemek, W5IK 66  
The Eyes Have It . . . . . Lew Fitch, W4VRV 68  
Amsat Aircraft Test. . . . . 70

ARPS . . . . . 71  
ARRL Museum . . . . . 33  
ARRL QSL Bureau . . . . . 76  
Coming Conventions . . . . . 81  
Correspondence . . . . . 88  
Feedback . . . . . 57,103  
Hamfest Calendar . . . . . 81  
Happenings of the Month . . . . . 82  
Hints & Kinks . . . . . 54  
How's DX? . . . . . 90  
Index of Advertisers . . . . . 158  
"It Seems to Us . . ." . . . . . 9  
League Lines . . . . . 10  
New Apparatus . . . . . 50  
Operating Events . . . . . 108  
Operating News . . . . . 104  
Silent Keys . . . . . 103  
Station Activities . . . . . 109  
World Above 50 Mc. . . . . 96  
YL News & Views . . . . . 101  
W1AW Schedule . . . . . 106  
25 and 50 Years Ago in QST . . . . . 20

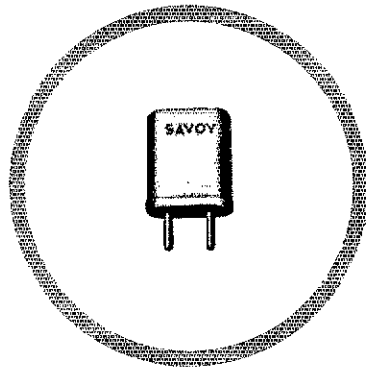
# Savoy

## High Accuracy Crystals

For over 30 years



TYPE 900 A



TYPE 901

Either Type

RECEIVER — \$3.95

TRANSMITTER — \$4.95

Post paid in U.S.

Specify crystal type, make and model of set, and desired frequency.

For amateur FM, fixed, mobile, and repeater use on 144 Mhz band.

Regency, Varitronics, Standard, Drake, Gladding, Tempo, Swan, and most others.

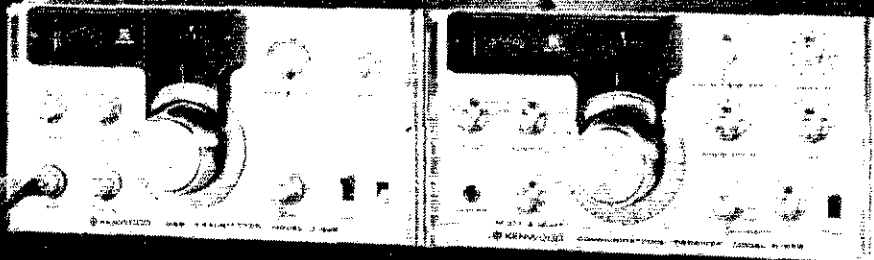


**Savoy Electronics, Inc.**

P.O. Box 7127 - Fort Lauderdale, Florida - 33304

Tel: 305-586-8416 or 305-947-1191

a winning pair...the  
**"Kenwood  
 twins"**



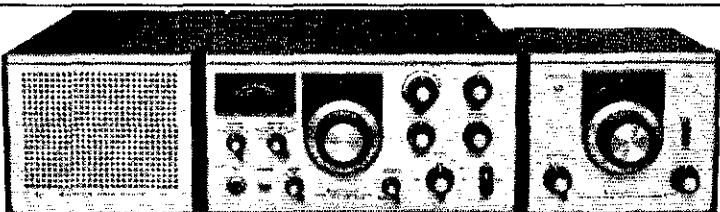
THE MOST EXCITING RECEIVER AND TRANSMITTER TO ENTER THE AMATEUR SCENE IN RECENT YEARS. THE KENWOOD R-599 SOLID STATE RECEIVER AND T-599 HYBRID TRANSMITTER HAVE ESTABLISHED NEW STANDARDS OF PERFORMANCE, RELIABILITY, FLEXIBILITY, STYLING AND VALUE.

**THE R-599 RECEIVER:** .5 microvolt sensitivity (amateur bands 1.8-21.0 MHz) • Dial readout to 1/2 kilocycle • Special detectors for SSB, AM, and FM • Transceive operation with T-599 • Built-in 100 kc and 25 kc crystal calibrator • Built-in 500 cycle CW filter • Provision for two meter and six meter coverage with optional accessory self-contained converters • Advanced "Space-Age" styling • Adjustable threshold squelch • The price... only \$329.00\*

**THE T-599 TRANSMITTER:** Clear, stable, selectable side-band, AM and CW • 4-way VFO Flexibility plus Receiver Incremental Tuning (RIT) when used with the R-599 • Amplified ALC • Built-in VOX • Full metering, including cathode current, plate voltage, ALC and relative Power Output • Built-in CW Sidetone monitor and semi-automatic break-in CW • Built-in power supply • Maximum TVI protection • Employs only 3 vacuum tubes • The price... only \$365.00\*

THE KENWOOD  
**TS-511S**  
 TRANSCEIVER

The Kenwood TS-511S is a five band SSB and CW transceiver packed with power and performance... offering features never before available in its price range. For example: built-in VOX, crystal calibrator, noise blanker, receiver incremental tuning, 1 kHz frequency readout, 8 pole filter, stable FET VFO, dual conversion and accessory CW filter.



**FREQUENCY RANGE:** 10, 15, 20, 40 & 80 meters (Amateur Bands)  
 **MODES:** LSB, USB, CW   
**INPUT POWER:** 500 watts PEP, 300 watts CW nominal.   
**SENSITIVITY:** 3.5-21.6 mHz band; 0.5 uv S/N 10 db 28.0-29.7 mHz band; 1.5 uv S/N 10 db and less than 100 cps frequency drift per 30 minutes after warm-up   
**SELECTIVITY:** SSB more than 2.4

KC (at 6 db) with 2 to 1 slope ratio CW more than 0.5 KC (at 6 db)   
**A.F. OUTPUT:** more than 1 watt (10% distortion)  **TUBE & SOLID STATE COMPONENTS:** 10 Tubes, 1 IC, 37 Transistors, 4 FET, 52 Diodes  **PRICE:** \$398.00\*  
**ACCESSORIES:** Power Supply with built-in speaker \$105.00\* External VFO \$99.00\* CW Filter \$35.00\*

\*Prices subject to import surcharge

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

**Henry Radio**

Section Communications Managers of the ARRL

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

ATLANTIC DIVISION

Delaware	W3DXK	Roger E. Cole	345 E. Roosevelt Ave.	New Castle 19720
Eastern Pennsylvania	W3JHK	George S. Van Dyke, Jr.	4607 Convent Lane	Philadelphia 19114
Maryland-D.C.	W3JFA	Carl R. Medrow	R1111	Drydenville, MD 21045
Southern New Jersey	W3YFZ	Charles L. Travers	State Police Drive	Trenton 08625
Western New York	E2KTK	Richard M. Hitzman	407 Woodland Rd.	Syracuse 13219
Western Pennsylvania	W3NEM	Robert L. Lowylo	1463 N. Allen St.	State College 16801

CENTRAL DIVISION

Illinois	W9PRN	Edmond A. Metzger	1520 South 4th St.	Springfield 62705
Indiana	W9RUD	William C. Johnson	2838 Haljude Ave.	Indianapolis 46718
Wisconsin	W9QRK	S. M. Pinkony	R. 4, Box 174	11 Atkinson 53535

DAKOTA DIVISION

Minnesota	K0MYI	John H. Halstead	1315 North Cleveland Ave.	St. Paul 55108
North Dakota	W0DDM	Harold L. Sheels	21 E. 14th Ave.	Grand Forks 58201
South Dakota	W0CQX	Ed Gray	2402 Hoeler Ave.	Rapid City 57701

DELTA DIVISION

Arkansas	W4EVWH	Jimmie N. Lowrey	2818 N. Albert Pike	Fort Smith 72901
Louisiana	W5PM	J. Allen Swanson, Jr.	R1D 1, Box 399	Covington 70433
Mississippi	W5NCR	Walker J. Cottry	R1D No. 2	Oxford 38655
Tennessee	W44GLS	O. D. Keaton	Mc. L. Mcdeans Dr.	Old Hickory 37138

GREAT LAKES DIVISION

Kentucky	W4CDB	Ed H. Huddle	604 Amanda Furnace Dr.	Ashland 41101
Michigan	W8781	Isvry J. Glinghouse	1227 Ross Dr.	Niles 49120
Ohio	W8FTU	Richard A. Eggert	6479 Red Fox Road	Reynoldsburg 43068

HUDSON DIVISION

Eastern New York	K2SN	Grath G. Berry	50 Parrot Ave.	New Rochelle 10801
N.Y.C. & Long Island	E21DG1	Edward J. Bruner	22 Jay Drive	Jericho, L.I. 11753
Northern New Jersey	W277	Louis K. Amoroso	180 Pleasant Ave.	Bergenfield 07621

MIDWEST DIVISION

Iowa	K0YVD	Al Culbert	P.O. Box 306	Charles City 50616
Kansas	K0BBI	Robert M. Summers	3045 North 72nd	Kansas City 66109
Missouri	K0BBV	Robert J. Previer	Route 4	Kirkville 63501
Nebraska	K00AL	S. A. Clisbon	144 Pine St., Box 488	Chadron 69417

NEW ENGLAND DIVISION

Connecticut	W1GVT	John J. McNasso	218 Berlin Ave.	Southington 06489
Eastern Massachusetts	W1ALP	Frank C. Baker, Jr.	85 Soder Ave.	Hartford 02165
Maine	W1LEV	Peter J. Sterling	49 Latham St.	Portland 04106
New Hampshire	W1BWT	Edward Mitchell	Box 147-A	Chester 03036
Rhode Island	K1AAV	John E. Johnson	39 Fruit St.	Pawtucket 02860
Vermont	W1VSA	*Harry A. Preston	R1D 1	Charlotte 05445
Western Massachusetts	W1BYR	Percy C. Noble	P.O. Box 5	Lanesboro 01737

NORTHWESTERN DIVISION

Alaska	KL7EVO	Emmett R. Klepl	265 Steele Cr. Rd.	Jarvis 99701
Idaho	W4ZMN	Donald A. Crisp	1508 Alder Drive	Lewiston 83501
Montana	W7RZY	Harry A. Roviance	P.O. Box 621	Harlowton 59036
Oregon	K7WVK	Dale T. Justice	1369 N. E. Spruce Lane	Hillsboro 97124
Washington	W7PT	Arthur Henning	4816 N. E. 60th St.	Seattle 98115

PACIFIC DIVISION

East Bay	W6DHH	Paul J. Parker	2246 White Park Ave.	Walnut Creek 94594
Hawaii	H6BZB	Lee R. Wical	48-001 Lulu Rd.	Kaunoe 96744
Nevada	W7PKV	Leonard M. Norman	652 Utah St.	Boulder City 89005
San Joaquin Valley	W6KYA	John E. Minke, III	6230 Rio Bonito Drive	Colmaicheal 94608
San Francisco	K6SRM	Kenneth S. McTaggart	484-4th St., E.	Sausalito 94967
San Joaquin Valley	W6PH	Ralph Soryan	6204 E. Townsend Ave.	Fresno 93702
Santa Clara Valley	W6VZT	Albert E. Costano	115 Adobe Rd.	Los Gatos 95030

ROANOKE DIVISION

North Carolina	W4WXZ	Charles H. Bridges	4907 Tiffany Ave.	Winston-Salem 27104
South Carolina	W44EP	Mrs. Elizabeth Y. Miller	1508 Highland Ave.	Canden 29020
Virginia	K4GR	Robert J. Slagle	3515 - 25th St., N.	Arlington 22207
West Virginia	W4IM	Donald B. Morris	1136 Morningstar Lane	Fairmont 26554

ROCKY MOUNTAIN DIVISION

Colorado	W7BHQ	Clyde G. Penny	1626 Locust St.	Denver 80220
New Mexico	W7SND	James R. Prine, D.V.M.	Box 1128	Los Alamos 87544
Utah	K7SCL	Carroll F. Sager	4422 Emigration Canyon	Salt Lake City 84108
Wyoming	W7CQL	Wayne M. Moore	147 South Montana Ave.	Casper 82601

SOUTHEASTERN DIVISION

Alabama	W84EK	James A. Brashear, Jr.	3602 Roswell Drive	Huntsville 35811
Atlantic Zone	K45VZ	James L. McMillen	P.O. Box 1849	Halifax
Eastern Florida	W8JLE	Regis B. Kramer	195 N. E. 76th St.	Miami 33138
Georgia	W3WQD	J. J. Garrison	2524 Blueberry Dr.	Austonia 30906
West Indies	K41CQ	Jose Medina-Hernandez	Box 1480	Aguaygua, P.R. 00709
Western Florida	W4RKH	Frank M. Butler, Jr.	525 Elliott Rd., S.E.	Fort Walton Beach 32545

SOUTHWESTERN DIVISION

Arizona	W7CAF	Gary M. Hamman	28144 Campbell Ave.	Phoenix 85016
Los Angeles	W6INH	Suzene H. Vindno	2839 Canada Blvd	Glendale 91208
Orange	W6MNY	Jerry L. Verluff	6372 Uymal St.	Yorba Linda 92686
San Diego	W6SR8	Paul C. Thompson	7331 Hamlet Ave.	San Diego 92120
Santa Barbara	W6DEI	D. Paul Gagnon	1914 Canby Way	Orland 93030

WEST GULF DIVISION

Northern Texas	W5LR	L. E. Harrison	1314 Holly Glen Drive	Dallas 75232
Oklahoma	W5PML	Cedric C. Cash	1802 Smith Ave.	Lawton 73501
Southern Texas	K84ZR	L. Lee Olney	4216 Dyart Drive	San Antonio 78220

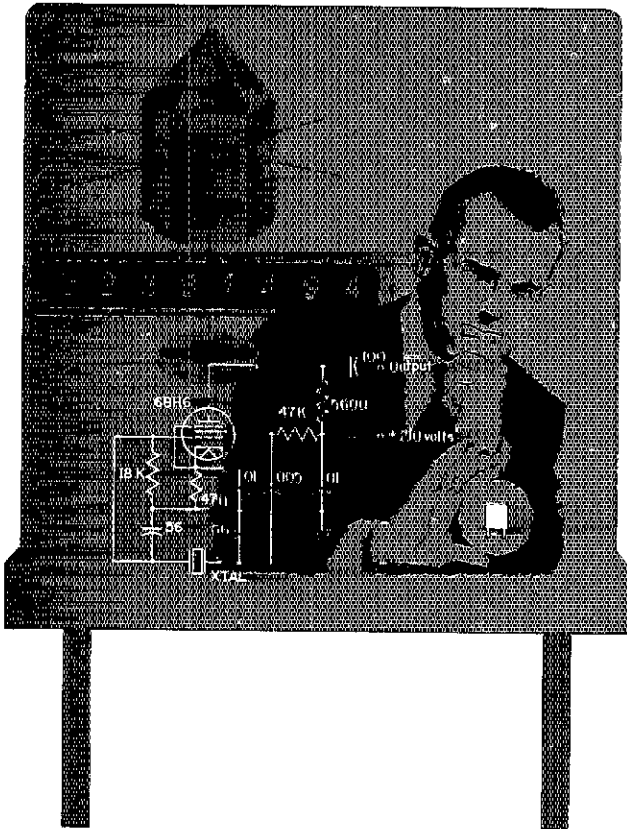
CANADIAN DIVISION

Alberta	VE6LK	Dun Sutherland	444-25th Ave., N.E.	Calgary, Alta.
British Columbia	VE7FB	H. E. Savage	4554 West 13th Ave.	Vancouver B.C.
Manitoba	V14FQ	Steven Fink	14 Grandcrest St.	Winnipeg 17, Manitoba
Maritime	V1AMR	Walter G. Jones	79 Waterley Ave.	Moncton, N.B.
Ontario	VE3DV	Holland H. Shepherd	3016 Cossava Cres.	Ottawa K1V 8L1
Quebec	VE2ALE	Joseph Unsworth	164 Mgr. Bourget	Vaudreuil, P.Q.
Saskatchewan	V18BO	Barry Ogden	2543 MacDonald Ave.	Prince Albert

\* Official appointed to act temporarily in the absence of a regular official



# There Is a Difference In Quartz Crystals



Space age communication equipment demands a crystal that meets all standards of technical advancement. Crystals that were acceptable some years ago do not meet present day specifications. As a general rule, your crystal must be selected from the best quartz . . . (no throw off cuts). Tight tolerances demand selected angles of cut. The x-ray is important in making this selection. The crystal should be preaged with stress cycling. It should be checked for frequency change vs temperature change. It must be checked for optimum spurious response. It should be calibrated to frequency with the correct oscillator. International Crystals are manufactured to meet today's high accuracy requirements. That's why **we guarantee all International crystals** against defective materials and workmanship for an unlimited time when used in equipment for which they were specifically made.

WRITE FOR CATALOG



**CRYSTAL MFG. CO., INC.**  
10 NORTH LEE  
OKLAHOMA CITY, OKLA. 73102

# 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.



## Past Presidents

HIRAM PERCY MAXIM, W1AW, 1914-1936  
EUGENE C. WOODRUFF, W8CMP, 1936-1940  
GEORGE W. BAILEY, W2KH, 1940-1952  
GOODWIN L. DOSLAND, W8TSM, 1952-1962  
HERBERT HOOVER, JR. W6ZH, 1962-1966

## Officers

President . . . . . ROBERT W. DENNISTON,\* W0DX  
First Vice-President . . . . . CHARLES G. COMPTON,\* W0BUO  
Vice-Presidents . . . . . ROEMER O. BEST, W5QKF  
CARL L. SMITH, W0BWJ  
Secretary . . . . . JOHN HUNTOON, W1RW  
Treasurer . . . . . DAVID H. HOUGHTON  
Honorary Vice-Presidents . . . . . WAYLAND M. GROVES, W5NW  
FRANCIS E. HANDY, W1BDI  
General Manager . . . . . JOHN HUNTOON,\* W1RW  
Communications Manager . . . . . GEORGE HART, W1NJM  
Technical Consultant . . . . . GEORGE GRAMMER, W1DF  
Assistant General Manager . . . . . RICHARD L. BALDWIN, W1RU  
Assistant Secretaries . . . . . PERRY F. WILLIAMS, W1UED  
WM. I. DUNKERLEY, JR, W4ZINB  
MORGAN W. GODWIN, W4WFL  
225 Main St., Newington, Connecticut 06111

General Counsel . . . . . ROBERT M. BOOTH, JR., W3PS  
1150 Connecticut Avenue, N. W., Washington, D. C. 20036  
Associate Counsel . . . . . ARTHUR K. MEEN, Q.C., VE3RX  
Suite 2210 44 King St. West Toronto, Ontario

## DIRECTORS

Canada  
NOEL E. LATON\* VE3CJ  
Box 860, Waterdown, Ontario  
Vice-Director: A. George Spencez VE2MS  
171 Kipling Ave., Beaconsfield, Quebec  
Atlantic Division  
HARRY A. MCCONAGHY W4SW  
8708 Fenway Dr., Bethesda, MD 20034  
Vice-Director: Jesse Bieberman W3KT  
RD 1, Box 66, Valley Hill Rd., Malvern, PA 19355  
Central Division  
PHILIP E. HALLER W9HPG  
6000 S. Tripp Ave., Chicago, IL 60629  
Vice-Director: Edmond A. Metzger W9FRN  
1520 South Fourth St., Springfield, IL 62703  
Dakota Division  
LARRY J. SHIMA W0PAN  
11417 Goodrich Rd.S., Bloomington, MN 55431  
Vice-Director: Edward C. Gray WA0CFX  
2402 Hoefler Avenue, Rapid City, SD 57701  
Delta Division  
MAX ARNOLD W4WHN  
612 Hogan Rd., Nashville, TN 37220  
Vice-Director: Franklin Cassen W4WBK  
925 N. Trezevant St., Memphis, TN 38108  
Great Lakes Division  
ALBAN A. MICHEL W8WC  
359 Bonham Rd., Cincinnati, OH 45215  
Vice-Director: Richard A. Egbert W8ETU  
6479 Red Fox Rd., Reynoldsburg, OH 43068  
Hudson Division  
HARRY J. DANNALS\* W2TUK  
16 Arbor Lane, Dix Hills, NY 11746  
Vice-Director: Stan Zak K2SJO  
13 Jennifer Lane, Port Chester, NY 10573  
Midwest Division  
RALPH V. ANDERSON K9NL  
528 Montana Ave., Holton, KS 66436  
Vice-Director: Paul Grauer WA0LLC  
Box 190, Wilson, KS 67490  
New England Division  
ROBERT YORK CHAPMAN W1QV  
28 South Road, Groton, CT 06340  
Vice-Director: Roger F. Corey W1AX  
60 Warwick Drive, Westwood, MA 02090  
Northwestern Division  
ROBERT B. THURSTON\* W7PGY  
1700 31st Ave., N.E., Seattle, WA 98115  
Vice-Director: David O. Bennett W7QLE  
Box 455, St. Helens, OR 97081  
Pacific Division  
I. A. "DOC" GMELIN W6ZRJ  
10825 Willowbrook Way, Cupertino, CA 95014  
Vice-Director: Albert F. Gastano W6VZT  
115 Old Adobe Road, Los Gatos, CA 95030  
Roanoke Division  
VICTOR C. CLARK\* W4KFC  
12927 Popes Head Road, Clifton, VA 22024  
Vice-Director: L. Phil Wucker W4ACY  
4821 Hill Top Road, Greensboro, NC 27407  
Rocky Mountain Division  
CHARLES M. COTTERELL W0SN  
130 S. Swadley St., Lakewood, CO 80228  
Vice-Director: Allen C. Aulen W0ECN  
2575 South Dakota St., Denver, CO 80222  
Southeastern Division  
H. DALE STRIETER W4DQS  
928 Trinidad, Cocoa Beach, FL 32931  
Vice-Director: Larry E. Price W4DQD  
P.O. Box 2067, Georgia Southern Branch  
Statesboro, GA 30458  
Southwestern Division  
JOHN R. GRIGGS W5KFW  
1272 13th St., Baywood Park, San Luis Obispo  
CA 93401  
Vice-Director: Arnold Dahلمان W6UEI  
14840 Hartland St., Van Nuys, CA 91405  
West Gulf Division  
ROY L. ALBRIGHT W5EYB  
107 Rosemary, San Antonio, TX 78209  
Vice-Director: Leon Vice W5VCE/W5BOC  
2822½ Campbell, Houston, TX 77055  
\* Member Executive Committee

# "It Seems to Us..."



## 1971 IN RETROSPECT

*Let the scroll fill as it may as years unroll —*  
Edward Everett Hale

THE UNROLLING YEAR 1971 filled its amateur radio scroll with many things: a world space conference in Geneva; proposals for expansion of the U.S. phone bands; a close reexamination of amateurs' traditional public service work; amateur communications after the California earthquakes; and a host of less-important but still-interesting events.

The World Administrative Radio Conference on Space Telecommunications was held in Geneva from June 7 through July 17 by the International Telecommunication Union, the United Nations specialized organization dealing with communications. The Amateur-Satellite Service was defined in the regulations for the first time: "A radio-communication service using space stations on earth satellites for the same purposes as those of the amateur service." More importantly, this Amateur-Satellite Service was authorized to operate on 7.0-7.1, 14.0-14.25, 21.0-21.45, 28.0-29.7, 144.0-146.0 MHz, and 24.0-24.05 GHz. In addition, it may share usage of 435-438 MHz, on a non-interference basis. The IARU was represented by an observer team from all three regions: WØDX, PAØDD, VE3CJ, ZL2AZ, W1RW, W1RU, and K3JTE. In addition, about 30 amateurs were on official governmental delegations from about 20 countries. Also on the ITU front, educated guesses now are that there may be a general World Administrative Radio Conference to deal with basic allocation problems probably in 1977 or 1978. As one of many preparations against that day, ARRL and AMSAT are participating actively in the International Radio Consultative Committee (CCIR), a study arm of ITU.

On the home front, biggest news was a Notice of Proposed Rulemaking from the Federal Communications Commission (Docket 19162) looking toward expansion of the U.S. amateur suballocations for radio-telephone. After long debate and considerable compromise, the ARRL Board of Directors voted to support phone expansion but with a somewhat different frequency mix than that proposed by FCC. On another matter, no compromises were necessary: the EIA proposal for establishment of a new Class E citizens radio service in the amateur band at 220-222 MHz (RM-1747) met nearly universal opposition from amateurs. Reac-

tion was mixed to a study by FCC, Docket 19245 (also called "The Eyebank Matter"), into amateur handling of messages for non-amateur groups. A majority of amateurs favored the fewest possible restraints on amateur traffic but a substantial minority agreed with FCC that there should be some limitations. The League's filing marshalled historic evidence in favor of the least possible regulation — and in any case, established the original meaning of the disputed language of Section 97.39, "Nor for its use."

Elsewhere on the regulatory front, decisions from FCC were awaited in Docket 18803, repeater rules (again, the ARRL position calls for the lowest possible amount of regulation); Docket 19110, the proposal to permit RTTY speeds of 60, 75, and 100 wpm; Docket 19163, which would lower the experience requirement for Extra Class to one year and give code credit toward Extra for holders of the former Extra First; and Docket 19183, FCC's study of TVI, etc. Still awaiting docket status were ARRL requests for expanded Technician privileges, RM-1535; "counterpart call signs" (e.g., W6ABC moves to Chicago; gets W9ABC), RM-1536; and call signs of the form W3DEF or K4GHI for Extra-Class amateurs not entitled to "two-letter" calls, RM-1597.

Action was completed on expansion of privileges in the 160-meter band, particularly for the western portions of the U.S. and Canada. The time for returning mail exams to FCC has been standardized at 30 days. Canadian rules for reciprocal licensing were eased, as were the trial rules for repeaters. Public Law 92-81, which opens up U.S. amateur licensing to future citizens (resident immigrants who have filed a "declaration of intention"), was signed by President Nixon in August; two months later, the first two licensees were on the air as a result. Less happily, the League petition for reconsideration and hearing in Docket 18802 (fee increases), was denied, leaving us stuck with fees of \$9 for new, renewed, modified-and-renewed, or upgraded licenses; \$6 for duplicates; \$4 for straight modification; and \$25 for those special call signs outlined in Section 97.51. (Actually, broadcasters were far worse off, despite their popular reputation as efficient lobbyists — some stations now

*(Continued on page 80)*

## League Lines . . .

"If at first you don't succeed . . ." worked again: the Canadian Department of Communications finally agreed to repeated requests and has now dropped the age restriction for amateurs. Previously, an applicant had to be at least 15 years old; now any age can apply.

Keep Hq. posted on your new ham recruitment activities so we can pass on success stories to others, through QST or the affiliated club bulletin. Good "bait" for the prospect with latent interest is the 1972 "Communications Handbook" now on newsstands and in radio stores (our p.r. man did the section on amateur radio).

By the way, Bill Welsh, W6DDB, who has probably taught more beginner classes in ham radio than anyone, says the 1968 deletion of Novice voice operating privileges has had a beneficial effect -- a higher percentage of his Novices now succeed in advancing to higher grades.

A vice-president of one of the major equipment firms took us to task for reporting, as we did on this page of the October issue, that FCC figures showed CB not growing at all, but rather is declining in numbers. He claims we're blind to the facts, that "growth continues unabated, more of it illegally every day as a result of the preposterous \$20 license fee." Current FCC CB licensing figures show totals down some thousands even since June, so if there is indeed market growth, it must be largely unlicensed and illegal. Is this what EIA is proposing additional frequencies for?

The annual meeting of the ARRL Board of Directors is scheduled for January 20 this year. Lots of items actually or potentially on the agenda (numbers, where they appear, refer to 1971 minutes in July QST): election procedures (24), mobile WAS and DXCC awards (79), 10 instead of 13 wpm code test (84), dues increase, QST on newsstands (89), Technician privileges (44, 91), certified volunteer examiners (56), ARRL sponsorship of technical seminar conventions. Contact your director (address page 8) concerning these or any other matters on which you have specific views.

At K7LDZ's request we correct two errors on this page in November: there were 3, not 5, amateurs indicted for bilking the phone company in that Montana case; and as one of those indicted for fraud, he wants it known he is again a member of ARRL.

Films on electronic/radio theory and technology are always needed by clubs and school groups via the ARRL Training Aids Library. If you know of any current or recent film produced for educational or employee training purposes by an electronics corporation or other organization, let headquarters know so we can follow up and see if a print might be made available.

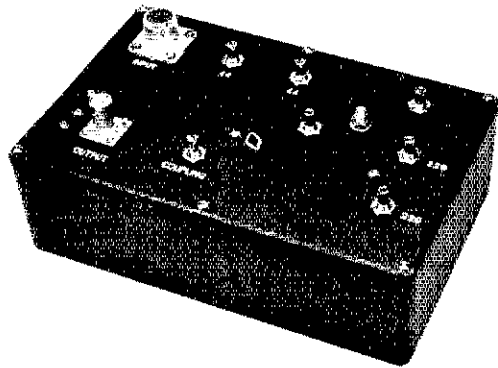
Composition of the three ARRL Advisory Committees for the coming year has now been announced by President WØDX. VHF Repeaters and DX personnel (see p. 86, September QST) are all reappointments, the former largely because FCC has still not acted on proposed rules, the latter because the committee is new and really now just getting under way. Contests: W3GRF (Chairman), W4UQ, KH6II, VE2NV, W6DQX, WØHP, plus newcomers K1ZND, W1BGD/2, K5TSR and WA9UCE.

In its monthly "Telecommunication Journal," the International Telecommunication Union has initiated a regular section covering amateur radio developments. This, plus fairly extensive coverage of worldwide radio activities, could make a subscription to the journal of interest to many amateurs. The price is 50 Swiss francs, (\$12.50 U.S. will do the job) and the address is simply 1211 Geneva 20.

# An Easy Road to 220 MHz

## A Varactor Quintupler

BY THOMAS McMULLEN,\* WISL



ANYONE WHO HAS listened to the fm channels on 2 meters lately will realize that there is a need for frequency expansion. Getting a repeater system going on the neglected 220-MHz band has been hampered by the lack of easily modified equipment, and a reluctance on the part of many amateurs to build a complete station from scratch. The equipment described here uses a varactor quintupler to put an fm signal on the 220-MHz band, with a small investment of time and money.

### *The Varactor Multiplier*

Varactors have been used as efficient sources of harmonic energy for some time. Many of us are familiar with their use as doublers, triplers, and quadruplers to get to some of the uhf bands.<sup>1,2</sup> By applying a driving frequency of 44 to 45 MHz to a quintupler it is possible to get 220-MHz output. Commercially manufactured equipment that does not require modification is available to furnish drive in that range.

In varactor-multiplier discussions, the terms *idler circuit* and *idler frequency* are mentioned often. Let's use an analogy to define the terms without getting too deeply involved in theory. When working with gears or pulleys, an idler is one that is not driven by the power source and does not deliver power directly to the load. It acts as a go-between to assist in the transfer of energy from the source to the load. An idler circuit in a varactor multiplier has a similar go-between function. When we apply drive to a varactor diode, it generates harmonics. By adding a circuit tuned to one of the harmonic frequencies, the amplitude of that harmonic can be increased. This circuit is called the idler circuit. The harmonic we have enhanced is called the idler frequency. By mixing the input

A cast-aluminum box, 4 1/2 X 7 1/2 X 2 1/4 inches, is used as a housing for the varactor quintupler. A standard aluminum chassis could be used as explained in the text. The two holes in the top cover are for access to coupling capacitors C2 and C7.

signal with the idler frequency we obtain an output frequency equal to the harmonic *plus* the drive frequency. The output signal obtained will be stronger than one produced by conventional harmonic generation alone. Fig. 1A shows that by applying an input of 44 MHz ( $f$ ), and tuning the idler circuit to 176 MHz (the fourth harmonic, or  $4f$ ), the mixing action will produce the resultant 220-MHz output ( $5f$ ). Since the energy in the idler circuit is derived from the action of the diode, the circuit is not directly driven from the source. The idler circuit does not furnish power to the load, therefore it is analogous to an idler pulley.

Useful harmonic output can also be obtained as the result of mixing the frequencies of two idler circuits, as in Fig. 1B. One idler is tuned to 88 MHz ( $2f$ ), and the other is tuned to 132 MHz ( $3f$ ). By adding these frequencies we obtain an output of 220 MHz. One advantage of using a design with two idler circuits is that both frequencies are much lower than the desired output frequency and therefore easier for the output circuit to reject.

### *Construction of a Practical Circuit*

A circuit for a varactor quintupler using two idlers is shown in Fig. 2. L1-C1 is parallel resonant at 44.8 MHz and L2-C2 is series resonant at the

\* Editorial Asst.

<sup>1</sup> DeMaw, "Varactor Diodes in Theory and Practice," *QST*, March, 1966.

<sup>2</sup> DeMaw, "Some Thoughts About 220-MHz Operation," *QST*, December, 1971.

Looking for a week-end project to get you started on 220 MHz? Move your fm transmissions out of the crowded 2-meter band to the open spaces on 220 MHz! Here is a 10-watt-output multiplier that does not require a filament or B-plus supply.

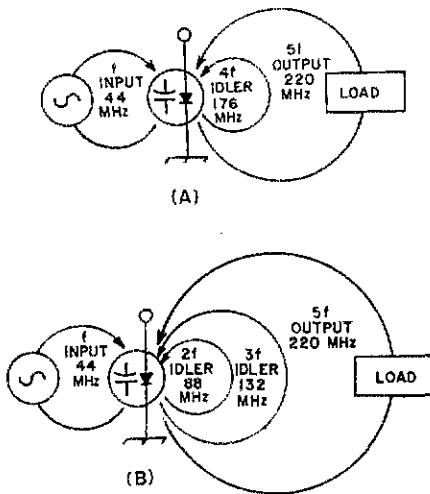


Fig. 1 — Signal paths in a varactor quintupler using (A) one-idler and (B) two-idler circuits.

same frequency. C2 can be adjusted to vary the coupling between the circuits. In addition to matching the varactor to the input line, these tuned circuits help prevent harmonic energy from appearing at the input. J1, L3-C4 is an idler circuit tuned to 89.6 MHz. L4-C5 is also an idler tuned to 134.4 MHz. The 224-MHz output circuit consists of series-resonant L5-C6 and parallel-resonant L6-C8. Coupling between the two can be adjusted by varying the setting of C7. L7 is the output coupling loop, and its reactance is tuned out by C9. L6 is a strip of .040-in.-thick aluminum, 7/8-in. wide and 7 3/4-in. long. It is bent as shown in Fig. 3. Soldering lugs and small screws are used to connect L6 to C8. Dimensions for L7 are also given in Fig. 3. Connect L7 between C9 and J2 and space L7 1/8 in. below L6.

The circuit is constructed on the top cover of a cast-aluminum box. This heavy metal is an excellent heat sink for the diode. A piece of sheet aluminum, cut to fit a standard chassis, can be used instead if an additional heat sink is placed over the varactor mounting stud. A U-shaped piece of sheet aluminum, 2 inches square, with sides one-inch high, is adequate. The top of the box will get warm, but not hot, after several minutes of operation.

The two idler coils are mounted at right angles to each other (and to L2 and L5) to minimize coupling. A sheet-aluminum partition, 1 3/4 inches high by 5 3/4 inches long, runs the length of the chassis to isolate the output strip-line inductor from the input network and idler circuits. The two coupling capacitors, C2 and C7, can be adjusted through holes in the cover.

All of the tuned circuits can be set to their approximate frequencies with the use of a grid-dip meter. C2 and C7 should be set to their minimum capacitances.

### Operation

Before applying drive, connect a 50-ohm load to the output. Some method of measuring both the output and the input power is needed. An SWR meter or reflected-power indicator will be ideal for this function. Apply 5 to 10 watts of drive and adjust C1, C2, and C3 for minimum reflected power as measured at J1. Tune C6, C7, C8, and C9 for maximum output, then peak the idler circuits,

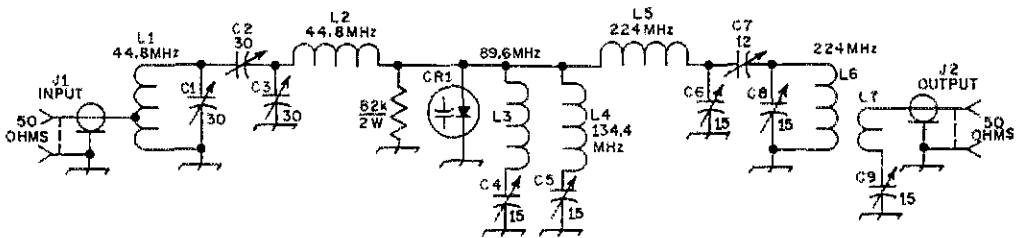


Fig. 2 — Schematic diagram of the varactor quintupler. Capacitance is in pF. Resistance is in ohms, k = 1000.

- C1, C3 — 30-pF miniature variable (Johnson 160-130 or Hammarlund MAC-30).†
- C2 — 30-pF trimmer (J. W. Miller 86MA1).
- C4, C5, C6, C8, C9 — 15-pF miniature variable (Johnson 160-107 or Hammarlund MAC-15).
- C7 — 3- to 12-pF ceramic trimmer (Erie 557-000A-3-12).

† Hammarlund capacitors are now being manufactured by Cardwell Condenser Corp., 80 E. Montauk Hwy., Lindenhurst, NY 11757.

- CR1 — Varactor diode (Amperex H4A/1N4885 or equiv.).
- L1 — 9 turns No. 18 enam. wire, 1/2-in. ID X 3/4 in. long.
- L2 — 13 turns No. 18 tinned wire, 1/2-in. ID X 7/8 in. long (B&W 3003).
- L3 — 9 1/2 turns No. 18 enam. wire, 3/8-in. ID X 1/2 in. long.
- L4 — 6 1/2 turns No. 16 tinned wire, 3/8-in. ID X 1/2 in. long.
- L5 — 4 turns No. 16 tinned wire, 1/2-in. ID X 1/2 in. long.
- L6 — Aluminum strip line, 7/8 in. wide X 7 3/4 in. long before bending (see text).
- L7 — No. 16 tinned wire, 4 3/8 in. long before bending (see text).

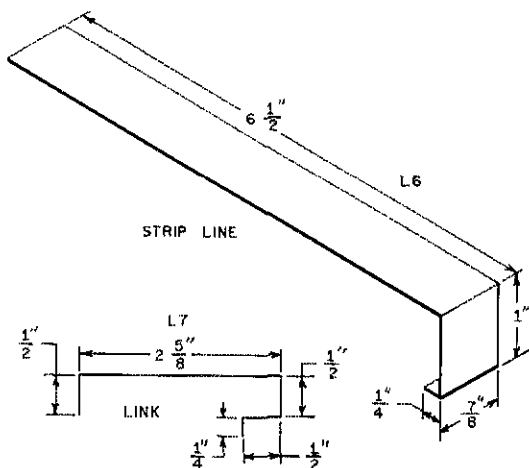
Fig. 3 — Dimensions for bending L6 and L7.

C4 and C5. Use a grid-dip meter or wavemeter to be sure that the output is at 220 MHz. Readjust the input circuits for minimum reflected power.

At this point you could fall into a trap that has caused some amateurs to have unkind thoughts about varactor multipliers. It is possible to repeak and readjust the circuits to get that last fraction of an increase in output power. Suddenly the output drops sharply, or even disappears completely! Then it is necessary to start all over with the tune-up procedure. What happens is this: As the circuits are adjusted for maximum output, more bias is developed across the diode. This additional bias changes the junction capacitance of the diode. Eventually a point is reached where the diode refuses to respond to the input signal and the junction capacitance reverts to its no-bias value. This is called the "Hysteresis effect" caused by dynamic detuning.<sup>3</sup> At this point the circuits are no longer resonant at the correct frequencies. After the initial tune-up has been done, check for stability by removing and applying drive several times. If the output returns to the same level each time, the tuning is correct.

Efficiency is approximately 50 percent. With 20 watts of drive, the output from this device (after filtering) is slightly more than 10 watts. This

<sup>3</sup> Kaylie, "The Design of Varactor Frequency Multipliers for Mobile Communications," available from Ampere Electronic Corporation, 230 Duffy Ave., Hicksville, NY 11802.

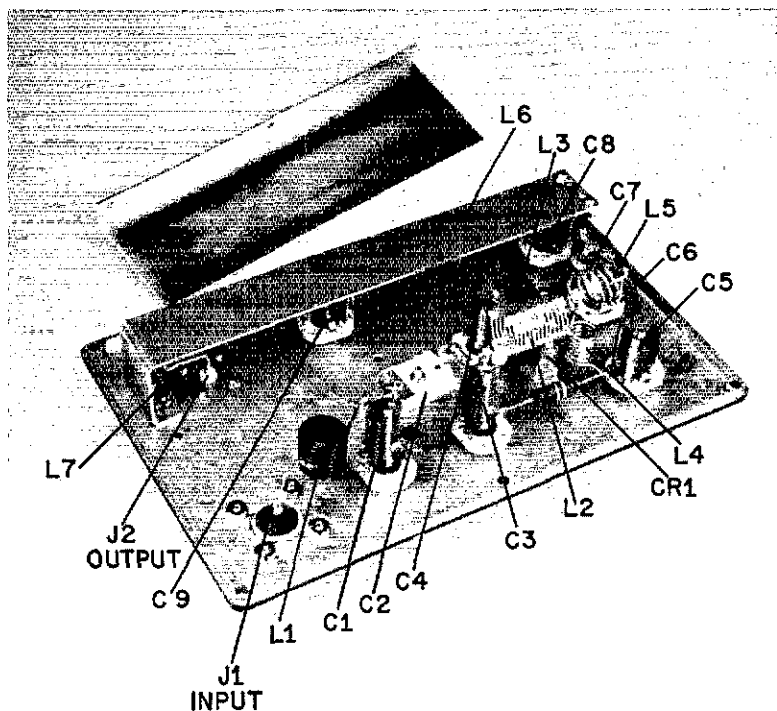


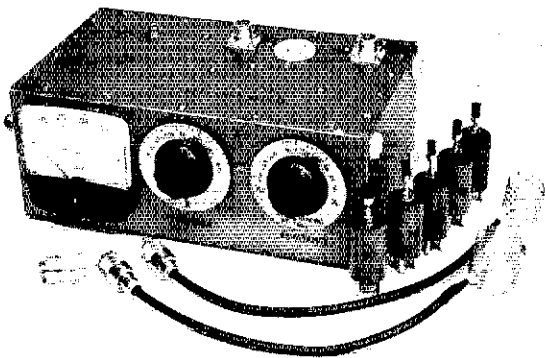
is a respectable power level for a base or a mobile station. The output from this unit is more than adequate to drive a medium- or high-powered final amplifier.

Although the output circuit has a strip-line tank for good rejection of unwanted products from the varactor, it is strongly recommended that additional filtering be used after the unit. This can be in the form of a strip-line filter such as the one shown in *The Radio Amateur's VHF Manual* and *The Radio Amateur's Handbook*. The spurious signals generated could cause interference to other services. Don't guess that these signals are attenuated — be sure they are!

QST

Inside the varactor quintupler. The partition is removed in the interest of clarity. C2 is connected between C1 and C3 with short leads. The varactor, CR1, can be seen between L2 and the resistor. C7 is fastened by its own leads between the end of the strip line and C6.





The Macromatcher and its accessories for measurement of complex impedances in the 3.5- to 30-MHz frequency range. A slug-tuned plug-in coil is used for each frequency band of measurement. Pickup-link assemblies used for exciting the instrument with a grid-dip oscillator are shown. Their construction, and that of the nonreactive load shown at the left in front of the Macromatcher, required for initial balancing, are described in the text. The box has been fitted with a carrying handle on the left end, and self-sticking rubber feet on the right end and bottom.

# The Macromatcher

An Rf Impedance Bridge for Coax Lines

BY JERRY HALL,\* K1PLP,  
and JOHN KAUFMANN,\*\* WA1CQW/1

SOME YEARS ago a new concept in simple variable-impedance bridges for antenna and other rf measurements was introduced to *QST* readers by Wade Caywood, W1KRD.<sup>1</sup> Before that presentation was published, most homemade adjustable impedance bridges used resistive components altogether, with a potentiometer as the adjustable element. At best, those instruments offered reliable calibration at only one frequency, because a pot is not a pure resistance at rf but a combination of resistance and reactance. As the arm of the pot is moved, the ratio of resistance to reactance changes. Caywood eliminated this and other attendant problems by using a differential capacitor as the adjustable element, a technique which provided increased accuracy over a large frequency range. Caywood's innovation gained popularity among antenna experimenters almost

<sup>1</sup> Asst. Technical Editor, *QST*,  
\*\* 487 Commonwealth Ave., Boston, MA  
02215.

<sup>1</sup> Caywood, "An Improved Antenna Bridge,"  
*QST*, August, 1955.

overnight, and a slightly modified version of his circuit has appeared in each edition of the *Handbook* since 1956. Countless numbers of bridges using the idea presented by W1KRD have been built.

In spite of the vast improvement over earlier bridge circuits, however, the differential-capacitor bridge still had one limitation; it could be used primarily to measure only nonreactive loads. When unknown loads contained reactance, the user was made aware of that fact because the null obtained on the instrument was an imperfect one. The more shallow the null, the higher the reactance of the load. But there was no way of knowing directly whether the reactance was inductive or capacitive, or its magnitude. Wayne Cooper, K4ZZV/W6EWC, came up with helpful circuit additions which gave an indication of the type of reactance, inductive or capacitive, and also gave a relative idea of the magnitude of the reactance.<sup>2</sup> The reactance indicators were not calibrated in absolute magnitude, however, because of the many variables involved.

To obtain the greatest accuracy in a homemade instrument for measuring complex rf impedances, an admittance bridge is perhaps the most suitable

<sup>2</sup> Cooper, "Reactance Signposts," Technical Correspondence, *QST*, September, 1966.

*On numerous occasions, almost any amateur wants to know more about his antenna system than a simple SWR indicator can tell him. If the SWR is high he may wish to reduce it to a lower value with some form of matching device at the antenna. The process is simplified if he first knows whether the SWR is caused by reactance at the antenna, by the "wrong" value of resistive load for the line, or by a combination of both. Heretofore, quickly finding the exact answer required a laboratory type of the rf measurement bridge or a complicated homemade instrument. The alternatives in reaching a suitable match involved a sometimes long process of cutting and trying, or using other roundabout methods. No more! The Macromatcher is a simple and inexpensive bridge which provides useful measurements of complex rf impedances over the range normally encountered in amateur hf antenna systems. Readings from the Macromatcher indicate the resistive and reactive components separately, and tell whether the reactance is inductive or capacitive.*



type. In that form of device, the basic bridge circuit is the same as it is in the impedance type of bridge, shown in Fig. 1A. In the admittance bridge, calibrated shunting elements are used in various arms of the bridge. These elements may be either resistive or reactive, or a combination of both, to cover a wide range of admittances. Compensation for stray reactances present in the bridge can be made by shunting lumped-constant values of the opposite type. An excellent device using these principles appeared in *QST* a few years ago.<sup>3</sup> As photographs of that instrument indicate, however, its use is confined primarily to the work bench or the shack. Too, its readings are in terms which are not used on an everyday basis by most amateurs — millimhos of conductance and micromhos of susceptance.

The coauthors of the present article, working together in the ARRL laboratory during the summer of 1971, were convinced that the basic differential-capacitor bridge and Cooper's "reactance signpost" idea could be incorporated into a portable instrument capable of indicating impedance, rather than admittance. Thus, if desired, the user could haul the instrument right up a tower or pole with him to the feed point of his antenna, and he could obtain information in readily understandable form — ohms of resistance and ohms of reactance. After a couple of false starts were made, the Macromatcher evolved, and it generally satisfies the original objectives. With suitable frequency coils, the Macromatcher can be used throughout the frequency range 3.5 to 30 MHz. The useful impedance range of the instrument is from about 5 to 400 ohms if the unknown load is purely resistive, or 10 to 150 ohms resistive component in the presence of reactance. The reactance range is from 0 to approximately 100 ohms for either inductive or capacitive loads. Although the Macromatcher cannot indicate impedances with the accuracy of a laboratory bridge, its readings are quite adequate for most amateur uses, including the taking of line lengths into account with a Smith chart or Smith transmission-line calculator. By its inherent properties, the Macromatcher accuracy is best at the centers of the dial calibration ranges.

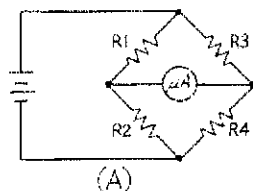
### The Basic Bridge Circuit

Fig. 1A shows the familiar dc Wheatstone bridge circuit, and 1B shows the circuit adapted for rf measurements. If C1, C2, and R1 are fixed values, the bridge may be used for fixed-impedance work, by substituting an unknown load for R2. As shown by Caywood,<sup>4</sup> incorporating a differential capacitor for C1 and C2 allows the bridge to be used over a wide range of impedances. A variable ratio in the C1-C2 arms is provided by two identical capacitor sections on the same frame, arranged so that when the shaft is rotated to increase the capacitance of one section, the capacitance of the other section decreases. With a fixed value for R1, the settings of the capacitor may be calibrated in terms of resistance at R2.

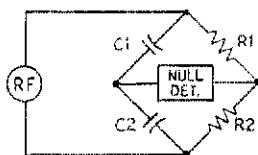
<sup>3</sup> Cherubini, "An Admittance Bridge for R.F. Measurements," *QST*, September, 1967.

<sup>4</sup> See footnote 1.

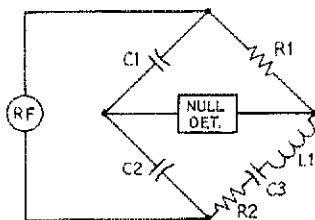
The basic circuit of the Macromatcher is shown in Fig. 1C. The differential capacitor is retained for C1 and C2 to measure resistance. L1 and C3 have been added in series in the R2 arm of the bridge, and it is these components which are used to measure the amount and type of reactance at the unknown load. Both L1 and C3 are adjustable in the actual bridge circuit. The Macromatcher is initially balanced at the frequency of measurement with a pure resistance at R2, so that the reactances of L1 and of C3 at its midsetting are equal. Thus, these reactances cancel each other in this arm of the bridge, and no reactance is reflected into the remaining bridge arms. For measurement, an unknown complex-impedance load is then connected into the bridge in place of R2. The resistive component of the load is balanced by varying the C1-C2 ratio, as in Fig. 1B. The reactive component is balanced by varying C3 either to increase or decrease its capacitive reactance, as required, to cancel any reactance present in the load. If the load is inductive, more capacitive reactance (less capacitance) is required from C3 to obtain a balance, with less reactance (more capacitance) needed from C3 if the load is capacitive. The end result, after C3 is properly adjusted for the particular unknown load, is that the overall R2 arm of the bridge again looks purely resistive, and a complete null is obtained on the null detector. The



(A)

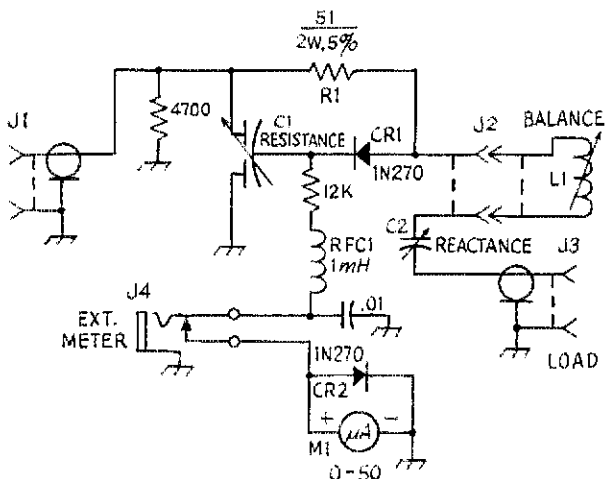


(B)



(C)

Fig. 1 — The basic Wheatstone bridge (A) and an adaptation for rf use (B). At (C) is the basic circuit of the Macromatcher. In this circuit the bridge is balanced before measurements are made, by setting  $X_{L1} = X_{C3}$ .



settings of C3 are calibrated in terms of the value and type of reactance at the load terminals. Because of the relationship of capacitive reactance to frequency, the calibration for the dial of the reactance-measuring capacitor is valid at only one frequency. It is therefore convenient to calibrate this dial for equivalent reactances at 1 MHz. Frequency corrections may then be made simply by dividing the reactance dial reading by the measurement frequency in megahertz.

### The Macromatcher Circuit

Fig. 2 is the complete schematic diagram of the Macromatcher. C1 is the resistance-measuring capacitor, and L1 and C2 the reactance-measuring components. R1 is the bridge "standard" resistor. Aside from the INPUT and OUTPUT jacks and the connector for L1, all other parts are associated with the null-detector metering section of the circuit. CR1 rectifies if energy present when the bridge is unbalanced, and this energy is filtered into direct current which is metered at M1. The 12k-ohm resistor provides a high-impedance input for the metering circuit, and the 4700-ohm resistor at J1 provides a return path for meter-current flow if the input source is capacitance coupled. J4 is for the connection of an external meter, in the event it is desired to observe readings remotely. CR2, placed directly across M1, protects the meter from over-current surges. Although it appears from the schematic diagram that this germanium diode will shunt out all meter current, such is not the case in actual operation because approximately 250 millivolts must be developed across the diode before it begins to conduct an appreciable amount of current. The internal resistance of a typical 50- $\mu$ A meter is 1800 or 2000 ohms, and this means that more than 100  $\mu$ A of current must be flowing through the meter before the diode shunting effect becomes appreciable. In operation, this diode prevents the meter needle from slamming against the peg if the load is disconnected while input power is still applied; the needle eventually reaches full scale, but travels more slowly with the diode in the circuit.

Fig. 2 - Schematic diagram of the Macromatcher. Capacitance is in microfarads; resistances are in ohms, k = 1000. Resistors are 1/2-W 10-percent tolerance unless otherwise indicated.

C1 - Differential capacitor, 11-161 pF per section (Millen 28801).

C2 - 17.5-327 pF with straight-line capacitance characteristic (Hammarlund RMC-325-S; Millen 19335 with slightly greater capacitance range also suitable).†

CR1, CR2 - Germanium diode, high back resistance.

J1, J3 - Coaxial connector, chassis type.

J2 - To mate plug of L1, ceramic.

J4 - Phone jack, closed-circuit type.

L1 - See text and Table I.

M1 - 0-50  $\mu$ A dc (Simpson Model 1223 Bold-vue, Cat. No. 15560 used here).

R1 - For text reference.

RFC1 - Subminiature rf choke (Miller 70F103AI or equiv.).

### Construction

The Macromatcher shown in the photographs is constructed in an aluminum box measuring  $4\frac{1}{4} \times 10\frac{3}{4} \times 6\frac{1}{8}$  inches. The size of this enclosure could be reduced somewhat if a smaller meter is used. In any rf-bridge type of instrument, the leads *must* be kept as short as possible to reduce stray reactances. Placement of component parts, while not critical, must be such that lead lengths greater than about 1/2 inch (except in the dc metering circuit) are avoided. Shorter leads are desirable, especially for R1, the standard resistance for the bridge. In the Macromatcher photographed, the body of this resistor just fits between the terminals of C1 and J2 where it is connected.

As the internal view indicates, all parts of the bridge except the meter and the calibrated dials are mounted on the top panel of the box. The dials are front-panel mounted on shafts with panel bearings.

† Hammarlund capacitors are now being manufactured by Cardwell Condenser Corp., 80 E. Montauk Hwy., Lindenhurst, NY 11757.

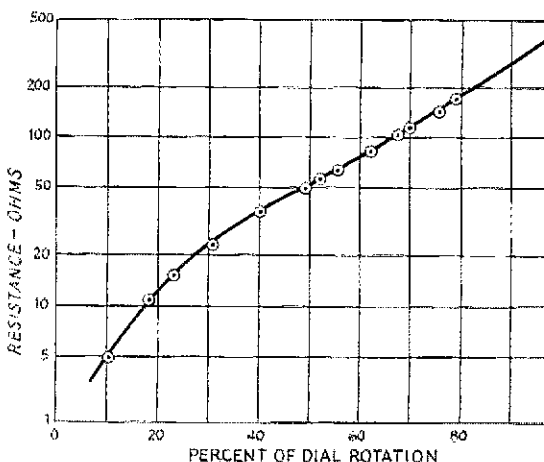


Fig. 3 - Graph showing calibration of the resistance dial of the Macromatcher.

TABLE I

Coil Data for Macromatcher			
Band	Nominal Inductance Range, $\mu H$	Frequency Coverage MHz	Coil Type or Data
80	6.5-13.8	3.2-4.8	28 turns No. 30 enam. wire closewound on Miller form 42A000CBI.
40	2.0-4.4	5.8-8.5	Miller 42A336CBI or 16 turns No. 22 enam. wire closewound on Miller form 42A000CBI.
20	0.6-1.1	11.5-16.6	8 turns No. 18 enam. wire closewound on Miller form 42A000CBI.
15	0.3-0.48	18.5-23.5	4 1/2 turns No. 18 enam. wire closewound on Miller form 42A000CBI.
10	0.18-0.28	25.8-32.0	3 turns No. 16 or 18 enam. or tinned bus wire spaced over 1/4-in. winding length on Miller form 42A000CBI.

The frames of both variable capacitors, C1 and C2, must be insulated from the chassis, and insulated couplings used on the shafts. Fiber shaft extensions were used in an earlier model of the Macromatcher in place of insulated couplings and shafts with panel bearings, but the "springy" feeling arising from the flexibility of the fiber shafts and the resulting backlash were objectionable. The capacitor specified for C1 has provisions for insulated mounting; C2 is mounted on 1-inch-high ceramic insulating pillars. C1, as supplied, has its own copper shield. In order to facilitate running shorter leads to other bridge components, this shield was removed and replaced by an enclosing aluminum shield. Connections are made with leads passing through holes drilled through the shield wall.

As we learned in an earlier version, band-switching arrangements for L1 complicate the construction and contribute to intolerable stray reactances in the bridge circuit. For these reasons plug-in coils are used at L1, one coil for each band over which the instrument is used. The coils must be adjustable, to permit initial balancing of the bridge with C2 set at the zero-reactance calibration point. Data for these coils are given in Table I. Millen 45004 coil forms (with the coils supported *inside*) provide a convenient method of constructing these slug-tuned plug-in coils. One of the photographs shows the parts used to make a coil assembly. A phenolic washer, cut to the proper diameter with a small rotary saw, is cemented to the top or open end of each form, giving a rigid

support for mounting of the coil by its bushing. Small knobs for 1/8-inch shafts, threaded with a No. 6-32 tap, are screwed onto the coil slug-tuning screws to permit ease of adjustment. Knobs with setscrews should be used to prevent slipping. A ceramic socket to mate with the pins of the coil form is used for J2.

*A Nonreactive Termination*

For calibrating the reactance dial and for initially balancing the Macromatcher each time it is

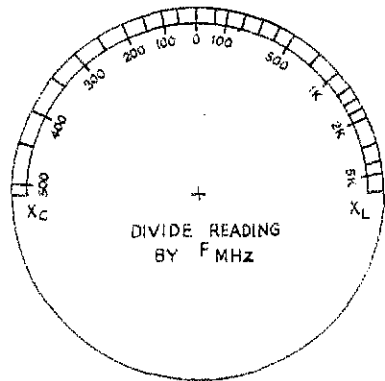
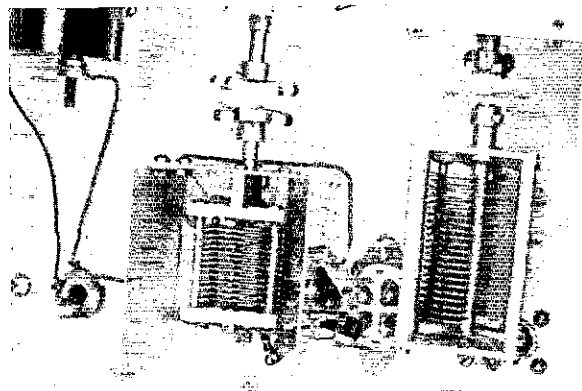
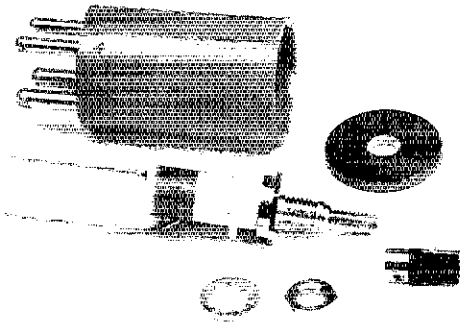


Fig. 4 - Calibration scale for the reactance dial with the Hammarlund capacitor used at C2. See text, Fig. 2, and †.

An inside view of the Macromatcher. All components except the meter and calibrated dials are mounted on the top of the box. C1 is visible inside the shield at the left, with C2 at the right and J2 mounted between them. J1 is hidden beneath C1 in this view; a part of J3 may be seen in the lower right corner of the box. Components for the dc metering circuit are mounted on a tie-point strip which is affixed to the shield wall for C1; all other components are interconnected with very short leads. The 4700-ohm input resistor is connected across J1. This photograph was made before the diode was connected across the terminals of M1.





Shown here are the parts used in making a plug-in coil assembly. The wire leads are first soldered to the coil, as shown. The nut, with the phenolic washer held in place by the nut over the coil bushing, the wire leads are inserted into the proper coil-form pins as far as possible and soldered. Excess lead length may then be trimmed off. Next, the nut is removed from the bushing and the phenolic washer cemented (epoxy) in place over the open end of the coil form. After the cement has set, the lock washer and nut are installed permanently to provide rigid support for the coil. The small knob is threaded with a 6-32 tap after the setscrews are removed, and is then screwed and secured onto the top end of the slug-adjusting screw to provide for easy adjustment with the fingers.

used on a new frequency, a purely resistive load is required for connection at J3. A suitable load which is essentially nonreactive can be made by mounting a 51- or a 56-ohm I-W composition (carbon) resistor inside a PI-259 plug.

The body of the resistor should be inserted as far as possible into the plug, with one resistor lead extending through the center-conductor pin. Solder this center-pin connection, and clip off any excess lead length. Make a 1/2-in.-dia copper or brass disk with a small hole at its center. Use a 1/16-in. or, preferably, a No. 60 drill to make this hole. (Initially the "disk" may be a square or rough-cut piece of metal. It may be rounded by filing or grinding after the assembly process is completed.) Place the shell of the plug over its body, and then slip the disk over the grounded-end lead of the resistor, so the resistor lead protrudes through the small hole. First solder the disk to the body of the plug and then clip off any excess lead length from the resistor. Next, solder the connection at the small hole. The disk, when assembled in this manner, completes the shielding, reduces lead inductance, and also prevents the shell of the plug from being removed completely.

### Calibration

The resistance dial of the bridge may be calibrated by using a number of 1/2- or 1-watt 5-percent-tolerance composition resistors of different values in the 5- to 400-ohm range as loads. The leads between the test resistor and J3 should be as short as possible, and the calibration preferably should be done in the 3.5-MHz band where stray inductance and capacitance will have the least effect. For this calibration, the appropriate frequency coil must be inserted at J2 and its inductance adjusted for the best null reading on the meter when C2 is set with its plates half meshed. For each test resistor, C1 is then adjusted for a null reading. Alternate adjustment of L1 and C1 should be made for a complete null. The several calibration points can be plotted on semilogarithmic graph paper and a smooth curve drawn to obtain convenient points for the actual scale. The graph of Fig. 3 is for the Macromatcher photographed, and agrees quite closely with the theoretical curve which has been published previously.<sup>5</sup>

<sup>5</sup> See footnote 1.

The dial scales for this Macromatcher were made by reversing the skirts of Millen No. 10009 dials and engraving the lines, for points taken from the graph, with an electric engraving tool. Numerals on the skirts are of the dry-transfer decal type.

If the constructional layout of the bridge closely follows that shown in the photographs, and if the Hammarlund capacitor specified for C2 is used, the calibration scale of Fig. 4 may be used for the reactance dial. This scale was obtained by connecting various reactances, measured on a laboratory bridge, in series with a 47-ohm I-W composition resistor connected at J3. Serious error should not occur if this scale is used for the Millen capacitor at C2; any departure will be noted primarily at the high-reactance points where accuracy of the bridge is not too important for most resonant-antenna work. The scale is applied so that maximum capacitive reactance is indicated with C2 fully meshed.

If it is desired to obtain an individual calibration for C2, known values of inductance and capacitance may be used in series with a fixed resistor of the same approximate value as R1. For this calibration it is *very important* to keep leads to the test components as short as possible, and calibration should be performed in the 3.5-MHz range to minimize the effects of stray reactances. Even at these frequencies, differences in lead lengths of one inch on the test components can be detected as a change of reactance. Begin the calibration by setting C2 at half mesh, marking this point as 0 ohms reactance. With the nonreactive load connected at J3, adjust L1 and C1 for a complete null on M1. From this point on during calibration, do not adjust L1 except to rebalance the bridge for a new calibration frequency. The ohmic value of the known reactance for the frequency of calibration should be multiplied by the frequency in megahertz to obtain the calibration value for the dial. As with the resistance calibration, the reactance calibration points may be plotted on semilogarithmic graph paper. The theoretical curve for the Hammarlund capacitor and the actual calibration curve obtained for the Macromatcher photographed are shown in Fig. 5. The slight difference between the two curves is attributed to a small amount of reactance in the instrument.

## Using the Impedance Bridge

Before measurements are made, it is necessary to balance the bridge. Set the reactance dial at zero and adjust L1 and C1 for a null with the nonreactive load connected at J3. This null should be complete; if not, reduce the signal level being applied to the Macromatcher. The instrument must be rebalanced after any appreciable change is made in the measurement frequency, more than approximately 1 percent. After the bridge is balanced, connect the unknown load to J3 and alternately adjust C1 and C2 for the best null. Measured impedances are of equivalent series form,  $R + jX/f$ , where  $R$  and  $X$  are the Macromatcher dial readings, and  $f$  is the frequency in megahertz. When the reactive component,  $X$ , is divided by the frequency, the result is  $R + jX$  in ohms.

This instrument is a low-input-power device, and is *not* of the type to be excited from a transmitter or left in the antenna line during station operation. Sufficient sensitivity for all measurements results when a 5-V rms rf signal is applied at J1. This amount of voltage can be delivered by most grid-dip oscillators employing vacuum tubes. In no case should the power applied to J1 exceed 1 watt, or calibration inaccuracy may result from a permanent change in the value of RL. The input impedance of the Macromatcher at J1 is low, in the order of 50 to 100 ohms, so it is convenient to excite the bridge through a length of 52- or 75-ohm line such as RG-58/U or RG-59/U.

If a grid-dip oscillator is used, a link coupling arrangement to the oscillator may be employed. A typical operational setup using this arrangement is shown in one of the photographs. Two pickup-link assemblies should be made if 5-band hf coverage is desired. The link using the larger coil covers the 80-, 40-, and 20-meter bands, and is made with 10 turns of 1 1/4-in.-dia coil stock with turns spaced at 8 turns per inch (B&W 3018). The link using the smaller coil may also be used for operation in the 20-meter frequency range, and it covers the 15- and 10-meter bands. This coil contains 5 turns of 1-in.-dia stock with turns spaced at 4 turns per inch (B&W 3013). When using a grid-dip oscillator, coupling to the oscillator should be as light as possible, while obtaining sufficient sensitivity, to prevent severe pulling of the oscillator frequency. Overcoupling may cause the oscillator to shift frequency by several hundred kilohertz, so for the most reliable measurements, a receiver should be used to check the oscillator frequency.

When the Macromatcher is used at the antenna, excitation may be "piped" to the instrument through the coaxial line which normally feeds the antenna. Unless an assistant can check the oscilla-

Operational setup using a grid-dip oscillator to excite the Macromatcher. The unknown load is the input impedance of the cable extending out of the photograph in the upper right corner. Tight coupling between the oscillator coil and the pickup link is shown here only to illustrate the method used. In actual operation, there will be a physical separation of the coils for optimum coupling.

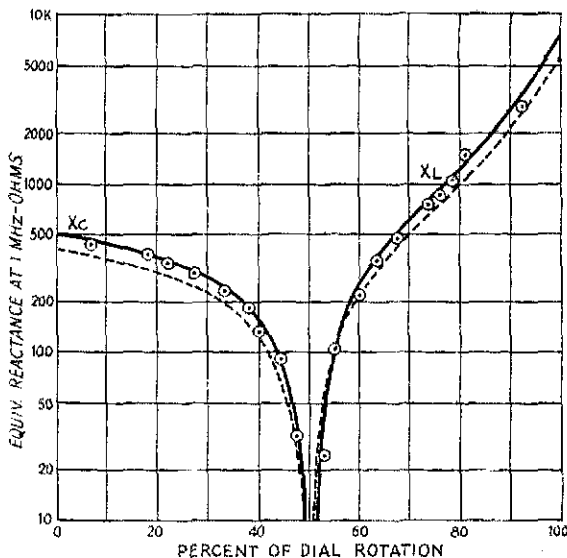
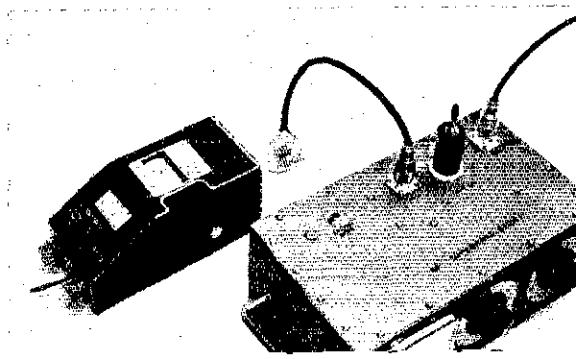


Fig. 5 — Graph showing the theoretical calibration (dashed line) and actual calibration of the reactance dial with the Hammarlund capacitor used at C2. The slight difference between the two curves is attributed to a small amount of reactance in the instrument.

tor frequency during each measurement, however, a grid-dip oscillator is unsatisfactory for this type of work. A more stable frequency source, such as a signal generator or QRP transmitter capable of delivering approximately 100 to 200 milliwatts, is ideal, as it can be left running during the time measurements and adjustments are being made. Here is where the Macromatcher can *really* prove its worth, for adjustment of matching networks such as the L, gamma, and hairpin, because the resistive and reactive components of the load are indicated separately. In these networks one adjustable element affects primarily the resistive component (the rod length of the gamma or the length of the hairpin), while the other adjustment affects primarily the reactive component (gamma-capacitor setting or driven-element length with the hairpin match). Of course there is some amount of interaction in the two adjustments, but the effects of making just one adjustment can be seen immediately on the Macromatcher. Obtaining a perfect match in a matter of a few minutes is a "snap" — adjust one of the two variables for the proper



resistance, adjust the other variable for zero reactance, perform a slight touchup on these adjustments, and you're finished! We've known of fellows using only an SWR meter who have spent nearly a whole weekend of cutting and trying in order to reach this same goal.

As shown in Fig. 4, the calibration of the reactance dial is nonlinear, with a maximum indication for capacitive reactance of 500. The measurement range for capacitive loads may be extended by "zeroing" the reactance dial at some value other than 0. For example, if the bridge is initially balanced with the reactance dial set at 500 in the  $X_L$  range, the 0 dial indication is now equivalent to an  $X_C$  reading of 500, and the total range of measurement for  $X_C$  has been extended to 1000.

Rather than using the instrument right at the antenna feed point for some measurements, many amateurs will prefer to perform measurements through a half wavelength of feed line. Disregarding attenuation in the line (and in ordinary coaxial lines the amount of attenuation is negligible if the line is only a single half wave in length), an impedance repeats itself every half wave along the line. Thus, the impedance measured at the input to the half-wave length of line will equal the impedance right at the antenna terminals. There is one important point to remember when measurements are being made in this manner. The half-wave dimension is the *electrical* length of the line, with the velocity factor taken into account. For

RG-8, -11, -58, and -59/U cables having solid dielectric and a velocity factor of approximately 66 percent, the physical length in feet for a half wave can be determined quite closely by  $l = 322/f_{MHz}$ . For foam-dielectric coax such as T4-50 with a velocity factor of approximately 81 percent, the length can be found by  $l = 400/f_{MHz}$ . For greater accuracy than can usually be obtained by making only physical measurements, the line can be measured electrically with a grid-dip meter. Terminate the far end of the line in a short circuit, and couple the grid-dip oscillator to a very short link connected from the center conductor to the shield at the input end of the line. A half-turn link looped over the oscillator coil is usually sufficient. The dip meter will indicate a dip at the frequency for which the line is an exact half wavelength.

It is not necessary to trim the coaxial line to an exact half wavelength in order to make "remote" measurements accurately. The line may be of any convenient physical length, but its electrical length must be known. Readings taken at the input end of the line can be converted into actual impedances at the termination point of the line by means of a Smith chart or calculator. Articles on the procedure to be followed have been presented in past issues of *QST*.<sup>6,7,8</sup>

<sup>6</sup> Cholewski, "Some Amateur Applications of the Smith Chart," *QST*, January, 1960.

<sup>7</sup> Hall, "Smith-Chart Calculations for the Radio Amateur," Parts I and II, *QST*, January and February, 1966.

<sup>8</sup> Hatcher, "On Using the Smith Chart," Technical Correspondence, *QST*, June, 1966.

**QST**



January 1922

... Our cover gives the list of stations copied by Paul Godley in Ardrossan, Scotland, during the recent Transatlantic tests. It also appears that many U.S. stations were copied by British amateurs, although their logs have not yet been received. Last September, it was my privilege to meet Paul again at the A.W.A. annual conference, and we relived a little of those important and historic days.

... There is full report on the matter of 2QR's claim that his signals had been copied in Scotland more than a year prior to our own successful tests. The Radio Club of America's committee investigated this matter for over a year, and it is certain now that at the time of the alleged reception, 2QR was not transmitting. That ends it.

... Complete details of the recently announced competition for the Department of Commerce Hoover Cup are given. It looks as though winners will deserve it! One of the conditions is that most of the station equipment shall have been made by the amateur himself. Mr. Hoover wants it that way, too.

... It's a little surprising to see a big piece about WJZ broadcasting station, Newark, N.J., but it was big news at the time, of course, and it tempted many a ham to try a little broadcasting. Some of those who did ultimately became bonafide broadcasters.



January 1947

... Looking back another 25 years, K. B. Warner editorializes about the successful Transatlantics of December, 1921. A neat summary. It is also fitting to observe the first 50 Mc. communication — along this same path: in November, 1946, Ed Tilton, W1HDQ, was in contact for over an hour with G6DH and G5BY on six meters. Incidentally, we have Ed's rig in our Museum. And let us never forget Paul Godley's enormous contribution to the advancement of amateur radio.

... We have the announcement of the ARRL's 12th International DX contest. Once things started, they rolled along real fast.

... Newcomers of today who may have started with 2-meter fm relay stations may be surprised to note that there is an article on a "New Phase-Modulation Circuit for Narrow-Band F.M." It was written by Jack J. Babkes, W2GDG.

... War surplus receivers are all around us and we have an article by Paul M. Kersten, W0WIT, on "Converting the BC348Q" receiver to ham use. This involves putting in separate rf and audio gain controls and adding an S-meter.

... Rowland J. Long, W9NLP, has constructed and describes his rotatable dual two-element array for 14 and 28 Mc. It is rotatable, too, although the rotating means is a little obscure.

... George Grammer, W1DF, has a short article on "Flat Lines and Loading." — *W1ANA*

# The Simulmonitor —

## A New Approach to Repeater Inputs

BY GIL KOWOLS,\* W9BUB

THE CHICAGO FM Amateur Repeater (CFAR) began as do most such projects. Someone connected the output of a receiver to the input of a transmitter, so that when certain conditions were satisfied the received signal was retransmitted on another frequency. The receiver and transmitter were located together. Next, someone came up with the idea of putting this collection of equipment near the top of a high building, and equipping it with a big antenna. This gave mobile stations on the input frequency a break by, in effect, giving them a voice as big as the powerful and well-equipped base stations.

The basic approach to vhf repeaters has been described very well before.<sup>1</sup> The first step in implementing it is the installation of a carrier-operated relay, as shown in Fig. 1. This simple system has some fundamental weaknesses which can be difficult to overcome. The first is the effect of the transmitter on the receiver sensitivity. Even though the two are on different frequencies the transmitter tends to block the receiver, or at least to reduce its sensitivity greatly.

One solution lies in isolation of the transmitting and receiving antennas. As may be seen from Table I, vertical separation of the antennas is much more effective than horizontal separation, for given amounts of spacing. As much as 80 dB of isolation is possible with 100 feet of vertical separation, with vertical antennas, whereas similar antennas mounted in the same horizontal plane would have to be nearly two miles apart for this isolation over an open path. It is not often possible to get 100 feet of vertical separation, and still have good coverage with both antennas, so other steps may be required.

One isolation device is a high- $Q$  tuned circuit, usually connected in the receiver line. This approach is typified by the Motorola TU-312H, which stands about three feet high and is one foot in diameter. It is possible to obtain loaded  $Q$ s in excess of 36,000, which cannot be approached with lumped circuits. The effective isolation obtainable depends on frequency separation and tolerable insertion loss. These factors are summarized in Table II. We see that with a frequency separation of 500 kHz, we can get 24 dB isolation with the cavity, if we can tolerate a 3-dB insertion loss. Using a cavity will allow us to get by with

\* Chairman, ARRL Advisory Committee for VHF Repeaters; Trustee, CFAR Licenses, 216 Belle Plaine Ave., Park Ridge, IL 60068.

<sup>1</sup> Cobb and O'Brien, "Amateur FM and Repeaters," *QST*, October, 1969, page 11.

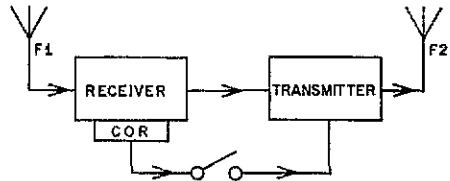


Fig. 1 — Basic diagram of a simple vhf repeater. A signal on the repeater input frequency,  $f_1$ , activates the carrier-operated relay (COR), which turns on the transmitter. Audio output from the receiver is patched into the transmitter speech equipment, so the signal is retransmitted on the repeater output frequency,  $f_2$ .

only 56 dB of antenna isolation, obtainable with about 25 feet of vertical antenna separation.<sup>2</sup>

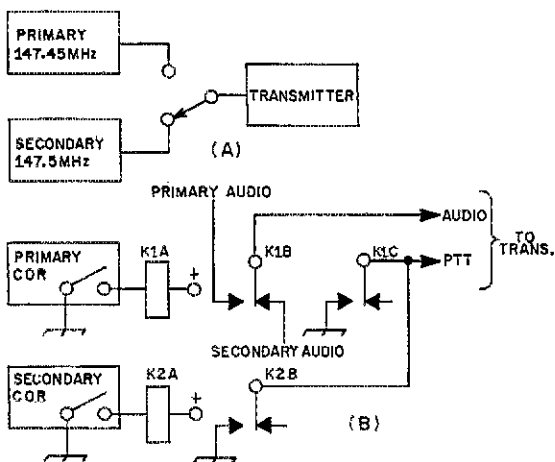
A third alternative is to remove the receiver from the premises, and connect it to the transmitter by a two-wire line. This was done with CFAR, as the transmitter was in the Loop area, where all the TV, fm, and commercial communications transmitters are located, complicating the receiving problem for the repeater. The receiving installation was placed in a tall apartment house seven miles to the north, on the Lake shore, with a leased telephone line connecting it to the transmitter. This was more than adequate for isolation. No high- $Q$  filter was needed to assure maximum receiver sensitivity, and the system still corresponded to Fig. 1. For the cost-conscious, the charge for this leased line is \$28 per month. Charges may vary considerably, depending on the length of the line and the territory it serves.

<sup>2</sup> A combination of circuits for rejecting transmitter energy and passing the received signal can be used to achieve higher isolation with lower receiving loss than is obtainable with simple coaxial tanks. See *QST*, March, 1970, page 42.

TABLE I

Isolation, dB	Horizontal Spacing, Feet	Vertical End-to-End Spacing, Feet
30	25	5.5
40	80	9.5
50	280	17
60	800	31
70	2800	55
80	9000	100
90	28,000	180

Table I — Isolation with vertical dipoles, 147 MHz.



The input frequency, 147.5 MHz, has been occupied by fixed-frequency fm mobiles and fixed stations in the Chicago area since 1948, long before there were fm repeaters, so the transmitter was placed on 147.75 MHz. To use the repeater an operator merely had to switch his receiver to the latter frequency. This still left a problem, however. Long occupancy of 147.5 by both base stations and mobiles tended to leave the repeater largely controlled by the base stations. So long as one was on, a poor mobile seldom had a chance. The primary purpose of the repeater, to extend the range of mobiles, was not being served.

### Priority for Mobiles

Development of the primary-secondary concept, shown in principle in Fig. 2, solved this problem. At A we see the secondary receiver on 147.5 MHz, normally feeding the transmitter. However, a primary receiver monitors 147.45. A mobile who wants to use the repeater transmits on the latter frequency, and as seen in B, the repeater input is switched automatically to the mobile channel. Thus the original objective of the system is fulfilled, yet base stations can be accommodated when there is no mobile traffic.

The receiver switching setup which makes this possible is shown in Fig. 3. It has proven to be very useful in the case of a mobile in an emergency situation. The mobile operator can break in immediately, even if the repeater is handling a base-station signal, knowing that he can transmit details of the emergency and get prompt attention.

TABLE II

Frequency Separation	Insertion Loss		
	0.5 dB	1 dB	3 dB
150 kHz	4 dB	8 dB	17 dB
500	13	19	24
1000	18.5	24.5	33

Table II — Isolation with high-Q circuit (Motorola TU-312H).

Fig. 2 — Block diagram of the primary-secondary concept, as used in the Simulmonitor. Frequencies used in the CFAR setup are shown at A. Base stations are on the secondary channel, mobiles on the primary. As seen in B, the secondary receiver's audio is normally fed into the line to the repeater transmitter. When a mobile station comes on the primary frequency, its audio is automatically patched into the line, and the secondary frequency (base station) loses control. The system can also be operated by a push-to-talk microphone at the receiving site, for maintenance purposes.

It is interesting to observe that such an emergency report will generally bring at least three calls to the proper authorities (police, fire department, etc.) indicating that the repeater enjoys a high listener-to-talker ratio.

There are still some bugs with this arrangement, not the least of which is that the base station may still be transmitting, even though he has lost the repeater. Thus he still may keep any base station from answering the mobile, and completing the communications loop. The answer is the *Simulmonitor*.

With this capability, each base station has a monitor receiver on the repeater output frequency while he is transmitting. As long as he has control, he hears himself in the monitor. Should a primary station cut him off he is aware of it immediately, and stands by for the break-in mobile. To use this system effectively the base-station operator must apply the isolation principles outlined earlier. In practice this is usually easier than it sounds. The repeater signal is always strong, so desensitization resulting from the base-station transmitter still leaves a usable signal, even with relatively small antenna separation.

### Typical Stations

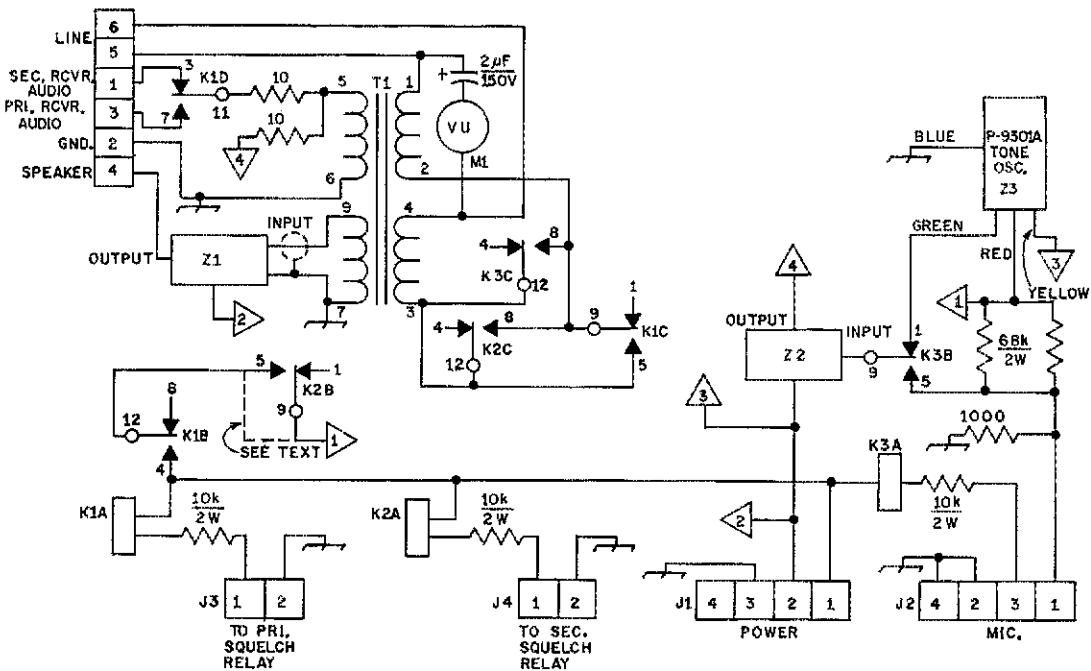
The practical requirements for "simulmonitoring" can be seen by examining a few stations which monitor in this way. The repeater runs 50 watts output, feeding a 6-dB antenna, 700 feet above ground, so it will have a strong signal at almost any base station in its service area. One base station 15 miles from the repeater, running 40 watts output on the secondary repeater input frequency, uses a receiving antenna made of RG-58/U only two feet above ground. It is directly under the transmitting antenna, which is 30 feet above ground. This same station runs 60 watts on 146.7-MHz Teletype, while monitoring the repeater output.

Another station 45 miles from the repeater uses two 3-element beams, one above the other, with the receiving beam the lower. A 25-watt transmitter is used, with a Motorola Sensicon "A" receiver. This station demonstrates that one can be at a considerable distance from the repeater and still have simulmonitor capability.

### Circuit Details

A practical receiver control circuit for the Simulmonitor is shown in Fig. 3. In my case, the chassis was a Motorola P-8066A remote-control





EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS ( $\mu F$ ); OTHERS ARE IN PICO FARADS (pF OR  $\mu\mu F$ ); RESISTANCES ARE IN OHMS; k=1000, M=1000 000.

unit. This was used because it was available, and it had the input and output transformers already mounted. The Simulmonitor contains the control circuits, transistor amplifiers for local audio, local audio generation to modulate the transmitter, and a tone generator for operation of the logging system.

The tone generator is used to start the recorder used for logging. When a station on the primary frequency overrides one on the secondary, the tone oscillator generates a one-third-second tone burst. A tone decoder triggered by this burst is used to start the logging recorder, which runs for a 15-second interval. The recorder tapes the period during which all the calls of the stations using the repeater are given. The recorder then goes off, and it will recycle only when the repeater transmitter goes off, or when the single tone is received from the control unit.

When this system was conceived about three years ago, it was anticipated that it might not be suitable when channel occupancy increased. With over 200 stations on the channel presently, that time has arrived, and the system is again undergoing modification. Use of the Simulmonitor, with its potential for frequent change of signal being repeated, has made it necessary for all break-ins to be logged automatically.

Fig. 3 - Schematic diagram of a Simulmonitor receiver control installation. Where parts are critical, values are given on the diagram, or a description is given below. Other parts designations are for text reference.

K1, K2, K3 - Potter-Brumfield KHP-17D11, with 9KH1 socket.

T1 - Line transformer, 500-ohm split primary, 600- and 3-ohm secondaries (Motorola 25B11697).

Z1, Z2 - 1-watt audio module (Amperex PCA-1-9).

Z3 - Tone generator (Motorola L-9301A).

The circuit of Fig. 3 operates in the manner illustrated in the lower half of Fig. 2, to connect the desired receiver to transformer T1, which feeds the telephone line from the receiving site to the transmitter. Relay K1 operates when the primary receiver picks up a signal. Relay K2 will operate when the secondary receiver picks up a signal, unless the system is being controlled by K1. Relay K3 operates when the local microphone push-to-talk switch is closed. Contacts on all three relays complete the dc path for the transmitter, through the telephone line, and thus turn the transmitter on.

(Continued on page 29)

# A 144-MHz Amplifier Using the 8874

BY RAYMOND F. RINAUDO,\* W6ZO

**T**HIS 144-MHz amplifier is an inverted ultraudion, grounded-grid, or a cathode-driven amplifier, depending upon what point in electronics history you choose to speak from. The first description has now been dropped and is probably recognized only by the real old timers, or students of radio history.<sup>1</sup> The second, grounded grid, is still widely used but somehow fails to describe how an amplifier works; it also implies no grid bias, but bias is often used. The third, by its words, cathode driven, tells you how the amplifier operates, without being unduly restrictive as to operating voltages.

## *The Cathode-Driven Amplifier and Tube*

The cathode-driven amplifier has become very popular with amateurs using the high-frequency bands. This popularity has developed primarily in the past fifteen years. One of the principal reasons is the availability of single-sideband exciters with a PEP output of one hundred or more watts. With exciters of that power capability, the natural step in increasing power level is to go to an amplifier which will absorb all, or almost all, of the exciter power — the cathode-driven amplifier. Also in the past few years, new modern-design tubes have been introduced which were developed for this service, having a very high mutual conductance and operating with very little or no grid bias. The best of these tubes operate satisfactorily at the lower vhf range, but are difficult to handle in the upper part of that range.

Now a new family of tubes has been developed which performs very well at hf, vhf, and well into

\* Elmac Division of Varian, 301 Industrial Way, San Carlos, CA 94070.

<sup>1</sup> It is interesting to note that a cathode-driven amplifier was described in *QST* almost forty years ago. See *QST* for September, 1933, "The Inverted Ultraudion Amplifier," by Hugo Romander, W2NB (now W6CH).

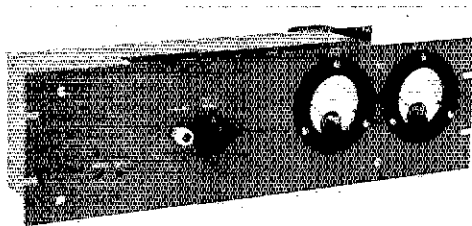


Fig. 1 — Front view of the 144-MHz amplifier. The grid-current meter is on the left and plate meter on the right. Plate-circuit loading is increased by pushing in on the coax connector. Input circuit tuning is done with an insulated screwdriver through the two holes at the left side of the panel labeled INPUT and MATCH.

the ultra-high-frequency range. These tubes are the 8873, 8874, and 8875. The tubes differ from each other only in the anode cooler construction. The 8873 is intended for heat-sink cooling, the 8874 for forced-air cooling, and the 8875 for cooling by large volume but very low-pressure air, such as is supplied by a fan. The 8874 is used in the amplifier which is to be described.

The requirements for a good cathode-driven tube will be briefly reviewed.

- 1) In order to have acceptable gain, the tube should have high mutual conductance.
- 2) The tube should have low grid interception of electrons. All other things being equal, the tube having the lowest grid interception is the easiest to drive.
- 3) The tube should have the least possible inductance between the grid in the tube and the external grid connection. Inductance in the grid lead causes degeneration which, in turn, means that more drive power has to be supplied to drive the tube to a particular plate current.

Incidentally, the long wire grid lead in the old glass high-mu triodes is the main reason for lack of vhf capability of those tubes. It is of interest to note that while the cathode-driven tubes require low grid-lead inductance, the grid-driven tube requires low cathode-lead inductance; lack of attention to this detail results in a tube which is hard to drive, and, for the same reason in both cases, degeneration.

The 4X150A/4CX250B tetrode tubes are still considered very good performers in the vhf range. However, the 8873 triode family, in cathode-driven service, gives power gains which approach that of the older tetrode types in a grid-driven arrangement and does that without the necessity for a screen supply or neutralization; and at the lower

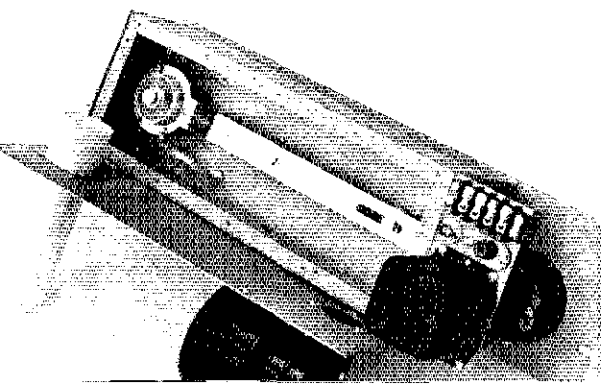


Fig. 2 — Looking into the box containing the plate-circuit strip line. The slot in the plate line is for a rough adjustment of frequency. Once set properly, all of the 2-meter band can be covered using only the front-panel controls. The Teflon chimney and wave-guide-beyond-cutoff vent pipe are attached to the box cover.

plate voltages the tube can be operated at zero bias. If fixed bias is needed, it can be obtained from a comparatively inexpensive Zener diode.

The 2-meter amplifier to be described uses one 8874 in a cathode-driven circuit and with a strip-line plate circuit. It is capable of 1100-watts PEP input for ssb suppressed carrier and 550 watts for cw. As an a-m linear amplifier it will run at 500-watts input.

### Construction

The amplifier is built so as to fit behind a standard 5 1/4 x 19-in. panel as shown in Fig. 1. The plate circuit enclosure is 13 x 5 x 3 in. and made of aluminum (see Fig. 2). This one happens to be of the hand-made variety, but a standard chassis of this size could have been used and would have saved some time. The cathode input circuit is in a 5 x 3 3/8 x 1-in. aluminum box. A standard 4 1/2 x 3 1/2 x 1-in. chassis would have served as well, as the box is not crowded. Two end brackets space the rf unit 1 3/4 in. behind the panel to allow room for the meters.

The tube socket is centered between the two sides of the plate-circuit enclosure and is 1 1/2 in. from one end. The grid is connected directly to the chassis by a grid collet. The grid collet was made by soldering a grid contact ring, Eimac part No. 882931,<sup>2</sup> to a 1/16-in.-thick brass ring. The brass ring has three No. 6-32 stud bolts attached which match the location of the three mounting holes of the Johnson 124-311-100 socket. There are other ways to make a good grid collet, and ingenuity of the individual builder can assert itself. Certainly the multiple contacts that finger stock gives is the type of thing needed. Never depend on the control-grid socket connections (pins 4, 7, and 11) to be good enough for vhf or uhf service.

Contact to the anode of the tube is made by a plate collet. The collet was made by sandwiching an Eimac plate contact ring, part No. 008294,<sup>3</sup> between two 1/16-in.-thick brass pieces. The upper piece is circular with a 1-in.-wide tab on one side, the tab having a 3/8-in. lip bent at 90 degrees for the plate blocking-capacitor mounting. The lower brass piece is also circular, but without the tab. The plate collet is shown in Fig. 3.

The plate line is made of copper, 1/8-in. thick and 1-in. wide. A 3/8-in. lip is bent at the tube end of the line for connecting to the plate blocking capacitor. The far end of the line stops about 1/4-in. short of the enclosure wall. The plate line is supported near the far end by a 1 x 1 x 1/2-in.

block of copper, and by a 1-in.-high ceramic insulator 5 1/4-in. from the tube center. A 1/4-in. bolt passes through the plate-line slot, the support block and a slot in the enclosure wall. The exact location of the ceramic insulator is not critical, except that it must not interfere with the location of the plate tuning and coupling capacitors which are between it and the tube! Both copper and soft aluminum have been used for the plate line and the 1 x 1 x 1/2-in. support block. Very careful power measurements showed no difference in performance, whichever material was used. Brass might be satisfactory, if it is silver plated. For those willing to experiment, 1/16-in.-thick material might be used instead of 1/8-in., as in this amplifier. The line would then have to be slightly shorter to tune to resonance.

Rf power is taken out of the amplifier by capacitance coupling to the plate line. A 1-in.-dia disk is positioned near the tube end of the line and coupling is varied by a sliding arrangement. Details of this coupling device are shown by Fig. 6.

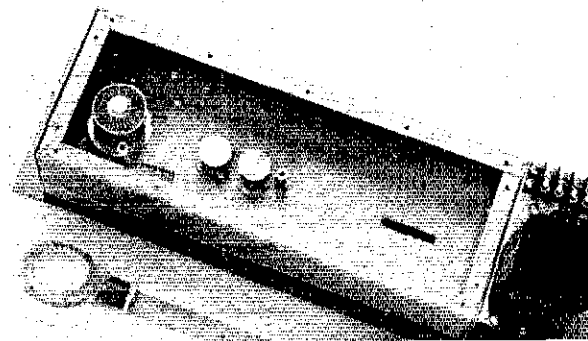
Plate tuning is done with a 1-in.-dia disk on a 1/4-in. threaded shaft which positions the disk relative to the plate line. The shaft turns in a threaded bearing mounted on the enclosure wall. When the plate-line support block is properly set, it is possible to tune the amplifier from 144 to 148 MHz without changing the position of the block. The plate tuning capacitor is spring loaded to prevent a variable ground-return path, sometimes encountered in this kind of device. The spring loader is made by soldering a threaded nut of the correct size to a piece of thin metal; brass or steel will do. This is then threaded on the turning shaft until it rests on two pillars mounted on the outside enclosure wall. Just enough compression to prevent play in the tuning shaft gives the best results. This device can be seen just to the right of the output coaxial connector in Fig. 4.

The tube anode is cooled by a blower mounted on the plate-circuit enclosure cover. The only escape for the air is through the tube anode cooler, the chimney, and then the vent pipe. The chimney used in this amplifier was made from sheet Teflon approximately .050-in. thick, formed into a cylinder and then taped to keep that shape. Since this material is not readily available, a suitable arrangement can be worked out using the standard ceramic chimney for the 4X150 or 4CX250, such as the Eimac SK-606. The idea is to prevent the air from going directly to the vent pipe without going through the tube anode.

<sup>2</sup> These contact rings are available at \$3.75 each by sending a check to the Amateur Services Dept., Eimac Division of Varian, 301 Industrial Way, San Carlos, CA 94070.

<sup>3</sup> Ibid.

Fig. 3 - Plate-line box with the strip line removed. The output coupling capacitor is the disk near the tube. The other disk is the plate-tuning capacitor. A one-inch-high ceramic pillar supports the plate line and is located next to the tuning capacitor.



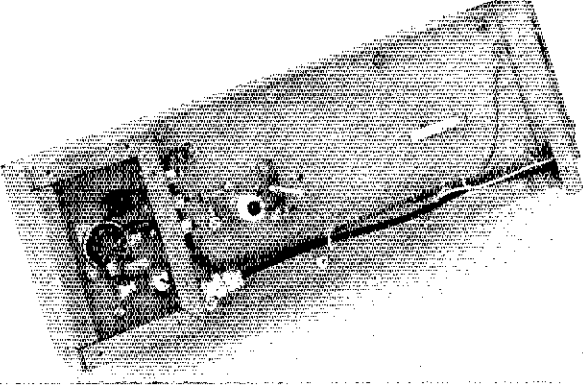


Fig. 4 - The front of the amplifier with the panel removed. The input-circuit enclosure which is to the left is normally covered with a piece of perforated aluminum. The spring-compression device which prevents erratic tuning of the plate-circuit resonating capacitor is shown just to the right of the type N output coax connector.

### Circuitry

In cathode-driven service the average input impedance of the 8874 is approximately 95 ohms. An input circuit, therefore, is needed for two reasons: (1) the input to the amplifier should look like 50 ohms to accommodate the transmission lines and the driver output impedance; this calls for an impedance transformer; and (2) the 95-ohm average input impedance varies tremendously during the rf cycle. For example, if the tube is operated Class B, the plate current is zero during half the rf cycle and the impedance is very high, but during the part of the cycle that the tube peak currents occur, the impedance is lower than 95 ohms. Since drivers don't like to have the load impedance varying wildly, a storage reservoir should be provided. A tuned circuit with some  $Q$  serves this function and also transforms the impedance.

The cathode input circuit is an  $L$ - $\pi$  network using lumped constants. It was designed to have a loaded  $Q$  of 3. Knobs were not provided for adjusting the input circuit because of its broadband nature. Instead, screwdriver slots in the capacitor shafts permit adjustment of the capacitors from outside the box. The "screwdriver" should be nonmetallic. A short 1/4-in.-dia Bakelite shaft filed in the shape of a screwdriver on one end and with a knob on the other end works very well. If the input circuit is matched at 146 MHz, changing frequency to either 144 or 148 MHz without touching the input adjustments will give an SWR of less than 1.7 to 1. At either 145 or 147 MHz the SWR is less than 1.35 to 1. Of course the input can be matched at any frequency within the band, if desired.

Fig. 5 shows the layout of parts in the input-circuit compartment. All of the six cathode terminals of the socket are connected together. The bifilar heater choke is wound on a small length of insulating rod and was made bifilar for the convenience of using only one form instead of two. Sharp-eyed readers who like to count turns will note that the outside layer of this coil has one less turn than the one on the inside. Again, it was a matter of convenience, not a requirement.

Although the  $\pi$ - $L$  or  $L$ - $\pi$  and  $T$  networks have been around a long time, the  $T$  network has not been used much. The  $T$  is useful where low-impedance transformations are necessary. The solid-state designers have this sort of problem in their work and have developed tables of solutions for a wide variety of impedance transformations.<sup>4</sup> A copy of these tables is very useful, indeed.

All of the power leads into the rf compartments enter via feedthrough bypass capacitors. They help keep the rf where it belongs. Three are low-voltage types, which feed the cathode and filament circuits. The fourth is a high-voltage unit for the plate voltage supplied to the tube.

### Cooling the Tube

The cooling of the tube is done somewhat differently than is usually the case. The tube data sheet, for 400-watts plate dissipation, specifies a minimum air flow of 8.6 ft<sup>3</sup>/min for 50 degrees C at sea level (you can use a little less if the air is cooler than 50 degrees C). The pressure required to move that quantity of air through the tube cooler is 0.37 inches of water, assuming no back pressure on the discharge side of the anode. This cooling air is provided by a Dayton model 2C782 blower.<sup>5</sup> The blower forces air into the box containing the tube plate circuit. A Teflon chimney connects the top of the tube anode to the vent pipe fastened on the box cover. All other holes in the plate-circuit box are sealed, so that the air blown into the box

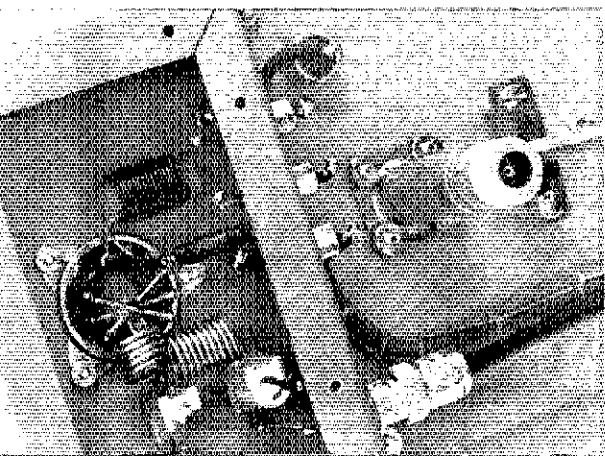


Fig. 5 - Close-up view of the input-circuit box. The bifilar-wound filament choke is above. The cathode choke is to the right and the input  $T$ -network coils and capacitors are below the tube socket. The slide mounting of the type N output coupling capacitor is shown to the right of the input-circuit enclosure.

<sup>4</sup> *Matching Network Designs with Computer Solutions*, Application Note AN-267, Motorola, Box 20912, Phoenix, AZ 85036.  
<sup>5</sup> Available from W. W. Grainger, Inc., 2750 W. Fulton St., Chicago, IL 60612.

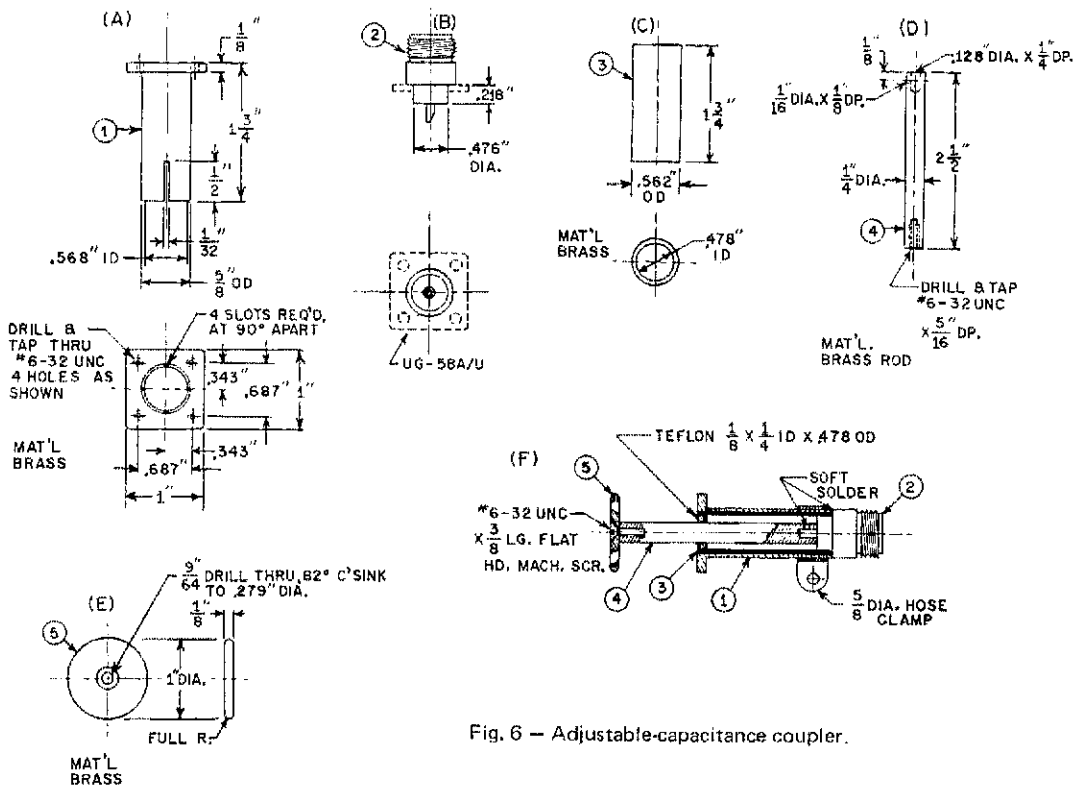


Fig. 6 - Adjustable-capacitance coupler.

can only escape by going through the tube anode cooling fins and then to the outside world. The vent pipe has practically no air restriction, yet acts as a very effective choke at these radio frequencies.

Equipment built for amateur service has not often taken advantage of the particular principle of microwave radio by which the vent pipe works - electronically, that is. In this case it is used for what it will *not* do, rather than for what it *will* do; that is, it will not transmit a radio signal of any frequency below about 4600 MHz. The pipe has a diameter of 1 1/2 in. For frequencies above 4600 MHz this would be an excellent transmission line. However, for frequencies much below 4600 MHz, the cutoff frequency, it becomes a choke. Its effectiveness as a choke depends upon how long it is. The usual description of this phenomenon is "wave guide beyond cutoff"; in this case "beyond" means below! The attenuation of this device is given by the formula:<sup>6</sup>

$$A_a = \text{Aperture attenuation (dB)} = 32 \frac{D}{d}$$

D = length of pipe  
d = inside diameter of pipe

The vent pipe used in this amplifier is 4 1/2-in. long and 1 1/2-in. ID. When these figures are put into the formula, this gives an attenuation of 96 dB! This attenuation is for frequencies well below the cutoff frequency, not for those close by. However, the 144-MHz output of the amplifier and its harmonics up to about the 20th can be considered well below cutoff.

### Tune-up Procedure

Tuning a cathode-driven amplifier is not much different than tuning one which is grid driven. There is one precaution that must be observed, though. Never run drive power into a cathode-driven amplifier unless the plate voltage is on. Running normal drive power with no plate voltage produces high grid dissipation and will quickly destroy the tube.

The 8874 has an indirectly heated cathode. Always allow at least 90 seconds for the heater to warm up before the tube is required to draw plate current.

When tuning a new amplifier for the first time, it is very helpful to start with reduced plate voltage. If the final operating conditions with this amplifier are to be 2000 V at 500 mA, then apply 1000 V to the plate and only enough drive to be able to tune the plate circuit to resonance. Then increase drive and adjust plate loading and tuning to maximize power output, while watching the grid meter to make sure that the current is not excessive, indicating high grid dissipation. When the drive, plate loading and tuning are optimized for maximum power output at 1000 V and 250-mA plate current, then the loading adjustments will be very nearly correct for the 2000-V 500-mA condition. Before going to the higher plate voltage, the cathode input circuit can be adjusted for a low input SWR. Do not waste time matching the input circuit exactly, as the input match will change somewhat at the higher power level.

<sup>6</sup> *Electrical Design News*, October, 1963.

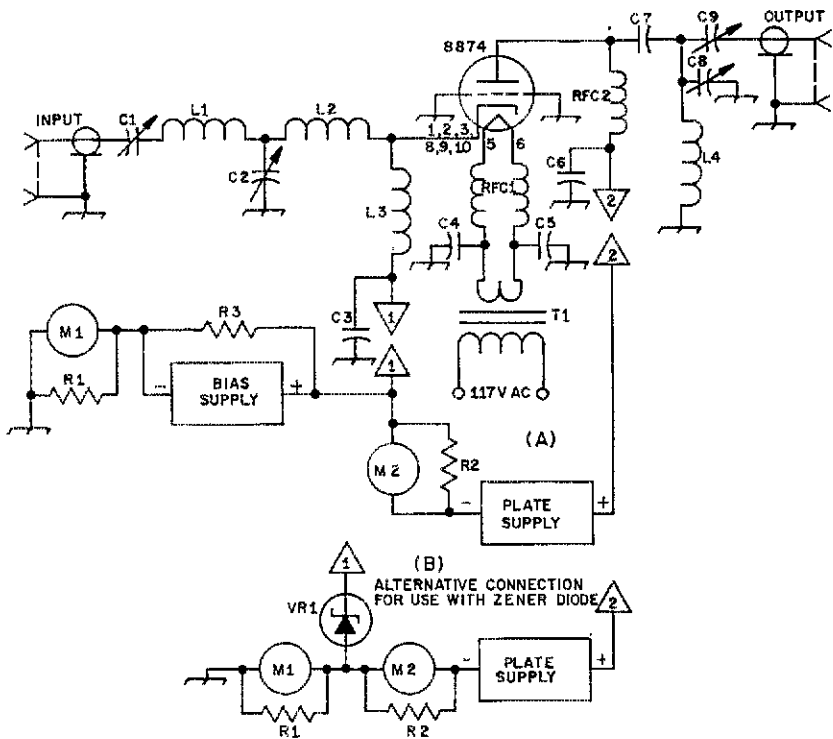


Fig. 7 — 144- to 148-MHz 8874 amplifier.

- C1 — 2.4 to 24.5 pF air variable (E. F. Johnson 189-509-4).
- C2 — 1.7 to 14.1 pF air variable (E. F. Johnson 189-505-4).
- C3, C4, C5 — 1000-pF feedthrough (Erie 327-005-X5UO-102M or equiv.).
- C6 — 1000-pF feedthrough, 2.5 kV (Erie 1270-10 or equiv.).
- C7 — 100 pF, 5 kV (Centralab 8505-100N or equiv.).
- C8, C9 — See text.
- L1 — 9 turns No. 16 wire, 3/8-in. dia, 5/8-in. long.
- L2 — 5 turns No. 16 wire, 3/8-in. dia, 3/8-in. long.

- L3 — 0.47- $\mu$ H choke, 300 mA (Miller 4588 or equiv.).
- L4 — Plate line; 1  $\times$  1/8-in. copper or soft aluminum, 8 1/2-in. long.
- M1 — 50-mA dc meter.
- M2 — 500-mA dc meter.
- R1, R2 — 50 ohms, 10 W.
- R3 — Bias-supply bleeder; select for approx. 100 mA current and appropriate wattage.
- RFC1 — Bifilar wound, each winding 15 turns on 3/8-in.-dia form. See text and photos.
- RFC2 — 10 turns No. 16 wire, 1/2-in. dia, 1 1/8-in. long.
- T1 — Filament trans., 6.3-V 4-A secondary (Triad F-43X or equiv.).
- VR1 — See text.

Now the plate voltage can be raised to 2000 V and drive power increased to give about 500-mA plate current. Again, plate loading and tuning and drive power are adjusted for maximum power output at the desired power level. And of course the grid-current meter is watched to avoid excessive grid dissipation. When the plate-circuit adjustments have been completed, then the input circuit can be adjusted for minimum SWR. If the drive power is free of harmonics or other spurious signals, an SWR of better than 1.1 to 1 is easily obtained on the drive line.

Of course it is not necessary to tune up for the first time with reduced plate voltage. However, if you start off at 2000 volts, then a great deal more care must be used. Unwanted or unexpected effects happen a lot faster and with more violence at 2000 volts than at 1000!

The preceding tune-up procedure applies to either cw or ssb linear operation. For a-m, the method would be the same provided that loading is adjusted for the most output at the crest of the modulation cycle when the drive signal is being 100-percent modulated. A peak-voltage-responding indicator is needed on the output of the amplifier to do that. An rf vacuum-tube voltmeter is one of the instruments that can be used.

A second method that can be used is to adjust the amplifier loading and tuning for minimum distortion when the drive signal is being 100-percent modulated. Still another method that will produce the correct loading adjustment is to simulate the conditions that exist at the crest of the modulation cycle, but by using a cw signal only. For example, if a driver with a 5-watt carrier is to be used, it will have a peak output of 20 watts

Table I

Typical Performance								
Plate Voltage	No - Signal Plate Current	Grid Bias	Plate Current	Grid Current	Drive Power	Power Output	Efficy.	Gain
1000	10 mA	-4.6V	250 mA	24 mA	7.2W	146W	58%	13.1 dB
1500	10	-7	250	25	8.4	238	63	14.5
2000	10	-9.8	250	22	9.4	320	64	15.3
1000	92	0	300	26	7.0	171	57	13.9
1500	140	0	400	27	11.4	362	60	15
2000	150	-1.7	500	29	18.3	636	64	15.4

Table II

Type 8874 Tube Data	
Heater Voltage	6.3 V
Heater Current	3.2 A
Maximum Plate Voltage	2200 V
Maximum dc Plate Current (key down)	250 mA
Maximum dc Plate Current (modulation crest)	500 mA
Maximum Plate Dissipation	400 W
Maximum Grid Dissipation	5 W

at the crest of the modulation cycle. Therefore a cw signal of 20 watts can be used as a driver temporarily while the linear amplifier is being adjusted for maximum power output, just as it is for cw or ssb operation. After the adjustments are completed the 5-watt driver can replace the 20-watt unit, and the amplifier is ready to go.

The important point to remember about an a-m linear amplifier is that the amplifier must be adjusted to accommodate the peak power conditions. One of the most difficult facts to accept is that amplifier settings which give the best and most readable signal are not the same as those which give the strongest carrier. After the amplifier has been correctly tuned, one is always tempted to touch up the tuning to get more carrier output. When the temptation is great, reread the paragraphs on a-m linear-amplifier adjustment!

You should now have amplifier performance which is very nearly like that shown in Table I. Because of variations from tube to tube, the grid current at a particular operating level may vary considerably from that shown in the table, possibly as much as 2 to 1. Drive power requirements may also vary, but to a smaller degree. This may be lesser or greater by 10 or 20 percent.

### Performance

The amplifier can be used for cw or as a linear amplifier for either ssb or a-m work. The mode of operation will determine the maximum input power that can be used. Table I shows the

measured performance of the amplifier with different plate voltages and idling plate currents.

Some conclusions can be reached from the data shown in Table I. The table shows that higher efficiencies and gain are possible with higher plate voltage and, of course, higher power output. Also, the lower the idling plate current, the lower the gain, but efficiency goes up.

For linear-amplifier service, good results can be obtained if the tube bias is set for an idling plate current of 25 to 50 mA. A Zener diode in the cathode return is probably the simplest way to get the needed bias. However, a variable low-voltage supply can be used and has the advantage of flexibility if much experimenting is to be done. A suitable circuit for such a supply is shown in the 1971 ARRL Handbook.

Other construction techniques such as coaxial resonant cavities can be used to build a good amplifier. What has been described is a fairly simple, easy-to-build unit. The 8873 family of tubes will do a good job at vhf and uhf in a well-designed amplifier. QST

## The Simulmonitor

(Continued from page 23)

A commercial transistorized amplifier suitable for Z1 is available at very nominal cost. It has a diode and filter capacitor, for rectification and filtering, so it is necessary to power the unit with only the 6.3 volts ac from the filament supply. This amplifier provides the local audio, and drives a local speaker for monitoring purposes during maintenance. Amplifier Z2 is similar. It provides the needed line level from the tone oscillator and the microphone.

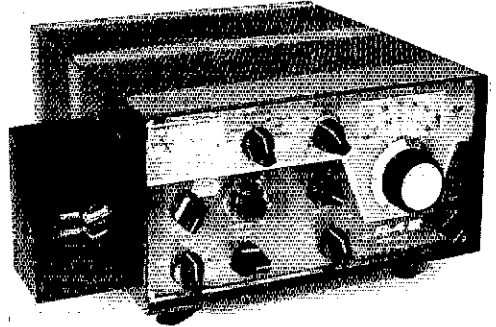
A jumper shown as a broken line between Terminals 5 and 9 of K2 determines whether a

tone burst is received only when the primary receiver is operative, or when either primary or secondary receiver is operative. This is the first step toward a future control system.

This, then, is the Simulmonitor, as conceived and utilized by CFAR. As channel occupancy increases and more satellite receiving setups come into the system, the approach becomes more sophisticated, and the Simulmonitor may change almost beyond recognition. In other areas the technique is used under other names and with other features, but the basic concept will most likely remain, and provide many benefits. The net result will be further advancement in the story of amateur radio repeaters. The story is just now starting to be told. QST

# A Crystal Filter for the Drake R-4B

BY DAVID SUMNER,\* K1ZND



**H**ERE IS an easy (though expensive) modification which may be performed on the Drake R-4 series of receivers to add a crystal filter. No holes need be drilled and the receiver can be restored to its original condition in less than an hour. The modified receiver has an i-f system with a 6-dB bandpass of approximately 2.2 kHz and a 6:60-dB shape factor of 1.5:1.

The R-4 is a dual-conversion receiver with a four-pole, 6-kHz-wide crystal filter in the first i-f stage (5645 kHz). The purpose of this filter is to provide immunity to out-of-band signals and to assure adequate image rejection which might otherwise be a problem in a receiver with a 50-kHz second i-f. The companion T-4XB exciter/transmitter uses two 8-pole crystal filters at 5645 kHz — one for each sideband. If provision is made for impedance matching, it is possible to use the 8-pole transmitter filters in the receiver first i-f stage. The combination of the sharper crystal filter in the first i-f and the LC filter in the second i-f provides excellent selectivity for ssb operation.

### Components

The 8-pole filters are available from the R. L. Drake Company at a cost of approximately \$80. Included in the package are two filters, a switch, and a mounting bracket. Additionally, a set of

\* P.O. Box 17401, West Hartford, CT 06117.

matching transformers is required (T2 and T3 in the T-4XB). These cost approximately \$8 for the pair. The only other items needed are three feet of shielded cable (RG-174 or equiv.), a metal box, and three 1/4-inch-dia rubber grommets. Any aluminum box larger than 2 1/2 x 3 x 3 inches will be satisfactory.

### Step-by-Step Procedure

- 1) Mount the switch, bracket, and filters in the enclosure as shown in the photograph. Include two grommets on the rear of the box.
- 2) Route a pair of 18-in. coaxial cables through the grommets on the rear of the enclosure and connect the center conductor of each cable to the center lug of each switch pole. Connect the shields of both cables to the nearest ground lug, respectively.
- 3) Remove the receiver top and bottom covers.
- 4) Locate T5 and T6 (the filter matching transformer and the existing crystal filter). Make a sketch of the connections to these transformers (for later reference).

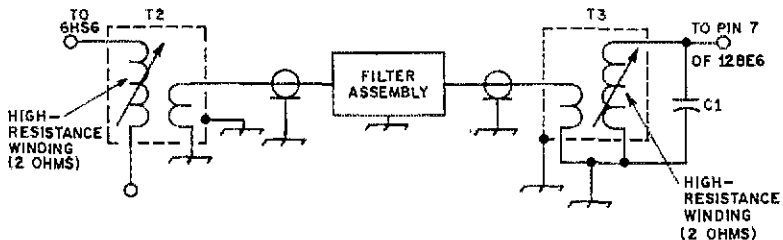
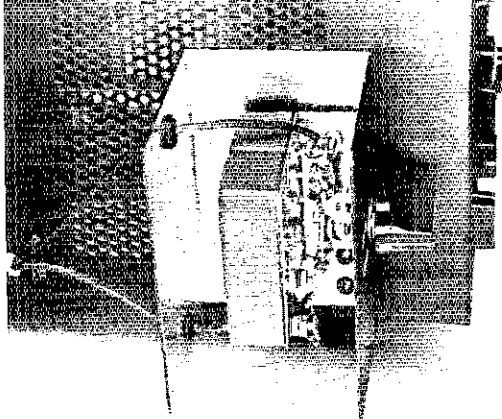


Fig. 1 — Circuit diagram of the modified i-f transformer section of the R-4B receiver. C1 is a 27-pF disk ceramic capacitor in the R-4A. The R-4B uses a 21-pF capacitor. The filter assembly consists of two filters, a ceramic switch, and a mounting bracket. T2 and T3 are the T-4XB transformer designations which replace the receiver T5 and T6 respectively.



Inside view of the filter assembly built by K1JHX. The box is homemade. Two of the screws for securing the receiver top cover are used to hold the assembly in place. Press-on decals and a Drake knob add a final touch.



5) Disconnect all of the leads to T5 and T6, then remove the transformers. It is not necessary to break or drill anything; the transformers are held in place with a pair of spring clips.

6) Install the new T2 and T3 (T-4XB nomenclature) transformers where T5 and T6 were mounted. T2 replaces T5 and T3 replaces T6. Note that in both cases the high-resistance windings (about 2 ohms) of both transformers are nearest the tube socket to which they are connected. See Fig. 1. The low-resistance windings of each transformer face each other.

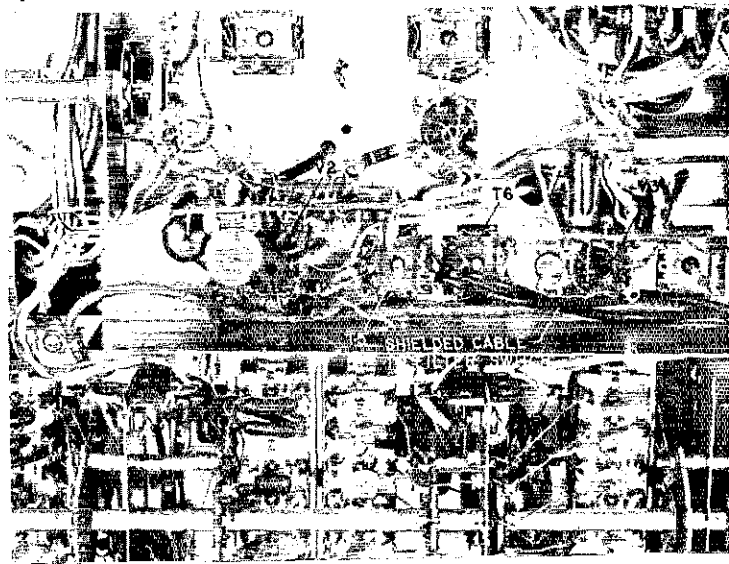
7) Reconnect all of the wires and components to the lugs on both transformers. *Exception:* Omit the connections between the two transformer low-resistance windings.

8) Position a rubber grommet in the spare jack hole on the rear chassis apron. Route the shielded wires from the filter box through the grommet and along the chassis to the new i-f transformers. Connect these cables to the i-f transformers as shown in Fig. 2. The center lugs on the transformers are not used. The lugs to which the shields are connected are then grounded with a short piece of hookup wire.

### Alignment

Set the receiver tuning dial to position one of the crystal calibrator markers in the middle of the passband. Select either USB or LSB with *both* the passband tuner and the crystal-filter switch. Adjust the PRESELECTOR, T2, and T3 for maximum S-meter reading. This condition occurs with the transformer slugs nearly all the way out. There should be no noticeable decrease in sensitivity or overall gain after the modification is completed.

Bottom view of the modified R-4B. The leads from the filter assembly are routed through a grommet in the rear chassis apron.



### Operation

The crystal-filter switch must be placed in the proper position for the mode of operation. The 4.8-kHz selectivity position of the passband switch is limited by the crystal filter, but the receiver is still usable for a-m reception.

The additional selectivity provided by the filter is noticed mostly while operating ssb during crowded band conditions. However, the cw performance is also improved since there is a substantial reduction of the audio image on the other side of zero beat. The entire modification requires roughly 2 1/2 hours. QET

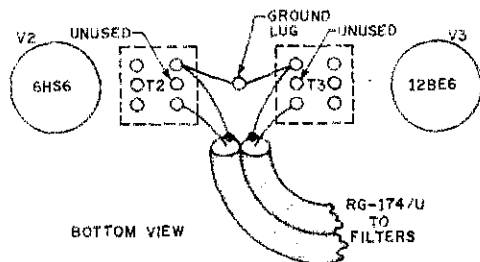


Fig. 2 — The two cables from the filters are routed through the grommet mounted on the rear chassis apron. The center lugs on the transformers are not used.

# A Helically Wound Vertical Antenna for the 75-Meter Band

BY GARY L. ELLINGSON,\* WA0WHE

IN ORDER to provide the reader with the complete story behind my helical antenna, some background information may be useful. I live at a QTH, similar to that of many other hams, where there is little room for a full-size dipole antenna for the lower frequencies. After some research, and ruling out buying a commercial antenna, a vertical radiator system was chosen.

In order to have a vertical antenna for the 75-meter band, however, the antenna would have to be around 65 feet tall. That, alone, would require guying, or some other means of support which would result in a structure with no aesthetic appeal to any nonhams (who comprise almost 100 percent of my neighborhood). By using a helical configuration, the overall antenna height is reduced, thus eliminating the need for guying. With the helically wound antenna, more equal current and voltage distribution is accomplished (as compared with a lumped impedance from a loading coil). As a result, a better radiation pattern is produced. With this system very little reactance has to be cancelled out, eliminating the need for an overly large "top hat." This antenna will easily take the full legal power limit.

Construction details for the antenna are shown in Fig. 1. The following is a list of parts I used in constructing the antenna system.

\* 123, North State St., Thief River Falls, MN 56701.

[EDITOR'S NOTE: Some form of metal top hat should be connected to the last turn of the driven element at the high-impedance end of the radiator. Extremely high levels of rf voltage can develop at the end of the helix, sometimes causing the tip of the antenna to burn. The top hat tends to lower the Q of the antenna, thus reducing the voltage level at the far end. An aluminum pie tin mounted on a ceramic cone insulator works well in this application.]

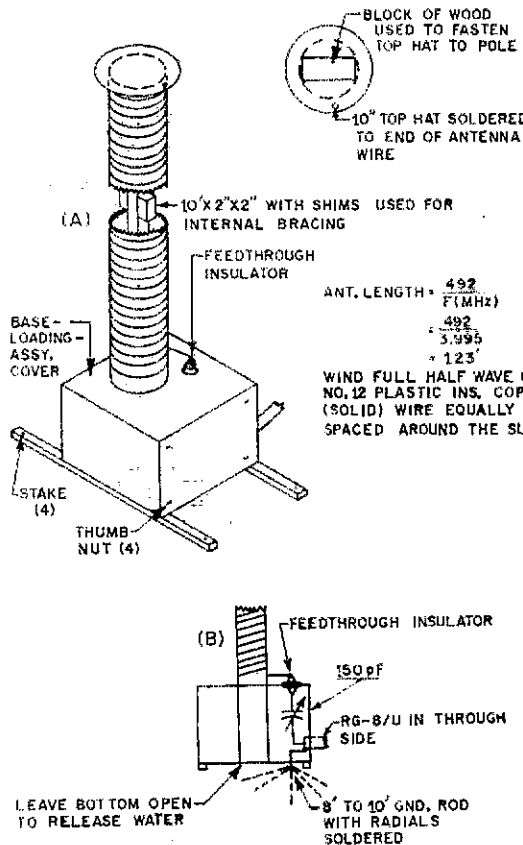


Fig. 1 — Construction details of the helically wound antenna.

### Antenna:

- 20-ft section of 4-in. OD plastic pipe (obtained at a local plumber) \$25.00
- 130 ft of No. 12 plastic-insulated solid copper wire (allow a little extra, about 2 ft) \$3.49
- 10-in. disk of sheet metal (top hat; stop at a sheet metal or furnace repairman - I got this free)
- 260 ft No. 14 solid bare copper wire (I used only four radials in this system; use as many as you have room or money for) \$7.50
- 20 sq. ft of marine plywood for base \$3.00
- 2 2 x 2 10-ft sections, for internal bracing \$2.00
- 1 8-ft copper ground rod (for radial junction) \$4.00

Total cost \$44.99

The cost can be reduced considerably if all materials are readily located or already owned.

Fig. 2 shows the results of SWR measurements. The SWR indicator used to make the measurements was a Midland model. The antenna was adjusted for minimum SWR at resonant frequency with the tuning capacitor at the base. The frequency for this antenna is 3995 kHz with 123 feet of wire wound on the support and one 8-ft ground rod and four 65-ft radials. There are numerous configurations possible with this system including a

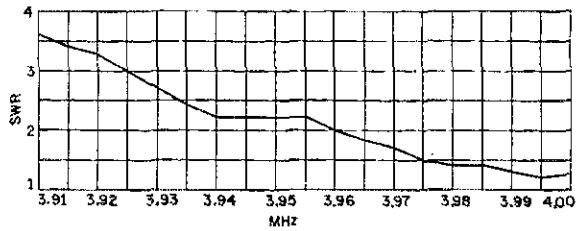


Fig. 2 - Measured SWR of the vertical antenna.

broadcasting favorite such as phasing two or more structures. I forgot to mention . . . give the entire structure one or two coats of marine varnish to seal the turns. **QST**

### Changes of Address

Please advise us direct of any change of address. As our address labels are prepared in advance, please allow six weeks notice. When notifying, please give old as well as new address and Zip codes. Your promptness will help you, the postal service and us. Thanks.

## From the Museum of Amateur Radio



Perched on top of one of our display cases is the radio-controlled sailplane built in 1937 by the late Ross Hull, then *QST* Editor, and the undersigned. It was quite successful although lacking present-day refinements. Control, through a reversable dc motor, was achieved up to distances of about a mile. It was flown at the international meet in Elmira, N.Y. Incidentally,

it was covered by liability insurance, the first such policy ever issued - Ross and I just couldn't see this 18-pound ship crashing into a passing automobile without coverage. We successfully demonstrated the control to the insurance people, landing it within five feet of the agent. He was impressed! But so were we! - *WIANA*

# Simple Approach to Circuit Boards

Compact Construction for Small Projects or Subassemblies

BY R. L. MORGENSTERN,\* WA2EAW

FOR THOSE of us with limited workshop space, or who for one reason or another want to make equipment as compact as possible, circuit boards are ideal. The compactness possible with these boards is hard to equal, but the making of them in the past has included some undesirable side effects for me. In the case of etched boards, there are dangers inherent in the solutions used as etchants. The special equipment needed for processing represents an extra cash outlay, and the storage or disposal of the acid may be a problem. Another drawback is that few of us have the vision to arrive at a perfect layout the first time, no matter how carefully we plan. After the board has been completed, we often find that some parts of the conducting circuitry are too far apart, or too close together, while some connections may have been omitted entirely. Trying to compensate for Murphy's Law with an etched board is not often successful.

Some time ago, I began a search for a circuit-board procedure that would embody simplicity, ease of fabrication, safety, stability, and flexibility (to allow for the "Law"). This has led to the production of many pieces of gear that enhance my station without taking up a lot of room.

## Materials

The first step was to acquire some readily available easily worked material for the circuit board itself. This turned out to be wood just thick enough to maintain rigidity, and soft enough to be pierced with a thin-pointed tool (diaper safety pins are fine), thereby eliminating the delicate task of making many holes with a fragile drill. I used some wood from an old cream-cheese box.

I first considered using foil for the conductor, but found that neither aluminum nor copper foil would adhere well to the board using ordinary cements because of the foil's nonporous surface. Furthermore, cutting out the necessary small intricate shapes proved to be a nerve-wracking and

\* 141-60 73 Avenue, Flushing, NY 11367

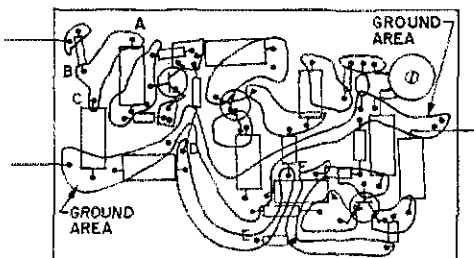


Fig. 1 — Top, or component side, of a typical circuit board. A full-size scale drawing of the component layout is transferred to the board by tracing over carbon paper. The irregularly shaped areas embrace terminals that are to be connected together. For example, in wiring up the board, terminals A, B, and C will be connected together; similarly, terminals D, E, and F will be connected together. The long narrow area weaving through the approximate center of the board includes all ground connections.

time-consuming task. Some foils cannot be soldered to, at least not without melting the foil. I finally decided to use bare copper wire for the connections. The wire is small enough in area that it will be sealed to the board when cement is flowed over it.

## Layout

In the long run, it will pay to take plenty of time to arrange and rearrange components (or full-scale paper substitutes) several times to arrive at the simplest wiring layout. Make a free-hand sketch of each layout arrangement as you go along so that you can compare them for simplicity. The main objective is to keep the leads of components that are to be connected together in one small area. Keep all terminals that are to be grounded in one unhampered area. This area need not necessarily be a small one, but it should be kept clear of other connections. (See the ground area indicated in Fig. 1 as an example.)

Once the simplest arrangement of components has been decided upon, make a full-scale, accurate

*This is a no-cost, no-chemicals approach to circuit-board construction. The extension to a better base material (phenolic or glass epoxy) is obvious. The carbon-paper scheme also can be used for transferring templates and layouts to regular foil-equipped circuit boards for etching.*

Fig. 3 -- The completed circuit board as seen from the component side. The shaded areas represent connections on the back side of the board, an X-ray view as shown here.

drawing of the board with its components in place, including outlines of the components. Indicate with dots the points where component leads will pass through the board. When the drawing has been completed, draw area lines around the groups of dots representing leads that are to be connected together. The final drawing should look something like Fig. 1, with the connecting-area boundaries superimposed on the component layout. Before proceeding further, carefully check your layout drawing against your wiring diagram to make sure that the connections will agree when your board is wired up.

Now place the board on a firm flat surface. Place two sheets of carbon paper, back to back, between the board and your scale drawing, with the drawing facing you. Fasten this "sandwich" together by pushing three or more straight pins through the layers of paper and into the board. Then, with a ball-point pen, use firm pressure (but gentle enough to avoid tearing the paper) to trace the complete drawing. When the sandwich is disassembled, a copy of the drawing (Fig. 1) should be left on the board, and a reverse copy should appear on the back side of the drawing itself.

Now push the pins through the board only, using the same holes as before. Let the pins protrude about 1/4 inch from the back side of the board. Place a piece of carbon paper, somewhat larger than the board, carbon side down, over the clean back side of the board, forcing the paper down over the protruding ends of the pins. Place your original scale drawing, face down, on the carbon paper, carefully matching the pins with the pin holes made in the drawing during the first operation. Tape the drawing and carbon to the board while the pins are still in place, being careful not to pull the paper so tight that it tears at the pin

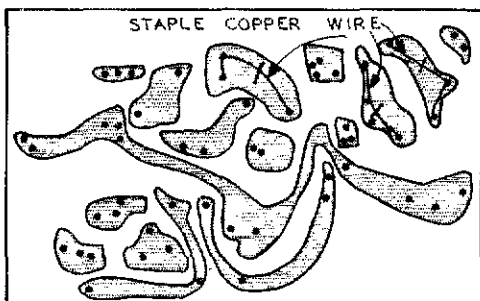
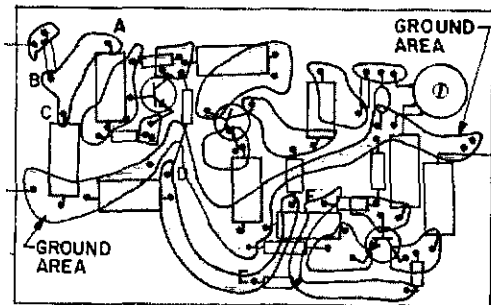


Fig. 2 -- Back, or wiring, side of the same board shown in Fig. 1. When a reverse drawing of the wiring areas only is transferred to this side of the board as described in the text, the patterns on opposite sides of the board should match up, as shown in Fig. 3. The shaded areas indicate connecting wires that are installed after the components have been mounted on the top side of the board.



holes. Remove the pins, allowing the tape to hold the drawing and carbon paper in place. Now trace the reverse drawing, which should be facing you, with a ball-point pen as before, *except* trace only the outlines of the connecting areas -- not the component outlines. When this sandwich is disassembled, a reverse drawing should be left on the back side of the board, as in Fig. 2.

For the next step, have the top side of the board (Fig. 1) facing you. Push a pin through the board at each dot, wiggling the pin a bit to make the hole large enough to pass the component lead.

Now turn the board over, form connecting wires to follow the hole pattern in each area, and staple each wire in place temporarily. See Fig. 2. Mount the components on the top side of the board, pushing the terminal leads through the holes. You can solder to the connecting wires underneath as you go along, or wait until all components have been mounted. When the soldering is complete, remove the staples, and flow a coating of cement over each connecting wire. This should complete the circuit board. QST

## Strays

QST congratulates . . .

Katashi Nose, KH6IJ, upon receiving the "Excellence in Teaching" award from the University of Hawaii.

Eunice Bernon, K8ONA, recipient of the 1971 Veterans Award of the Joint Veterans Commission of Cuyahoga County (Ohio).

Vernon Wilson, W3MA, promoted to FCC Engineer-in-Charge, Philadelphia, PA.

Philip E. Deaven, WB6QIZ, awarded the first W6HC Harry Engwicht Memorial Scholarship.

Earle Porter, VE3FPP, appointed Director, Telecommunications and Electronics Branch of the Canadian Air Transportation Administration.

Earl E. Weston, W8BXO, elected president of the Medical Amateur Radio Council.

Sir Ian Orr-Weing, O.B.E., G5OG, elevated to a life peerage.

Monterey Park Amateur Radio Club, for their award-winning "Ham Radio Around the World" parade entry.

Sadami Kitahara, KH6DK, presented a "Sustained Superior" award for his outstanding 23 years of service with WVVH.

John P. LaBlonde, W9FZC, elected Secretary-Treasurer of the Wisconsin Chapter of the Associated Police Communications Officers, Inc.

## • Beginner and Novice

# Why A Beam Antenna?

Some Basic Antenna Information for the Newcomer

BY LEWIS G. McCOY,\* WHCP

A NOVICE doesn't have to operate on 15 meters very long before he gets a yen for an antenna that will give more push to his signal. This article treats the design and construction of rotatable antennas, from a simple one to a four-element beam. The latter should appeal to the most seasoned operators.

### Beam Antennas

Before getting into construction details, let's talk a little about beam antennas so the newcomer will have a better idea of how they work. You won't be in ham radio very long before you hear hams talking about *gain*, or *power gain* from an antenna. Let's make one point clear at the beginning. An antenna is *never* a power amplifier. Some amateurs believe that an antenna can amplify their signal. This is an incorrect assumption. What a beam antenna does is to take our signal and guide it, so that we have more power going in one direction than in another. The more we concentrate our rf energy in one direction, the more gain we have in that direction.

Gain figures are usually expressed in *decibels* (dB). You'll hear a lot about decibels in ham radio, so a short explanation is in order. A decibel is not a unit of power but rather a *ratio* of power levels. One decibel usually refers to a just-noticeable increase in signal strength. If the power were increased by five dB, for example, it means that there have been five just-noticeable increases in signal strength. *Doubling* your power would cause an increase of 3 dB, and *four* times the power would be 6 dB.<sup>1</sup>

\* Novice Editor

<sup>1</sup> For a power increase of 1.9953 the increase in gain equals 3 dB.

In amateur work, antenna gain is usually rated in dB. Naturally, the next question would be, "Antenna gain over what?" Most amateurs use a half-wavelength dipole as a standard of reference. In theory the dipole has a radiation pattern like a figure 8 with two major lobes of radiation, each with equal signal strength. If we set up a dipole and a test antenna, and then measure the difference in signal strength between the two, we can make relative measurement of the gain or loss of the test antenna against the reference dipole. These gain or loss figures are rated in dB.

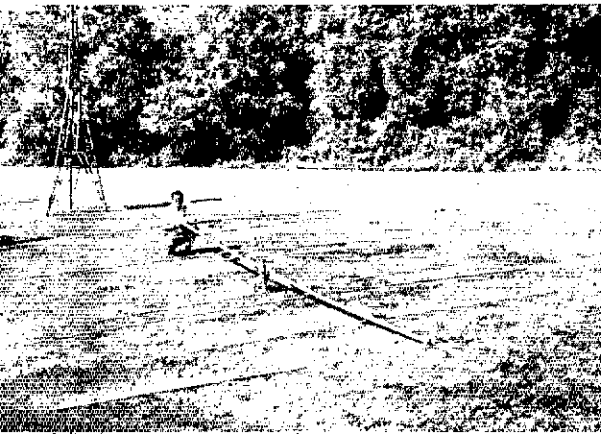
You'll also see gain figures on antennas referenced against an *isotropic source*.<sup>2</sup> It is impossible to make an isotropic "antenna" but such a reference is used in relating antenna gains. The reason this is mentioned here is because a half-wave dipole has a gain of 2.14 dB over the theoretical isotropic radiator. This is why some antenna manufacturers like to show gain figures over an isotropic radiator rather than a dipole. It gives them bigger gain claims in their advertising copy!

### Yagi Antennas

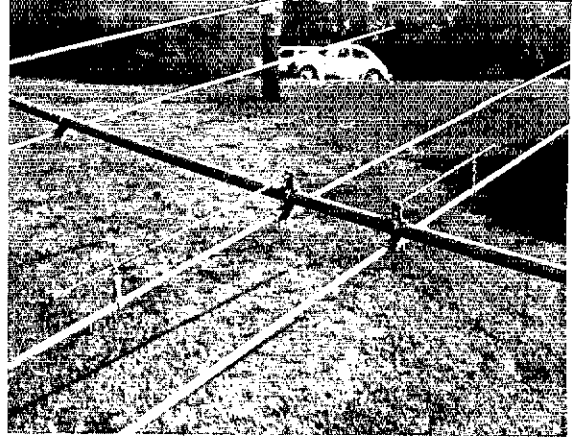
The most popular beam antenna used by hams is called a Yagi (after one of its inventors). The Yagi consists of a driven element (a half-wavelength dipole) plus "parasitic" elements. The reason we call them parasitic elements is because power is supplied to only the driven element, directly. These parasitic elements are usually longer (reflectors), or shorter (directors) than the driven element. It is customary to use a single reflector and one or more directors. The common three-element beam consists of a reflector, driven element, and director. Depending on the spacing and lengths of the elements and the tuning of the array, the gain of a three-element beam should be approximately 7 dB over that of a half-wavelength dipole. In other words, if you had a reference dipole aligned so that it radiates best in the same direction as the beam, the beamed signal will be 7 dB stronger in its favored direction.

<sup>2</sup> An isotropic antenna would have the ability to send out equal amounts of energy in all directions.

Ready for erection, this is the completed dual-band beam.



These are the 15- and 10-meter gamma-matching sections. These matching units, and the boom-to-element U-bolt assemblies are manufactured by Kirk Electronics.



Because the beam concentrates the rf energy, it offers another advantage over a dipole: most of the signal will be going in one direction from the beam — off the front. This means that there will be a signal minimum off the back; thus the beam has a *front-to-back* ratio. Depending on the tuning of the array, the front-to-back ratio of a three-element beam can be as great as 30 dB. This can really help in rejecting undesired received signals. Likewise, a beam antenna can have front-to-side rejection on the order of 40 to 50 dB. One can quickly see the advantage of using a beam antenna.

### A Rotatable Dipole

The simplest method of taking advantage of an antenna's directive characteristics is to rotate it. The simplest antenna for this purpose is a rotatable dipole. Shown in Fig. 1 is a 15-meter rotatable antenna that can be made from easily available materials. This antenna will provide a good match to 50-ohm coaxial cable, and without complicated matching networks.

The dipole is made from two 10-foot lengths of electrician's thin-wall steel tubing. Aluminum tubing could be used but practically any electrical supply house has thin-wall tubing in stock, and the two lengths should cost only a few dollars. The correct length for a full-size 21.15-MHz dipole is about 22 feet. Twenty feet of material is slightly short, so the additional length is made up with a small coil mounted at the center of the dipole. The electrical circuit for the antenna is shown at Fig. 1A. The coil is made from 1/8-inch-diameter copper tubing and consists of 5 turns, one inch in diameter with 1/4-inch spacing between turns. The ends of the tubing at the center of the antenna should be flattened with a hammer or in a vise. A coax fitting, chassis type SO-239, is installed as shown in Fig. 1 at C. The coil, L1, is connected between the inner pin of the coax fitting and the other half of the element. Four standoff insulators are mounted on a four-foot length of 2 x 2 wood to support the completed dipole. A one-inch

floor-mount pipe flange can be installed on the 2 x 2, and the antenna mast can be a length of one-inch pipe screwed into it. This antenna is light enough to be turned by a TV rotator, or the mast can be mounted near the shack window with TV hardware and rotated via the "Armstrong method."

### A 2-, 3-, or 4-Element Beam

The "one-element" beam just described will have no front-to-back ratio because a dipole radiates equally well in two directions. It will have useful front-to-side characteristics but if gain is desired, additional elements will be required. Depending on how ambitious the amateur is (and how healthy his pocketbook is), the 4-element beam shown in the photographs may be constructed to provide a high-performance directive array.

With four elements, this antenna will provide approximately 10 dB of gain — which can be likened to increasing your power by 10 times! However, you don't have to employ four elements. A two-element beam with a driven element and a reflector will provide about 5 dB gain and 10 to 15 dB front-to-back ratio. It seems that the majority of hams prefer a three-element array (director, driven element, and reflector). So, depending on space availability and your pocketbook, you can take your choice.

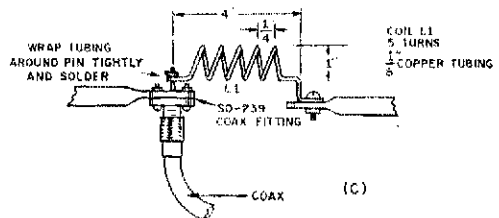
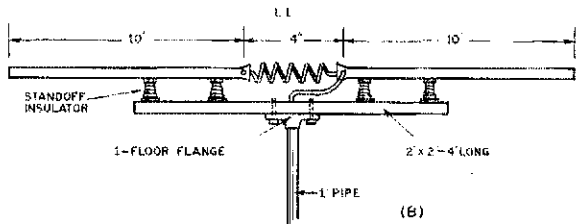
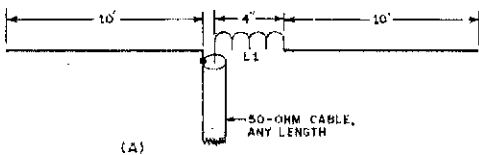
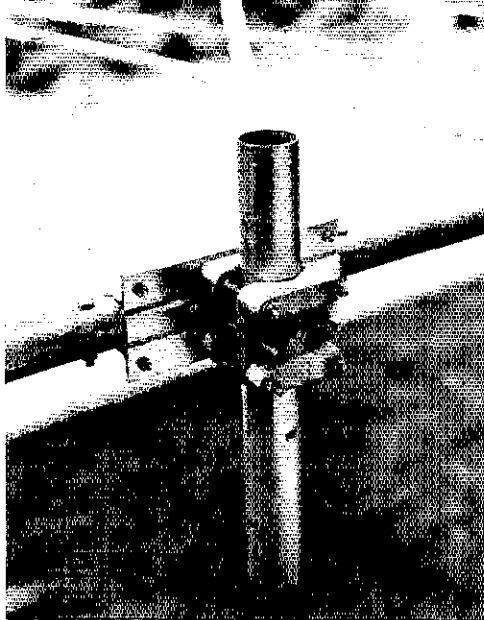


Fig. 1 — At A is the electrical circuit of the one-element rotary antenna, and at B, the construction details. Details for making L1 are shown at C.



This is the boom-to-mast fixture that holds the two 12-foot boom sections together. The unit is made by Hy-Gain Electronics.

### Construction Information

Shown in Fig. 1 are the element lengths and spacings. Whatever you decide on — 2, 3, or 4 elements — the same spacing and lengths can be used. For example, a 2-element beam, driven element, and reflector, would have a boom length of 8 feet, and the driven element would be 22 feet, 4 inches long. The reflector would be 23 feet, 6 inches in length. When you get your General Class or higher license you may want to add another band. In the antenna shown here, we actually have made a two-band beam, four elements on 15 and four on 10.

The array is constructed with 6061-T6 aluminum tubing. This material is available from metal dealers; check your Yellow Pages for the nearest supplier. The standard tubing length is 12

feet. This means that telescoping sections have to be used to obtain the required lengths. The 15-meter elements use 1-inch OD sections for the center portions of the elements. The wall thickness is .058 inch. This is an important point to keep in mind if you are to build antennas. If you use .058-inch wall-thickness material, the next lower standard size will telescope into it. In this case it would be 7/8-inch OD tubing. For example, the 1-inch stock has an ID of .884 inch, so 7/8-inch tubing (0.875 inch OD) will slide very nicely into the 1-inch OD size. The ends of the larger tubing can be slit with a hacksaw and then compression hose clamps can be used to tighten the connection.

In the antenna shown, the boom has an OD of 2 inches. The boom material also comes in 12-foot lengths so they must be joined together for this antenna. The next smaller size tubing could be used as a joint, but we elected to use a commercial boom-to-mast mounting<sup>3</sup> that serves the dual purpose of joining the sections and as a mast attachment. In addition, with this fixture the beam can be tilted to provide access to the elements after the antenna is installed on the tower.

For 15 meters, each element is made from two lengths of tubing, a 12-foot length of the 1-inch OD (.058 wall), and one 12-foot length of 7/8-inch OD, .035 wall. The 7/8-inch stock is cut into two equal lengths, and these sections are used to telescope into the larger tubing. The ends of the 1-inch OD stock are slit with a hacksaw, about a one-inch cut, and garden hose compression clamps are slid over the slit portion and tightened.

If it is desired to add the 10-meter beam, the elements can be made from 3/4-inch OD, .058-inch wall for the center sections. The telescoping portions are made from 5/8-inch OD stock, .028-inch wall thickness. Only two 12-foot lengths of this material are required for the four-element beam. Each length is cut into four 3-foot pieces and these are used for telescoping sections.

The driven elements of the beams are fed with 50-ohm coax cable. A matching network is required on each driven element to match the antenna impedance to that of the coax cable. The matching sections shown in the photograph are called *gamma matches*. These shown are a commercial type, manufactured by Kirk Electronics.<sup>4</sup> Also, the element-to-boom U-bolt assemblies are Kirk products. However, automobile muffler clamps can also be used to support the elements.

<sup>3</sup> Hy-Gain Electronics Corp., P.O. Box 5407-HK, Lincoln, NE 68505.

<sup>4</sup> Kirk Electronics, 6151 Dayton-Liberty Road, Dayton, OH 45418.

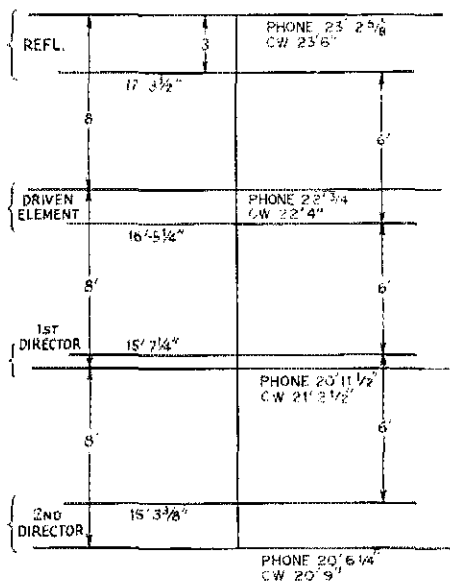


Fig. 2 — Element lengths and spacing information for the 15- and 10-meter beams.



## Antenna Height

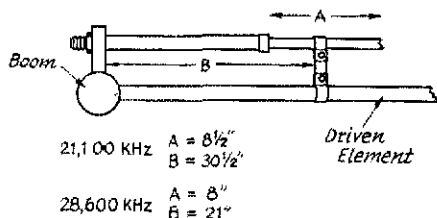


Fig. 3 — Dimensions for the gamma-matching system.

### Adjustments

The only tuning adjustment for the beam is setting the gamma match. Ideally, the gamma adjustments should be made with the antenna mounted in its permanent location. However, this can be difficult because in many cases it may be impossible to reach the gamma match when the antenna is installed on a tower. Fortunately, there is a simple method of making the adjustments while the antenna is on the ground.

The antenna should first be mounted in a vertical position with the reflector element resting on earth. In other words, the beam would be pointed straight up. The beam can be guyed temporarily with clothesline while making the adjustments. Under this setup, the driven element will only be eight feet above ground and will be easy to reach from a stepladder.

Connect a short length of 50-ohm coax to the feed point on the boom and then insert an SWR bridge between the short length and the transmission line running to the transmitter. Next, set the gamma adjustments to the dimensions shown in Fig. 3. These figures probably won't be the final settings but will provide a starting point. Turn on the transmitter and feed enough power to the beam to obtain a reading on the SWR indicator. Switch the indicator to read reflected power and adjust the gamma section until a reading of zero reflected power is obtained. This indicates a standing wave ratio of 1 — a matched condition for the system. The beam can then be mounted in its permanent location. There may be a slight change in the SWR, and if so, the gamma section can be "tweaked" to get a perfect match. The beam shown was installed on a 60-foot tower after being matched on the ground. The SWR with the beam on the tower was only 1.2:1 so we didn't bother to make any further adjustments.

Some readers may be concerned about the element lengths and tuning of the beam. If you can reach the reflector and directors you'll probably have the urge to tune the antenna for more gain or greater front-to-back ratio. It may be worthwhile with very close-spaced arrays where the elements only have one-tenth wavelength separation. However, with wide spacing (such as used in this array) tuning the elements just isn't worth the time and effort. Countless experiments have shown that any difference in gain between an antenna cut to the formula lengths, and one that is tuned, is practically unmeasurable.

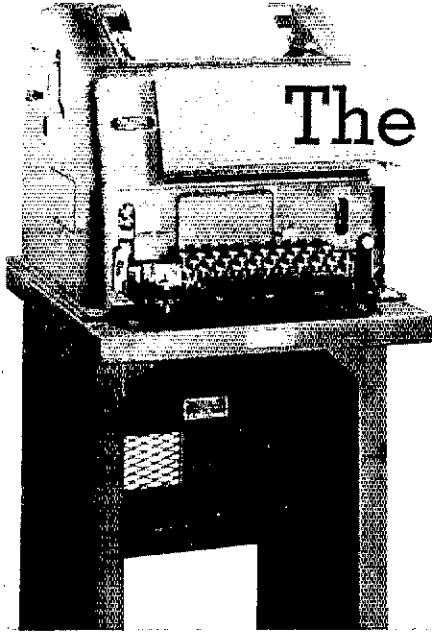
While we don't want to get into a long discussion about angles of radiation from antennas, a word or two about the height above ground for a beam is important. Usually, what the amateur desires from his beam antenna is the lowest possible angle of radiation. The lower the angle, the less the absorption of the signal in the ionosphere. One can get into a lot of arguments about what is the *best* height for a beam so it is difficult to generalize. The vertical angle of radiation from a horizontal antenna is primarily dependent on its height above ground. In general, the ham should try to get his beam at least a wavelength above earth for good performance. On 15 meters this amounts to about 40 feet high. The absolute minimum height for a beam that a ham should try for should be no less than a half-wavelength above ground.

Assuming the Novice operator is running 75-watts input with about 65 percent efficiency, his output power would be on the order of 50 watts. The 4-element array described here has a gain of approximately 10 dB. This means a gain of ten times, so the 50-watt signal is increased by that ratio. It doesn't take much figuring to realize that beam antennas are worthwhile devices. QST

## Strays

I would like to get in touch with . . .

- . . . Vietnam veterans interested in a net on 3975 kHz. WA1ECY.
- . . . hams who keep or are interested in keeping salt-water aquariums. KP4BPH.
- . . . French students to converse in French on 15 meters. WA2ORF.
- . . . others interested in visions and apparitions. W8HUY.
- . . . amateurs associated with Mercedes-Benz sales or service. WI1FA.
- . . . anyone interested in a 10-meter teenager net. WN3NUD.
- . . . anyone with information about a "talking clock" for use by the blind. ZE1BP.
- . . . stockbroker hams to discuss the stock market. W3AXR.
- . . . teenagers interested in a 3925 kHz daily net. WB8GBY.
- . . . hams interested in the cultivation of orchids. 4S7NG.
- . . . former members of the International One Sixty Society. W4WFL.
- . . . prospective members for the Eastern Area Slow Net. WA3JSU.
- . . . amateurs interested in a school teachers net. WA3PEI.
- . . . Wisconsin Novices who would like to start a net. WB9FBG.
- . . . amateurs who are stamp dealers. W9CI.
- . . . chiropractic amateurs who are alumni of NWCC. WA0OJJ.
- . . . Novices in Illinois interested in forming a 15-meter net. WN9FGB.
- . . . other hams who are falconers. WA9AXL.
- . . . anyone interested in playing chess over the air. WA8CAU.
- . . . amateurs interested in telemetry. K9GED.



# The Modern Teleprinter Local Loop

BY FRANK MERRITT,\* VE7AFJ

**T**HERE HAVE been technological changes in the past few years that have had a profound impact on the teleprinter local loop. Very little of this technology is taken advantage of in most amateur-radio teleprinter local loops. Before proceeding, a definition of the local loop itself is in order. In the course of this discussion the term, "local loop," is taken to refer to the teleprinter selector magnets together with the source of electrical power and the device used to key the power to the selector magnets. Rather than to complicate the discussion unduly, it will be assumed, unless otherwise specified, that the selector-magnet mechanism is operated with a current of 60 mA. In this respect, the selector magnets of the models 14, 15, and 19 will be connected in parallel.<sup>1</sup>

## *The Quasi-Constant-Current Local Loop*

In dealing with the selector-magnet assembly, early designers became involved with a basic problem of electronics. When a series circuit is connected as in Fig. 1, the voltage of the source was selected to result in a steady-state current of 60 mA. During the "make" transition the current available to the magnet is considerably less because of the inductance of the selector magnet. Early technologists had no access to a practical constant-current power source, so another solution to the problem had to be found. Fig. 2 illustrates the quasi-constant-current principle. By using a voltage of much higher potential, usually in the 100- to 150-V dc range, a resistor is selected to result in a steady-state current of 60 mA. In this instance, when the contact is made in the switch, the selector-magnet resistance and inductive

reactance are a small part of the value of the limiting resistor. This results in a condition which is referred to as quasi-constant current. The limiting resistance, usually between 2000 and 5000 ohms, largely determines the current value during the first instant of current flow. While the result is not a true constant-current condition, the effect of the selector-magnet inductive reactance is greatly reduced. It is essentially this local loop that many otherwise state-of-the-art RTTY demodulators use today.

## *A True Constant-Current Loop*

In August, 1962, W3TUZ presented a significant article in 73.<sup>2</sup> The conclusion of this article is that a power transistor should be used in a constant-current configuration. The circuit is presented in Fig. 3. The most desirable condition in a local loop is that a constant current will be flowing in the selector magnet regardless of the inductive reactance. The circuit is beautiful in its simplicity. The part of the circuit marked CONSTANT-CURRENT SECTION features Q1 in the function of the constant-current active element. R1 is used to provide a current to permit the operation of the Zener diode. R1 should be selected to provide a reasonable Zener current during both mark and space. R2 is used to adjust the current flowing through the selector magnets. In transistor circuitry, the emitter voltage plus the emitter-base junction voltage must equal the base voltage (from the emitter return point to the base). Thus, by stabilizing the base voltage, the operating current is selected by varying R2. Thus, R2 can be a rheostat or a fixed amount of resistance whose value has been tailored to provide the desired loop current. Q2 is a switching transistor.

## *Other Local-Loop Circuits*

It is interesting to note that the transistor offers a near perfect solution to the keying problem in low-voltage circuits such as that of the local loop. The loop power-supply voltage has been reduced from the 100- to 150-V dc range to 40 V dc. This is a significant step. Authors of other early articles developed low-voltage local loops with varying degrees of success. In 1959, W2JAV showed a 30- to 35-V dc loop using a 2N270 transistor with the

<sup>2</sup> Van Brunt, "Of RTTY . . . and transistors," 73, August, 1962.

\* 152 Morison, P.O. Box 309, Parksville, BC, Canada.

[**EDITOR'S NOTE:** Many military and late-model commercial versions of the 14, 15, and 19 sets require series connection of the selector magnets for 60-mA operation. See Craig, "Teleprinter Selector Magnets," Technical Correspondence, QST, September, 1971.]

selector magnets connected for 20 mA operation.<sup>3</sup> In 1962, Van Brunt provided a good discussion of the constant-current technique in the local loop using the Zener diode "in" the loop.<sup>4</sup> In 1964, a demodulator called *El Simpatico 1* used a 24-V dc local loop.<sup>5</sup> The lowest local-loop voltage I have been able to discover was featured in the Triple "T" Converter, in which the local-loop supply voltage was 15 V dc.<sup>6</sup>

Don Stoner, W6TNS, developed a remarkable demodulator called the RT-1.<sup>7</sup> The local loop is slightly different and is presented in Fig. 4. It will be noted that the constant-current section shown in this schematic is a bit different from the circuit of Fig. 3. The important thing in this discussion is that Q1 is a constant-current transistor and the loop supply voltage is 24 V dc. Q2 and Q3 provide a sophisticated transistorized switch in the keying circuit. The first time I used this circuit I obtained a 5-point increase in the range of my model-15 printer. This was an improvement over any other quasi-constant-current circuit I had ever used. This circuit does work! Note that two 2N301 transistors are used. The main advantage is their low price.<sup>8</sup> The actual dissipation of these transistors is very low as evidenced by the fact that no heat sink was provided (or needed) in the RT-1.

Commercial equipment designers now take liberal advantage of transistors. The AN/TGC-14 teleprinter manufactured by Mite uses an interesting circuit. The outputs from the emitter and collector of a common-emitter amplifier drive two transistors in push-pull. A specially designed two-section selector-magnet solenoid is connected in the collector circuits of the push-pull amplifier.

The Teletype Corporation uses a circuit to drive a high-current selector-magnet solenoid. The MARK condition requires 0.5-A of selector-magnet current. The input to the circuit is amplified in a common-emitter amplifier and coupled to a transistor switch which is quite similar to the keying section of Fig. 3. In this design, the requirement for constant current is minimized by the 0.5-A solenoid requirement. It will be remembered that most of the teleprinters in amateur service are directly driven by 60 mA.

As the foregoing information delineates very graphically, the constant-current local loop is not something new, and transistor technology has been in use for a period of time. It is reasonable to take the position that in modern design only transistors will be used in the local loop. This fact, coupled with the practical, simple reality of the constant-current transistor circuit, indicates a direction for amateur-radio designers.

In the development of a recent project, specifications required some original design work.

<sup>3</sup> Catona, "Transistor Keyer For Holding Magnets Printers," *RTTY*, September, 1959.

<sup>4</sup> Van Brunt, "A Note on the Selector Magnetic Keyer of Transistor Terminal Units," *RTTY*, February, 1962.

<sup>5</sup> Van Ness, "El Simpatico 1," *RTTY*, March, 1964.

<sup>6</sup> Belfi, "The Triple 'T' Converter," *RTTY*, June, 1964.

<sup>7</sup> "RT-1 TU," *RTTY*, November, 1965.

<sup>8</sup> [EDITOR'S NOTE: Motorola manufactures the 2N301, a germanium pnp power transistor. The Motorola HEP230 is an equivalent.]

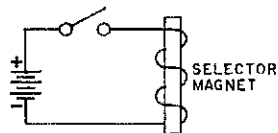


Fig. 1 - Simple selector-magnet circuit.

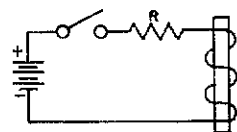


Fig. 2 - Quasi-constant-current selector-magnet circuit.

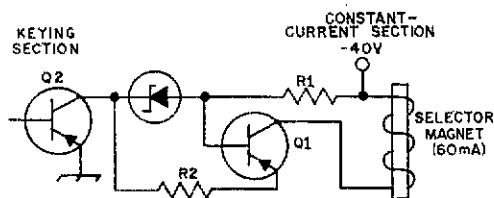


Fig. 3 - Constant-current selector-magnet circuit. All parts identifications are for text reference.

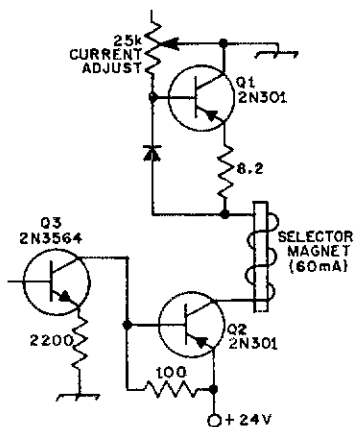


Fig. 4 - Stoner's constant-current selector-magnet circuit of the RT-1.

A basic requirement was for both positive and negative supply voltages to be used in the circuit. This would result in the maximum flexibility in dealing with the rest of the circuit in the demodulator and modulator. The input keying voltage was required to be oriented to ground. After considerable experimentation was conducted, a circuit was developed that functions in a superior manner. This circuit is presented in Fig. 5. An effort was made to use the least number and cheapest parts possible. The circuit involving Q3 will be recognized as the constant-current section. Q2 is the keying transistor which is driven by Q1. The exact resistance value of R1 is always the

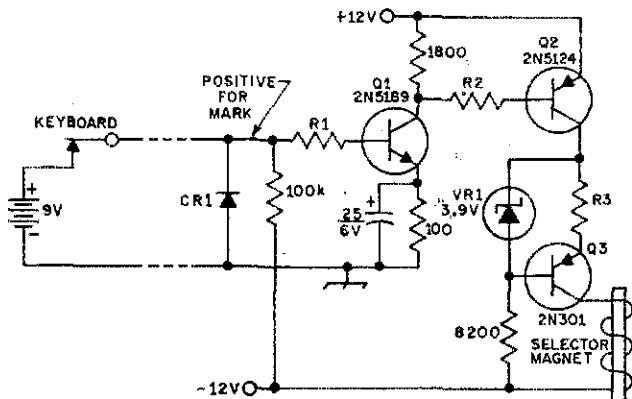


Fig. 5 - VE7AFJ selector-magnet driver for mark-positive input. Resistances are in ohms,  $k = 1000$ ; capacitances are in microfarads. Parts not listed below are identified in the schematic diagram for text reference.  
 CR1 - Any small-signal silicon diode.  
 R1, R2 - See text.  
 R3 - Fixed value selected for proper amount of loop current. See text.

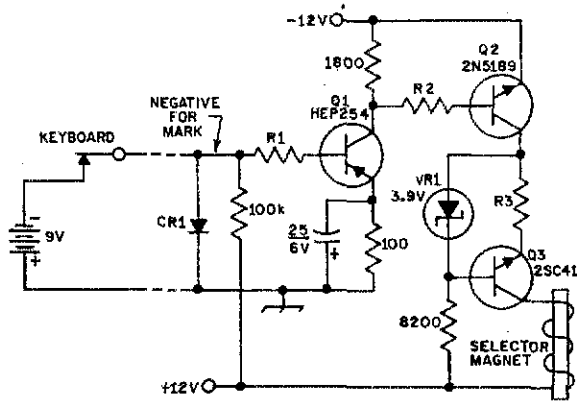
result of tailoring to suit the circuit parameters. This value is based on the supply voltage and the transistor used as Q1. With a resistor substitution box or a 25k-ohm linear potentiometer in place of R1, decrease the value of the resistance until the voltage across the 100-ohm emitter resistor fails to increase. This is the saturation point of Q1. The value of R1 should be one standard-resistance value lower than that found to saturate the transistor.

A value of  $18k\Omega$  for R2 will be found to be correct for a reasonable beta spread of Q2 for the transistor specified. A transistor for Q2 may be selected as at least a 100-mW unit capable of switching 100 mA. A switching transistor is to be preferred but most modern audio types will function satisfactorily. Low leakage is a requirement in this circuit. With a resistor substitution box or a linear 25k-ohm potentiometer, the exact value of R2 may be determined. With Q1 in a saturated condition, decrease the value of R2 until the voltage across Q2 fails to decrease. This

condition indicates saturation of Q2, which is an essential condition for its operation as a switch. The value of R2 will be one standard-resistance value lower than that causing saturation of the transistor.

The opposite polarity of input voltage may be accommodated by the circuit in Fig. 6. This is the mirror-image circuit of Fig. 5, with the use of npn transistors in place of pnp transistors and a pnp in place of the npn transistor. In this particular circuit, various operating parameters are noted for reference. Either circuit can be built on a circuit board that measures about  $2 \times 2$  inches. This is with the exception of R3 and the transistor, Q3. In practice, it will be found convenient to use a 100-ohm, 2-watt resistor for R3, the current-setting resistor. Bridge this resistor with higher value resistors to result in the desired selector-magnet current of 60 mA.

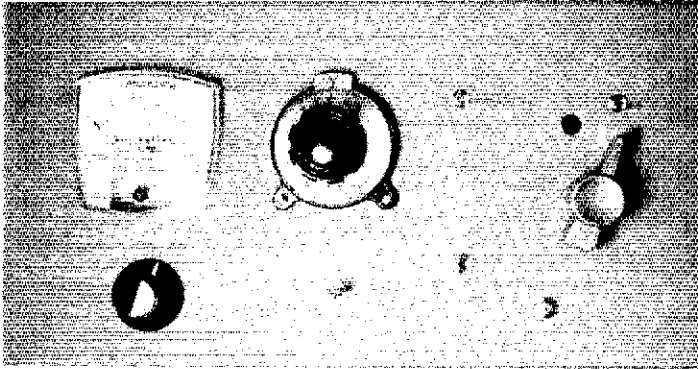
The basic circuit of Figs. 5 and 6 has been repeated both in breadboard technique and circuit-board configuration with no problems. Today, newer and cheaper transistors are probably available that will afford a saving of money as well as space. An interesting feature of the circuit is that in its final circuit-board configuration it provides a building block that can be used by the constructor to simplify the design of terminal-facility units. Truly, the advent of transistor technology has provided a superior method of driving the selector magnet in our teleprinters. Try the circuit; build it, and you, too, will become a believer in the "easy way" that just also happens to be the best way.



- NOTES:
- 1)  $E_{SAT}(Q2) = 0.35 V.$
  - 2)  $I_{(VR1)} = 2.5 mA.$
  - 3)  $P_C(Q2) = 22 mW.$
  - 4)  $E_{CE}(Q3) = 18 V.$
  - 5)  $P_{(Q3)} = 1.08 W.$
  - 6) Adjust R1 for  $I_{B(Q1)} = 1 mA.$

Fig. 6 - VE7AFJ selector-magnet driver for mark-negative input. Resistances are in ohms,  $k = 1000$ ; capacitances are in microfarads. Identified parts not included below are for text reference.  
 CR1 - Any small-signal silicon diode.  
 R1, R2 - See text.  
 R3 - Fixed value selected for proper amount of loop current. See text.  
 Q1 - Motorola transistor.  
 Q3 - Sony transistor; an equivalent is Motorola's HEP707.

# Transistors and ICs In a Phase-Locked Local Oscillator



KENNETH W. ROBBINS,\* W1KNI

**T**HIS ARTICLE describes a low-cost phase-locked oscillator (PLL) designed for use as a first-conversion HFO in a converter or a communication receiver. The PLL has a wide-range synchronizing capability which allows locking to any integral harmonic of the reference crystal oscillator; see Table I.

A spectrum-analyzer check, using a 500-kHz crystal in the reference-oscillator stage, showed spurious output signals down about 60 dB. Thus, one "rock" and an eight-stage circuit enable constructors to duplicate the desirable stability characteristics found in the HRO-500 and Galaxy 530 receivers.

The author's present plans call for use of the PLL HFO in a double-conversion superhet with a 7- to 7.5-MHz tunable i-f, using a 500-kHz standard crystal. Output of the PLL will be a spot frequency every 500 kHz from 8 to 43 MHz. Reception is thus possible on any frequency between 0.5 and 36 MHz, in 71 0.5-MHz segments. A prospective builder can choose from one to as many tuning ranges as he deems necessary. Modification of the tuned circuits shown in Fig. 2 will allow other i-fs to be used, such as 3.5 to 4, 5 to 5.5, or 9 to 9.5 MHz. Also, narrower tuning bands are possible, such as 400, 300, or even 200 kHz by changing the crystal frequency. But, narrower tuning ranges progressively demand a more exotic dial to assure resetting the PLL to the desired output frequency. The circuit shown in Fig. 2 can be reset in 0.2-MHz increments up to a maximum of 32 MHz without difficulty.

## Circuit Details

The circuit described in this article is an end result of about a year of intermittent experimentation with various circuits for a simple PLL. Initially, an avalanche transistor, frequency-locked to a crystal standard, was used to generate short pulses which were applied to a sampling bridge.

\* Sperry-Rand Research Center, Sudbury, MA 01776.

The PLL is assembled on a 4 1/2 x 9-inch panel. An imported vernier tuning dial and milliammeter are used. The hole above the band switch allows access to the VCO tuned-circuit coils for alignment purposes.

This approach required a tedious selection process to find a suitable device, produced a repetition rate which was limited to 1 MHz, and required a high B-plus voltage. Encouraging results were obtained, however. A gated-oscillator configuration looked promising, but the tuning characteristics of this circuit produced a nonleveled harmonic output spectrum, which made it difficult to achieve phase lock. Medium-speed TTL logic gates did a fair job of harmonic generation, if an additional tuned circuit was employed to enhance hf content. When high-speed TTL gates were tried, successful operation was obtained without the tuned circuit. Various problems arose as work on the phase-locked oscillator progressed, and their solutions required a circuit which would satisfy the following requirements: amplitude-leveled harmonic output from the oscillator, unilateral amplification for isolation, easy generation of crystal-controlled sampling pulses, simple loop-gain adjustment, audible and visual phase-lock indication, and ease of calibration. These requirements have been met in the circuit of Fig. 2.

The PLL circuit consists of a crystal oscillator using two TTL inverter gates, U1A and U1B, that generate a quasi-square wave followed by a differentiator to create short-duration output pulses. IC internal diodes clip the negative spikes; positive excursions drive cascaded NOT gates to produce output pulses that are ac-coupled to a diode half-bridge detector circuit. A voltage-controlled oscillator (VCO) modulates the diode pair. Output of the sampling detector, CR1 and CR2, is amplified by Q1 to produce a 10-volt pk-pk control signal which is applied to a variable capacitance diode, CR3.

The VCO uses a uhf pnp silicon transistor, Q3, in a grounded-base oscillator circuit with emitter feedback provided by a tap on the collector coil. A

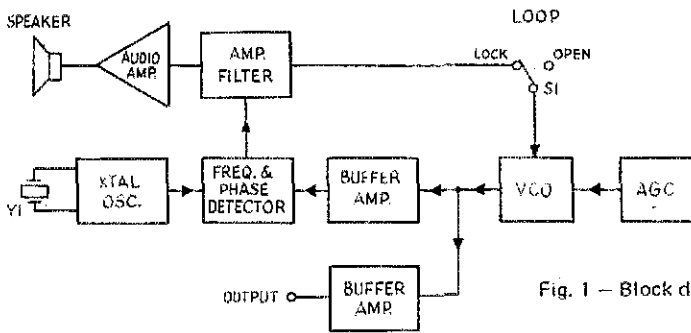
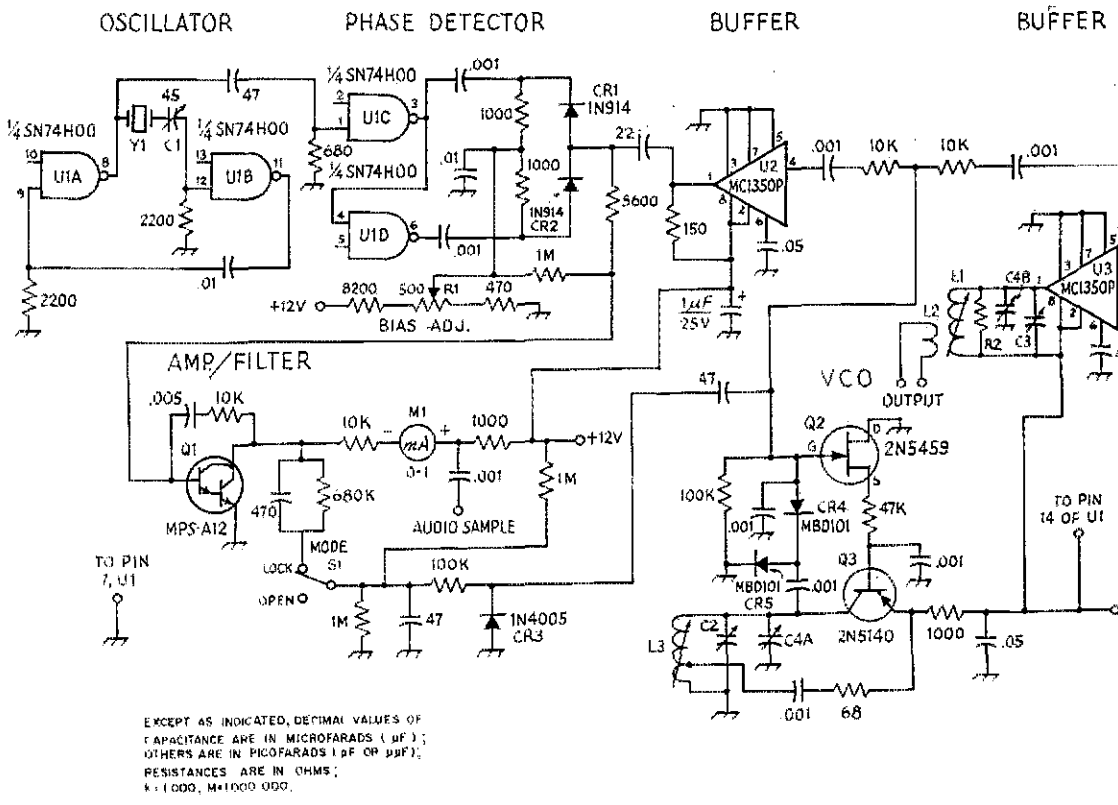


Fig. 1 — Block diagram of the PLL system.



EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS ( $\mu F$ ); OTHERS ARE IN PICOFARADS ( $pF$  OR  $\mu\mu F$ ); RESISTANCES ARE IN OHMS; K = 1,000, M = 1,000,000.

- Fig. 2 — Schematic diagram of the phase-locked oscillator. Resistors are 1/2-watt composition and capacitors are disk ceramic, unless otherwise noted.
- C1 — Ceramic trimmer.
  - C2, C3 — See Table 2.
  - C4 — Dual-section air variable, 25 pF per section (Cardwell HFD-25).
  - CR1, CR2 — High-speed silicon diode, 1N914 or equiv.
  - CR3 — Silicon rectifier diode used as a Varicap (see text).

- CR4, CR5 — Hot-carrier diode (HP 2800, Motorola MBD101, or equiv.).
- L1-L3, incl. — See Table 2.
- M1 — Surplus or imported milliammeter.
- Q1 — Motorola Darlingtion transistor.
- Q2 — Motorola JFET.
- Q3 — Motorola bipolar transistor.
- R1 — Linear-taper, 1/2-watt composition control.
- R2 — See Table 2.
- S1 — Spst toggle or rotary.
- U1 — TTL quad gate (Signetics, Motorola, Texas Instruments or Fairchild SN74H00 suitable).
- U2, U3 — Motorola IC.
- Y1 — See Table 1.

negative-feedback circuit for amplitude-leveling purposes makes use of a JFET in series with the base of Q3, automatically varying the source-to-drain resistance in response to a half-wave rectified voltage sample taken from the oscillator tuned circuit. When checked on an HP vector voltmeter, output level from the VCO held constant within 1 dB from 1 to 50 MHz. Tuning of the oscillator by means of a dc voltage for phase-locking purposes is accomplished using an inexpensive silicon rectifier diode acting as a voltage-variable capacitor. Some diodes obtained from surplus, which were marked "1 kV 1 A controlled avalanche," performed even better than units actually designed for Varicap service. The VCO, without phase locking, is a good wide-range cw source, as the alc makes coil  $Q$  and the position of the feedback tap point uncritical. The output wave form from Q3, as viewed on a 150-MHz Tektronix scope, is almost a pure sine wave. Unilateral amplification (buffering) is provided by a Motorola MC1350P IC, which was designed for use in TV i-f stages. A broadly resonant output circuit uses loading-resistor values between 1000 and 2000 ohms to hold the tank emf to about 1.5 volts rms.

The high-speed TTL gates, U1A and U1B, will oscillate satisfactorily from 200 to 500 kHz using FT-241 xtals and up to 10 MHz using crystals in HC-6/U holders. An RC network in series with the positive voltage lead gives low-frequency, high- $Q$

crystals a few milliseconds to get going upon application of 12 volts. Without the RC network, the gates tend to saturate immediately, and the loop gain is too low for oscillation to start. Although propagation delay is about 5 ns for SN74H00N gates, lack of coincidence of the sampling pulses does not hinder detector operation at the frequencies of interest if the lag is approximately 10 ns.

Of the many types tried as detectors, 1N914 high-speed switching diodes delivered the highest output voltage at vhf. They drive a Motorola MPS-A12 Darlington-connected transistor pair. Miller feedback is employed to roll off ac gain rapidly above 2 kHz. A bias-adjustment control, R1, is used to set the 1-mA meter to mid scale during unlocked periods. The 0.5-mA of current through the MPS-A12 load resistor develops 6 volts at its collector, which equals the voltage of a resistive voltage divider that maintains the varicap bias. This alignment of dc levels eliminates transients when switching S1 to LOCK, and it also compensates for small changes of output voltage from the detector diodes when changing frequency ranges. A parallel RC network which connects the Varicap and the transistor together in the LOCK mode sets the loop gain adjustment. With 0.2-MHz tuning increments at 40 MHz, lock is held over plus or minus three dial divisions as contrasted to tuning completely through a beat note in one half a division when S1 is set at OPEN. Originally, a three-position switch was used; its third terminal shorted out the RC network and made a direct connection for even tighter loop control. Although this procedure worked, it required switching back and forth each time the output tuning was shifted to a new frequency. The VCO is fairly stable and drifted less than one kHz with the loop open; therefore, a two-position MODE switch is adequate, enabling the operator to shift from one lock

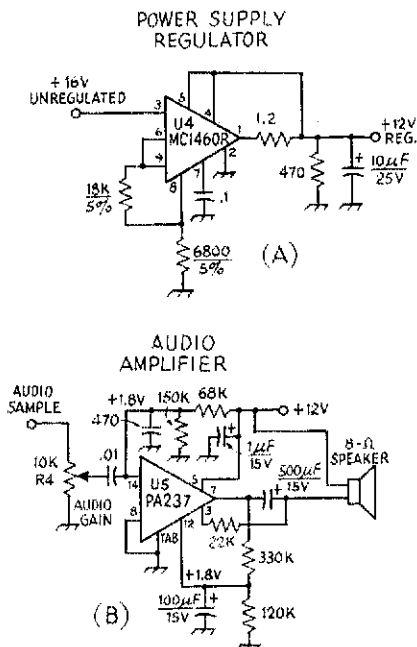
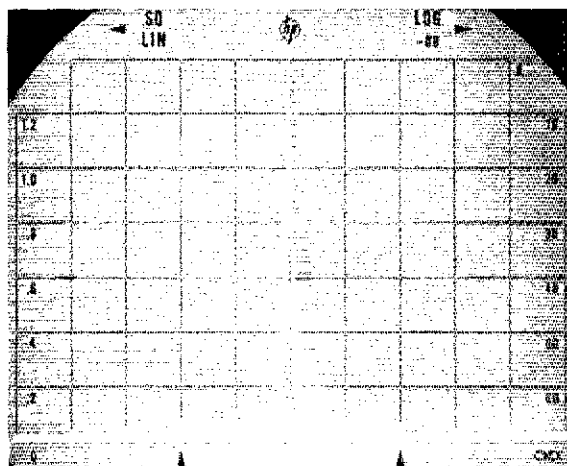


Fig. 3 -- Diagrams of the (A) power-supply regulator and (B) audio amplifier. Resistors are 1/2-watt composition, except as noted otherwise. Capacitors are disk ceramic, except those with polarity marked, which are electrolytic. R4 -- Linear-taper, 1/2-watt composition control. U4 -- Motorola IC. U5 -- General Electric IC.

Output spectrum from the phase-locked oscillator. Using a 1-MHz-per-cm sweep, the HP analyzer has been tuned to center the 23.5-MHz output on the screen. Spurious outputs are shown to be at least 60 dB down from the desired energy.



point to the next using only the meter for phase-lock indication.

The phase detector is an elementary circuit that lacks any *R* or *C* balance adjustment and which has slightly misaligned sampling pulses. A residue of approximately 0.5-volt pk-pk is present at the center tap, and this voltage would produce unwanted sidebands if fed back to the VCO. Motorola's MC1350P is used as a buffer because its reverse transfer admittance of much less than one micromho and its high forward gain make it a good isolation stage. Indication of phase lock is accomplished by an IC audio amplifier and a small speaker; see Fig. 3. The supply voltage is regulated by another IC, although this task can be accomplished using a Zener diode, if desired.

### Construction

A high-quality tuning capacitor and a dial which provides readout to 1 division out of 100 should be used. A Japanese vernier assembly and a Cardwell HFD-25 capacitor work well. The author's version uses a Standard Coil TV turret tuner which was reworked by removing the top section (with a fine-tooth hacksaw), leaving a small lip to which the pc board is secured by sheet-metal screws. The location of the VCO is adjacent to the 6-terminal coil. A maximum of ten 500-kHz harmonics for any one tuning range was chosen. Because a small tuning range is used, only five harmonics are available from the lowest frequency coil. Even so, not all turret positions are used. An rf sampler such as used in the alc circuit of Fig. 2 can be added to enable peaking of the buffer tuning, if desired.

### Alignment

After each VCO coil is wound, its tuning range should be checked by means of a dipper. If the final tuning range is to be in 500-kHz increments, a crystal right on, or very close to, an integral MHz between 5 and 10 should be installed at Y1. Place S1 at OPEN and set the meter to mid scale with the BIAS ADJ control. Tuning C2 will now produce one or two audible beat notes whose

Table I

Range	Crystal (Y1)
1 to 40 MHz	0.2 MHz
1 to 60 MHz	0.5 MHz
2 to 80 MHz	1 MHz
4 to 100 MHz	2 to 10 MHz

harmonic number can be determined by the previous rough calibration with the dipper. Substituting a crystal for 2 or 1 MHz at Y2 will then yield intermediate calibration points. Adjustment of inductance and any padding in the VCO circuit should now be made to "ballpark" the desired frequency range. Finally, a 500-kHz crystal should be installed and calibrated against WWV using C1. Exact 0.5 MHz calibrations can now be logged for the test coil. Confusing? Well, let's run through an example to clarify the procedure.

Set the VCO to produce oscillations at approximately 40 MHz. The second harmonic of this frequency will produce interference on television channel-5 video at 77.125 MHz; the VCO frequency will be near 38.5 MHz. Install an 8-MHz crystal (8.030 MHz, for example) at Y1. U1 will generate harmonic energy at 32.12, 40.15, and 48.18 MHz. A slight turn of C2 will produce a birdie which should be the 5th harmonic of 8 MHz, giving an accurate calibration at 40.15 MHz. Then, the 500-kHz crystal should be installed and, by very careful counting of beats (since we know its 80th harmonic at 40.0 MHz is just a "whisker" lower than 40.15 MHz) find the calibration check point.

After all of the tuning ranges are calibrated, locked-loop operation is the last item to check. Low loop gain is evidenced by a tendency toward motorboating and lock release when C2 is detuned by several kHz. Excessive gain produces audio squeals or ultrasonic oscillations and a broad spectrum of noise around the carrier when monitored on an hf receiver. Any simple oscilloscope can be employed to display the voltage at the MPS-A12 collector. In the OPEN loop setting of S1, there should be a strong audio signal that builds up to 10 volts pk-pk when the VCO is tuned to nearly zero beat with a harmonic of the crystal standard. On lower frequencies, the signal will tend to be a square wave. There will be other audio beats of lesser amplitude between 500-kHz points; this is normal. In the LOCK position of S1, an audio signal will start to build up as the VCO approaches a harmonic of the crystal oscillator and, suddenly, lockup occurs and the ac signal disappears. Meter tracking now takes over as a dc indicator of the servo action maintaining phase lock, if tuning or oscillator drift occurs. At

An end view of the oscillator. The variable capacitor is mounted on an aluminum plate which is supported by the enclosure of the TV tuner. The pc board which contains most of the small components for the PLL is attached to the wall of the tuner case.

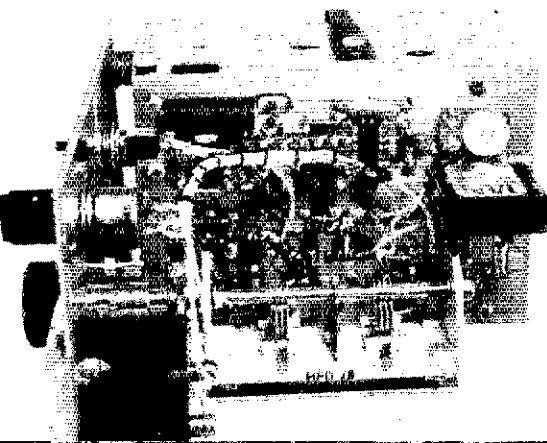




Table II

Coil Data (for TV-turret tuners with 7/32-inch OD-coil forms)					
Oscillator					
Freq. MHz	Wire size	L3	Tap	C2	
7.5-9.5	No. 32 enam.	18/32-inch long winding, close wound	1/3 of total winding	None	
10.0-13.0	No. 32 enam.	13/32-inch long winding, close wound	1/3 of total winding	None	
13.5-17.0	No. 32 enam.	8/32-inch long winding, close wound	1/3 of total winding	5 pF	
17.5-21.5	No. 28 enam.	24 turns, close wound	9 turns	10 pF	
22.0-26.5	No. 28 enam.	17 turns, close wound	7 turns	18 pF	
27.0-31.0	No. 24	20 turns, spaced 18/16 in.	7 turns	30 pF	
31.5-35.5	No. 24	12 turns, spaced 11/16 in.	5 turns	43 pF	
36.0-40.0	No. 24	10 turns, spaced 13/16 in.	4 turns	68 pF	
40.5-45.0	No. 24	9 turns, spaced 12/16 in.	3 turns	68 pF	
Amplifier					
Freq. MHz	Wire size	L1	L2	C3	R2
7.5-9.5	No. 32 enam.	22/32-inch long winding, close wound	6 turns	None	1000
10.0-13.0	No. 32 enam.	16/32-inch long winding, close wound	5 turns	None	1000
13.5-17.0	No. 32 enam.	8/32-inch long winding, close wound	5 turns	5 pF	1000
17.5-21.5	No. 28 enam.	28 turns, close wound	4 turns	10 pF	1000
22.0-26.5	No. 28 enam.	16 turns, close wound	4 turns	20 pF	1000
27.0-31.0	No. 28 enam.	8 turns, close wound	3 turns	51 pF	1200
31.5-35.5	No. 24	12 turns, spaced 11/16 inch	3 turns	68 pF	1200
36.0-40.0	No. 24	8 turns, spaced 8/16 inch	2 turns	82 pF	1500
40.5-45.0	No. 24	7 turns, spaced 9/16 inch	2 turns	82 pF	1500

least 0.4 mA either side of a mid-scale setting may be indicated on M1 before loss of phase lock occurs. There should be no ac signal displayed on the scope during phase lock. If one is seen, loop oscillation is present which must be eliminated. Coil and capacitor substitutions in the VCO are acceptable. Miller feedback around the MPS-A12 uses carefully selected RC values which permit stable closed-loop amplification for all of the crystals which have been tried.

**Operation**

While the circuit may sound a bit complicated, the method of operation is not. For example, suppose that the PLL is part of the aforementioned receiver, and we would like to listen to the high end of the 10-meter band. Our HFO must operate at 37 MHz so that 30 MHz can be heterodyned to 7 MHz. We engage the appropriate coil, place the mode switch on OPEN, set meter M1 to mid scale using the BIAS ADJ control, and tune for an audio beat note at the 37-MHz calibration point. The mode switch is then set to LOCK. The audio tone will cease, indicating a locked loop, and, if tuning is varied slightly, the meter will verify that lock is still being maintained by a current variation that tracks from 0.1 to 0.9 mA. We can now tune the 10-meter band using the 40-meter i-f. To tune the next lower segment, we just shift down to the 36.5-MHz calibration point and check for lock as indicated by M1. 29 to 28.5 MHz? Shift again to the next lower calibration point at 36 MHz. Ten cw? Down once more to 35.5 MHz. Thus, we can

set up to tune the entire 10-meter band in four 500-kHz ranges by turning a knob!

In the near future hams will certainly use more of the PLL IC packages from Signetics, Fairchild, and Motorola. Meanwhile, if you'd like to give a PLL a try, purchase the solid-state devices called for in this article, "dig up" an old TV turret tuner, and scrounge through your junk box for parts. Improvements to this circuit may be as close as the tip of your soldering iron!

**Reference**

Kircher, "A Phase-Locked Local Oscillator for Advanced Receiver Design," *CQ*, September, 1966.

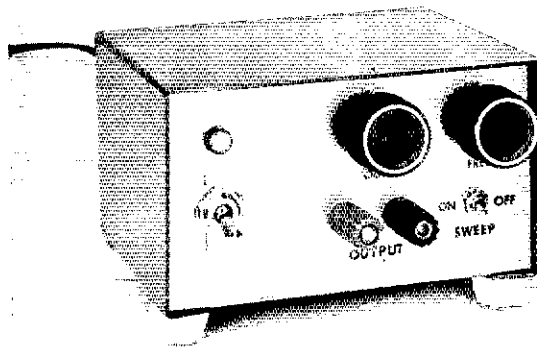


If you hear more than the usual "strange" modulation in the Extra and Advanced phone subbands, it's likely because the growing number of SSTVers are having their own contest activity. It is limited to seven hours on two occasions: 1500-2200 GMT February 5, and 0700-1400 February 13.

Here's one for the Field Day record books. For the second year running, the W3OI/3 Field Day entry has failed to arrive at Hq. despite careful placing in the U.S. Post Office. Their final claimed score should have read: W3OI/3 Lehigh Valley ARC 896-B-2142 in Class 3A. Just one more reason for suggesting use of preferential mail (registered, certified, etc.) to be sure.

# A Simple

# Sweep Generator for



## FM Receiver Alignment

BY ARTHUR E. FURY,\* WA6JLJ

IN THE PAST a sweep generator was such an expensive piece of test equipment that it was rarely found in amateurs' workshops. Today, however, because of a new low-cost integrated-circuit function generator, anyone willing to spend an evening building a simple project can enjoy the advantages of a sweep oscillator. Such a generator is useful for aligning fm receiver i-f strips, for checking homemade i-f amplifiers and filters, plus for determining the response characteristics of band-pass tuned circuits.

The heart of the sweep generator is a Signetics NE566 integrated-circuit voltage-controlled oscillator. The '566 produces square- and triangular-wave outputs simultaneously. The frequency of oscillation is determined by an external resistor, a capacitor, and the voltage applied to the control terminal. The device can be made to shift frequency over a ten-to-one range with exceptional linearity. The upper frequency limit of the NE566 is approximately 1 MHz.

### Circuit Information

A schematic diagram of the sweep generator is shown in Fig. 1. Integrated circuit U2 functions as

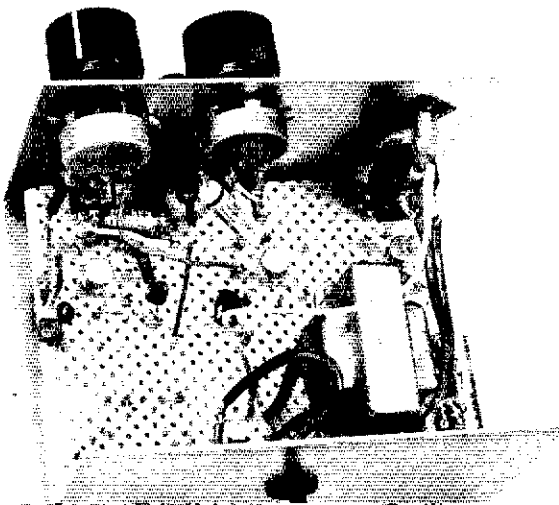
\* 811 E. Argues Ave., Sunnyvale, CA 94086.

the main oscillator whose frequency can be varied from 100 kHz to 1 MHz. Control R2 provides the means of frequency adjustment. The output level from the oscillator may be varied by adjustment of R3. When S1 is closed, a sawtooth wave is applied to the control terminal of U2, sweeping the output frequency. The sweep frequency is determined by the setting of R1. The triangular-wave output from U1 is modified to a sawtooth wave using Q1 and Q2. Square-wave output from pin 3 of U1 is applied to Q2 via Q1, which is connected to function as a Zener diode. When the voltage reaches sufficient level to turn Q2 on, the timing capacitor, C1, is immediately discharged. This discharge occurs just as the triangular wave form reaches its peak voltage, preventing the down-slope side of the wave form from appearing at the output.

Either the sweep timing or the frequency range of the generator may be modified by changing the value of the timing capacitor, C1 for U1 and C2 for U2. Table 1 shows approximate values for frequency ranges from 1.2 Hz to 1 MHz. An RTTY'er, for example, might choose a 10- $\mu$ F

TABLE 1

C1 (or C2) in $\mu$ F	Frequency Range
10	1.2-12 Hz
1	12-120 Hz
.1	120-1200 Hz
.01	1.2-12 kHz
.001	12-120 kHz
.0001	120-1000 kHz



Inside view of the sweep generator. Small components are mounted on Vector T2.8 terminals which have been inserted in a piece of electronic pegboard. The voltage-regulator IC is located to the far right, just above the power transformer. The small pc-mount control to the far left is used to set the sweep frequency.

**QST** for

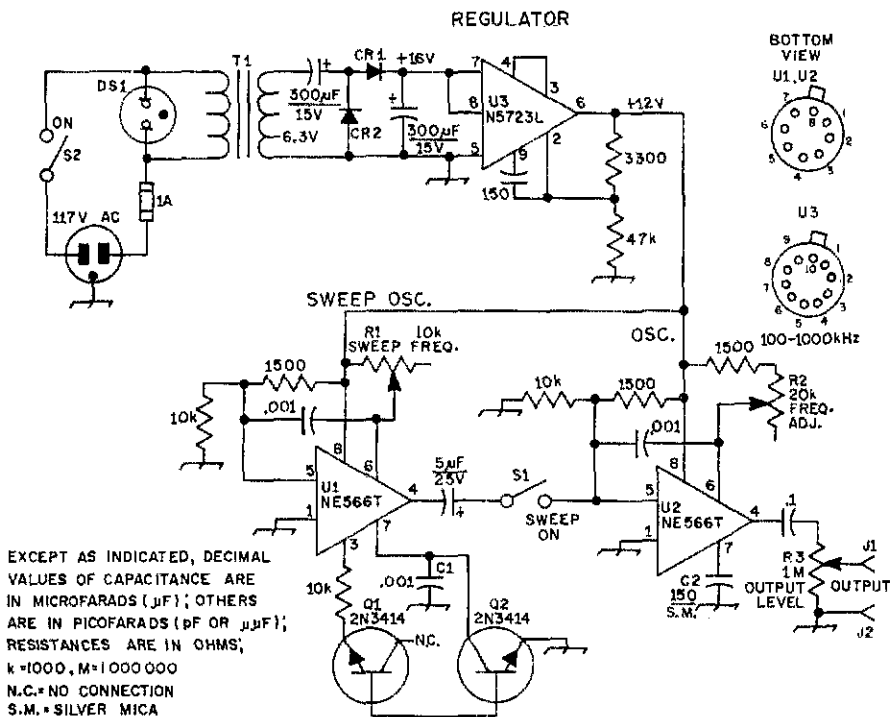


Fig. 1 - Circuit diagram of the sweep generator. Resistors are 1/2-watt composition and capacitors are disk ceramic (except those with polarity marked, which are electrolytic) unless otherwise noted.

- C1, C2 - See Table 1.  
 CR1, CR2 - Silicon diode, 100 PRV, 500 mA.  
 DS1 - Neon indicator, panel mount, for 117 V ac.  
 J1, J2 - 5-way binding post.  
 Q1, Q2 - GE bipolar transistor; most low-power npn amplifier or switching types with medium beta should be suitable.  
 R1 - Linear taper, pc mount.  
 R2, R3 - Linear taper, panel mount.

- S1, S2 - Spst toggle.  
 T1 - Filament type, 117-V primary, secondary 6.3 V at 300 mA.  
 U1-U3, incl. - Signetics integrated circuit (available from Compar, 2531 Whitney Avenue, Hamden, CT 06518; the NE566T [TO-99] costs \$10.25 and the NE566V [DIP package] is \$9.50; the N5723L is \$2.00).

capacitor for U1 to obtain a sweep rate of about 2 Hz, and might select a 0.1- $\mu\text{F}$  capacitor for C2 so that the generator will provide output between 2 and 3 kHz.

Power for the generator is provided by a 6.3-volt filament transformer. A voltage doubler and an N5723 integrated-circuit regulator are employed to deliver 12 volts to the NE566s. Approximately 40 mA of current is needed.

### Construction

The sweep generator is assembled on electronic pegboard. A pc board can be employed, if desired, although making a circuit board would probably double the amount of time needed to complete the project. A small 3 x 5 x 4-inch cowl-type Minibox is used as an enclosure.

After checking the completed unit for wiring errors, apply line voltage and measure the dc voltage at pin 6 of U3. The reading should be approximately 12 volts. With S1 open, the output from the oscillator can be checked by monitoring the second harmonic with a bc radio. A short piece

of hookup wire connected to J1 will serve as an antenna. With S1 closed, R1 should be set to produce the desired sweep frequency.

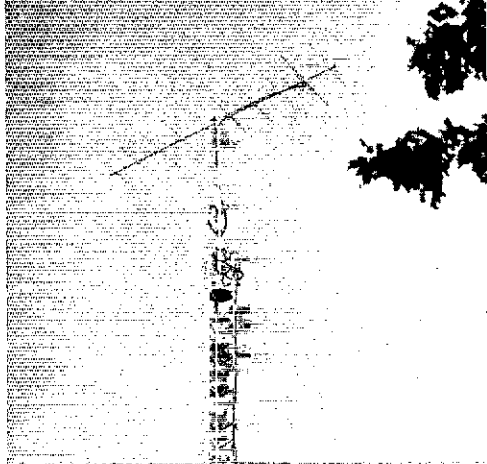
**QST**

### Back Copies and Photographs

Back copies of *QST* referred to in *QST* issues are available when in print from our Circulation Department. Please send money order or check - 75¢ for each copy - with your order; we cannot bill small orders nor can we ship c.o.d.

Full size (8 by 10) glossy prints of equipment described in *QST* by staff members (only) can be furnished at \$2.00 each. Please indicate the *QST* issue, page number, and other necessary identification when ordering, and include full remittance with your order - we do not bill or ship c.o.d.

Sorry, but no reprints of individual *QST* articles are available, nor are templates available unless specifically mentioned in the article.



### The 4-Pole Vertical Antenna

For those who desire an omnidirectional, vertically polarized gain antenna the Cush-Craft 4 Pole may be of interest. This antenna is shown in the photo, held upright by WINPG of the ARRL technical staff.

The antenna consists of four half-wave dipoles which are mounted on a 30-foot mast. Overall length of the antenna array is 23 feet. The remainder of the length (7 feet) results from our use of three standard 10-foot lengths of TV masting.

The dipoles can be spaced around the mast at 90-degree intervals to provide an omnidirectional pattern. Alternatively, the four dipoles can be attached to the mast, one above the other, to secure a cardioid radiation pattern. The latter will provide slightly more gain in the favored direction.

A weather-sealed coaxial antenna harness is supplied with the kit. Each dipole has a gamma-matching assembly. This package is sold as Model AFM-4D, less masting. The elements are cut for operation between 146 and 147 MHz. Our tests showed the SWR to be 1.3:1 after adjusting each bay separately, then connecting the harness.

The antenna is presently under test atop a 100-foot tower at WA1KHK, the call for the Insurance City Repeater Club, Avon, Conn. It has endured a severe windstorm already, and has given good coverage despite its being side mounted (omnidirectional) on the tower legs rather than being mast-mounted above the tower. This antenna should be useful for repeater applications, or for use at home. The price is \$42.50 from Cush-Craft, 621 Hayward St., Manchester, NH 03103. — W1CER

## ● New Apparatus Cush-Craft FM Antennas

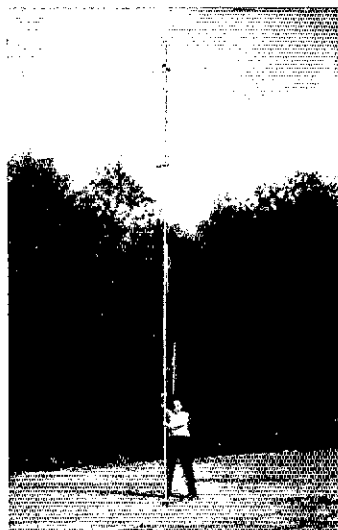
Two of Cush-Craft's new gain-type antennas for 2-meter fm operation should be of interest to the base-station operator. The first, their FM Twist, is apparently an adaptation of the earlier Quad Twist which was intended for circular and axial polarization. The FM Twist, however, is designed for vertical polarization between 146 and 147 MHz (for fm work) and horizontal polarization for the low end of 2 meters. Separate 10-element Yagis are attached to a common boom, and each antenna has its own feed line (50 ohms). This antenna should prove quite useful to the vhf man who utilizes all of the 2-meter band.

The photo above shows an FM Twist array atop the tower at W1CER. A single length of 50-ohm coaxial cable is used to feed both antennas. A surplus coaxial switch is mounted atop the tower (opposite the rotator), and is controlled from the shack by means of a 28-volt dc power source and switch box.

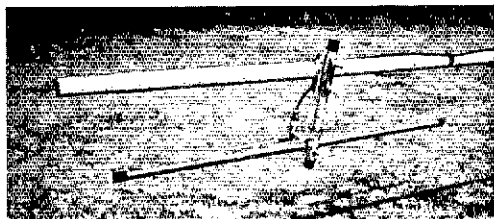
The antenna is structurally rugged and should last a long time. The driven elements of the two Yagis use the gamma-matching technique. Shrink tubing is used at the open end of the gamma rod to keep out moisture. A uhf-type coaxial connector is attached to the feed point of each beam and is part of the package.

The boom length is 130 inches, and the longest element measures 40 inches. Overall weight of the antenna (less mast) is 10 pounds. Performance during a one-month evaluation has been excellent. The forward gain is what one might expect from a 10-element Yagi, the front-to-back ratio is good, and the SWR after careful adjustment is satisfactory. The vertical Yagi adjusted to an SWR of 1.5:1, and the horizontal antenna provided an SWR of 1.25:1. The higher SWR of the vertical antenna can be related to the metal mast being in the plane of the antenna elements.

The model number of the antenna is A147-20T, and the price is \$39.50.



The completed 4-pole antenna on a 30-foot 1 1/2-inch diameter steel mast. W1NPG serves as the ARRL strong man in this photo.



Close-up view of one bay of the 4-pole vertical array. Rugged large-diameter aluminum tubing is used for the elements. The gamma-matching element is sealed to keep out moisture. Plastic caps prevent water from entering the ends of the driven element.

# A "Universal" HF Receiving Converter

BY DOUGLAS A. BLAKESLEE,\* WIKLK, AND PETER ZILLIOX,\*\* WA3EQK/I

**T**HE RECEIVING CONVERTER shown in Fig. 1 can be used as a "down converter" with an i-f output of 3.5 to 4 MHz, as an "up converter" with an i-f of 28 to 28.5 MHz, or as a front end for a multiband hf receiver. The tuned circuits at the front end will cover all of the hf amateur bands — 1.6 to 29.6 MHz. Thus, it is only necessary to select an appropriate output network for the mixer, tuned circuits for the crystal oscillator, and crystals for the desired frequency coverage. WWV or WWVH reception at 5, 10, 15, or 20 MHz may be added. With the band-switch arrangement shown, five amateur bands and one WWV frequency can be selected with S1. A second switch, S2, allows bypassing the converter. Suitable coil and capacitor combinations are given in the chart, Fig. 2, for all of the bands mentioned above. Other 500-kHz segments in the range from 1.6 to 30 MHz may be covered with an appropriate conversion crystal and oscillator-tank circuit.

## Design

The design of the converter has been optimized for strong-signal performance. All of the rf selectivity has been placed *before* the rf amplifier, insuring maximum rejection of out-of-band signals. The tuned circuits exhibit some loss, a limiting factor that determines the sensitivity of the converter. Average sensitivity is about 0.5  $\mu$ V for a 10-dB signal-plus-noise-to-noise ratio (S + N/N). When using the 40673 dual-gate MOSFET it is possible to achieve far better sensitivity, typically an S + N/N ratio of 0.1  $\mu$ V, below the level of man-made and atmospheric noise in most locations. Thus, operating the converter at the best possible sensitivity would reduce the dynamic range of the unit unnecessarily. For those fortunate enough to have an extremely quiet location and no neighbors who are hams operating

\* Assistant Technical Editor, *QST*.

\*\* 21 Long Lane, West Hartford, CT 06117.

The front-end tuning capacitor, C1, is mounted on a small shelf just above the toroid coils. The rear section of the main circuit board contains the crystal oscillator. The crystals are soldered directly into the board. The capacitors that go with the oscillator-tank coils are connected across the terminals of the pc-mount coil forms. Most of the chokes and resistors are mounted vertically to save space.



Front view of the hf converter. The upper knob controls the PRESELECTOR capacitor, while the lower control is for the band switch. The small switch to the lower right disconnects the converter from the antenna line.

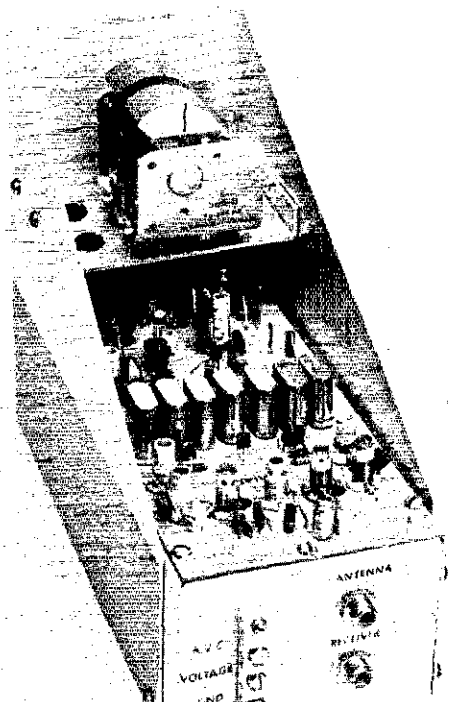
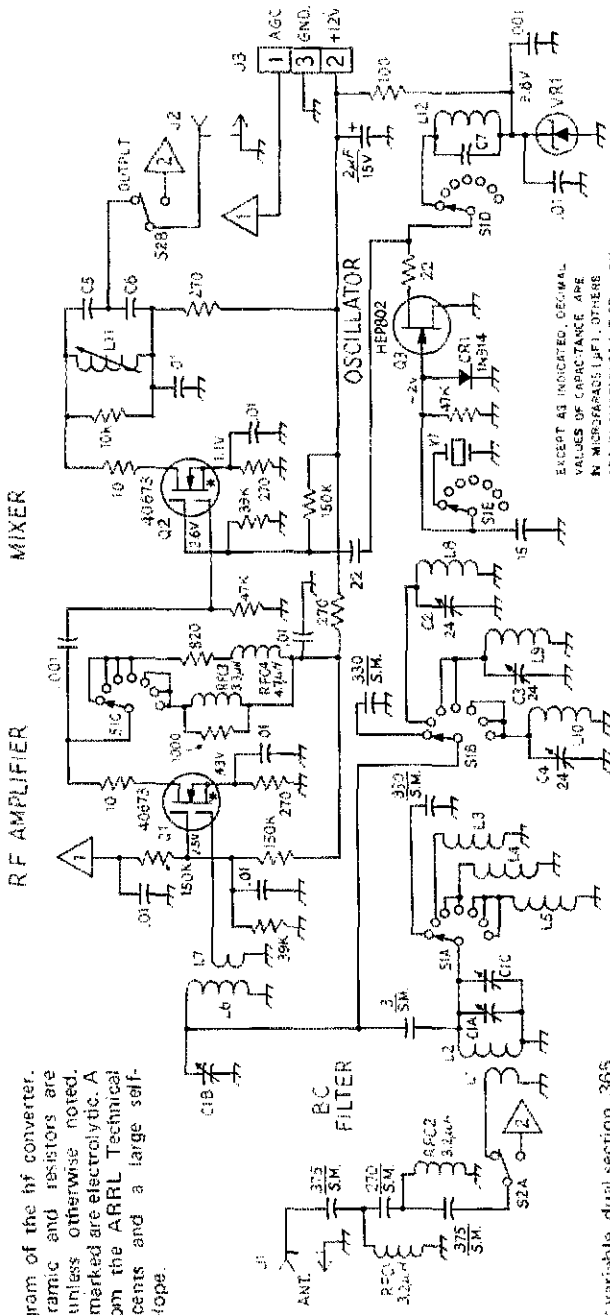


Fig. 1 - Schematic diagram of the hf converter. Capacitors are disk ceramic and resistors are 1/2-watt composition, unless otherwise noted. Capacitors with polarity marked are electrolytic. A template is available from the ARRL Technical Department for fifty cents and a large self-addressed stamped envelope.



EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (μF), OTHERS ARE IN PICOFARADS (pF OR pFt). RESISTANCES ARE IN OHMS.  
 \* - MOOD, MFR 000700  
 S.M. = SILVER MICA  
 \* = GATE PROTECTED

RF AMPLIFIER

MIXER

OSCILLATOR

B.C. FILTER

- C1 - Broadcast-type air variable, dual section, 365 pF per section, gear-reduction drive (J. W. Miller 505-8).
- C2-C4, incl. - Air variable, pc mount (Johnson 189-0509-005).
- C5, C6 - For 3.5 MHz, 45 and 470 pF, respectively. For 28 MHz, 15 and 150 pF. May be silver mica or disk ceramic.
- C7 - See table (Fig. 2).
- CR1 - High-speed silicon switching diode.
- J1, J2 - Phono type, chassis mount.
- J3 - 3-terminal strip, screw type (Millien E303).
- L1 - 6 turns No. 28 enam. wound over L2.
- L2, L6 - 52 turns No. 28 enam. on Amidon T-68-2 toroid core (Amidon Associates, 12033 Ostego St., North Hollywood, CA 91607).
- L3, L8 - 46 turns No. 28 enam. wound on Amidon T-58-2 core.
- L4, L9 - 20 turns No. 20 enam. wound on Amidon T-50-2 core.
- L5, L10 - 13 turns No. 20 enam. wound on Amidon T-50-6 core.
- L7 - 13 turns No. 28 enam. over L6.
- L11 - For 3.5 MHz, 22-μH slug-tuned coil; for 28 MHz, 1.2-μH slug-tuned coil, pc mount (J. W. Miller 46A225CPC and 46A126CPC, respectively).
- L12 - See table.
- O1, O2 - RCA dual-gate MOSFET.
- O3 - Motorola JFET.

- RFC1, RFC2 - Solenoid-wound rf choke, one turn removed (J. W. Miller 74F336AP).
- RFC3 - Solenoid-wound rf choke (J. W. Miller 74F336AP).
- RFC4 - Solenoid-wound rf choke (J. W. Miller 74F476AP).
- S1 - Assembly consisting of one Centralab PA-302 index section and 5 Centralab PA-1001 1-pole, 11-position phenolic sections.
- S2 - Dpdt toggle.
- VR1 - Zener diode, 9.3 V, 1 W.
- Y1 - See table.

		1.8 MHz	3.5 MHz	7 MHz	10 MHz	14 MHz	15 MHz	21 MHz	25 MHz	28 MHz	28.5 MHz
For 2.5-4 MHz i-f	Y1	5.8 MHz	N/A	11 MHz	14 MHz	10.5 MHz	11 MHz	17.5 MHz	29 MHz	37 MHz	37.5 MHz
	L1C1	7.5 $\mu$ H		4.25 $\mu$ H	2.5 $\mu$ H	4.8 $\mu$ H	4.25 $\mu$ H	2.5 $\mu$ H	1.5 $\mu$ H	1.5 $\mu$ H	1.5 $\mu$ H
	C7	46A476CPC	N/A	46A476CPC	46A276CPC	46A476CPC	46A476CPC	46A276CPC	46A156CPC	46A156CPC	46A156CPC
		100 pF	N.A.	39 pF	47 pF	39 pF	39 pF	18 pF	10 pF	5 pF	5 pF
For 28-28.5 MHz i-f	Y1	30.3 MHz	32 MHz	35.5 MHz	38 MHz	42.5 MHz	43 MHz	49.5 MHz	53 MHz	N/A	N/A
	L1C2	1.5 $\mu$ H	1.5 $\mu$ H	1.2 $\mu$ H	1.0 $\mu$ H	0.82 $\mu$ H	0.87 $\mu$ H	0.54 $\mu$ H	0.55 $\mu$ H	N/A	N/A
	C7	46A156CPC	46A156CPC	46A126CPC	46A106CPC	46A87CPC	46A87CPC	46A576CPC	46A576CPC	N/A	N/A
		7 pF	5 pF	5 pF	5 pF	5 pF	5 pF	5 pF	5 pF	N/A	N/A

Fig. 2 — Table of values for the hf converter.

the hf bands, the front-end tuned circuits may be split so that one is located at the input circuit and the second acts as the drain load for Q1. See Fig. 3 for a sample circuit. However, if the drain of the rf amplifier is tuned there is the possibility of a tuned-gate, tuned-drain oscillation that is not present when the circuit of Fig. 1 is used.

A second dual-gate MOSFET, Q2, functions as the mixer. The amplified rf signal is fed to gate 1 of this device, while gate 2 is coupled to the hf oscillator, Q3. The dual-gate MOSFET is an excellent transistor for mixer service as it has good conversion gain, provides isolation between the signal and oscillator inputs, and performs well when handling strong signals. The mixer has a low-Q output tank to permit nearly constant gain over a 500-kHz tuning range, even when a 3.5- to 4-MHz i-f is chosen. A capacitive divider provides the impedance transformation necessary to match 52-ohm cable. A short length of RG-58A/U is suitable as an interconnecting cable to the associated receiver.

### Construction

All components, except for the dual-section TUNING capacitor and the chassis-mount connectors, are installed on a 3 1/2 x 8-inch etched circuit board. A foil pattern and parts-placement template may be obtained from the ARRL Technical Department (see Fig. 1). A length of sheet-aluminum stock, bent to form a 3 1/2 x 8 x 2-inch rectangle (with a 1/4-inch lip around the top), provides a base for the pc board. Sheet-metal screws are used to secure the board to

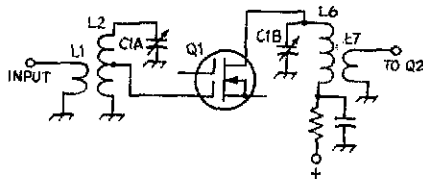


Fig. 3 — Alternative input circuit.

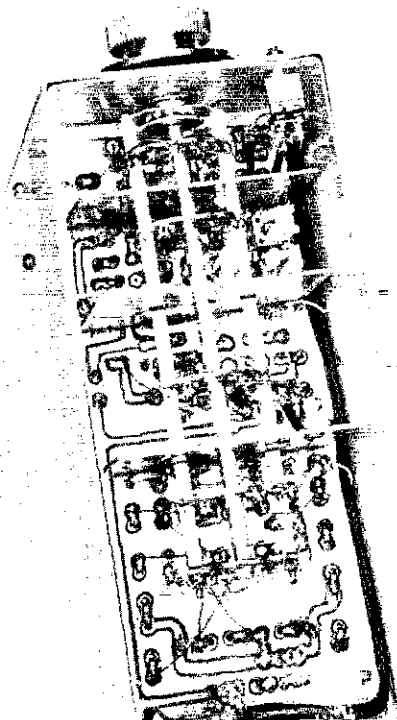
The bottom view reveals the shielding sections which provide a mount for the switch, as well as isolating the stages of the converter. These shields are made from 3 x 2-inch sections of double-sided circuit board. C2, C3, and C4 are mounted on the bottom side of the main board so that they can be reached easily for alignment purposes.

the base. The dual-section input-tuning capacitor, C1, is mounted on a small shelf supported by the 6 1/2 x 3 1/2-inch front panel — see the rear-view photograph. C1 has a built-in reduction drive which facilitates tuning on the 21- and 28-MHz bands. The frame of C1 contains two small trimmer capacitors, one for each section. The trimmer closest to the tuning shaft is retained, but the second one is disabled by removing the screw. Trimmers C2, C3, and C4 are used instead to align the front end for proper tracking. Three 25-pF miniature variable capacitors are employed and are mounted on the bottom side of the circuit board. Before installation, the two solder tabs on each capacitor are bent out at right angles to the capacitor body. Correct positioning of these capacitors is shown in the parts-layout diagram offered in Fig. 1.

### Alignment

Before applying 12 volts to the converter, check to see that the transistors are properly oriented in their sockets and that no solder bridges are shorting the foil sections on the pc board. Check the resistance from J3 (pin 3) to ground; it

(Continued on page 67)





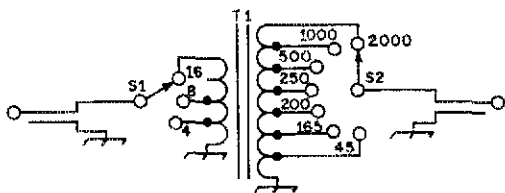
# Hints and Kinks

## For the Experimenters



### AUDIO MATCH-MAKER

Over the years I have accumulated several headsets and loudspeakers. No two have the same impedances. Likewise, they rarely match the output impedance of my receiver. As a result the signal I hear is less than optimum. I solved my problem by using an audio transformer with multiple taps on the primary and secondary which I select by means of a rotary switch. I now hear the weak signals that eluded me because of this mismatch in receiver output to headphones. — *A. A. Gabriele, M.D., K3BZK*



Multi-tap audio transformer used to match a variety of impedances.

S1 — 1-pole, 3-position wafer switch.

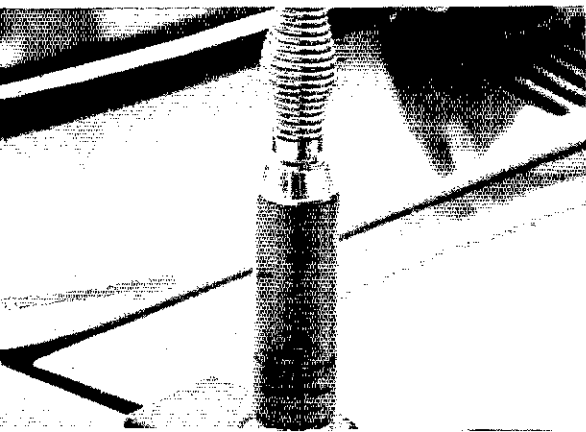
S2 — 1-pole, 7-position wafer switch.

T1 — Line to voice coil transformer (Stancor A-8104).

### MOUNTING A 2-METER 5/8-WAVELENGTH ANTENNA ON A VW FASTBACK

Since the product review describing the Regency HR-2 appeared in *QST* for August, 1971, this writer has been asked many times how he mounted the antenna mentioned in the write-up. Because a VW was specified as the automobile in use during the evaluation period, several VW owners have asked for this information.

The photo shows how an aluminum bracket can be formed to support the antenna and its base mount. Shown here is an Antenna Specialists 5/8-wavelength vertical whip for use on 2-meter fm. The assembly is mounted on the right front side of the car, just ahead of the windshield (opposite the boom antenna). The transceiver is

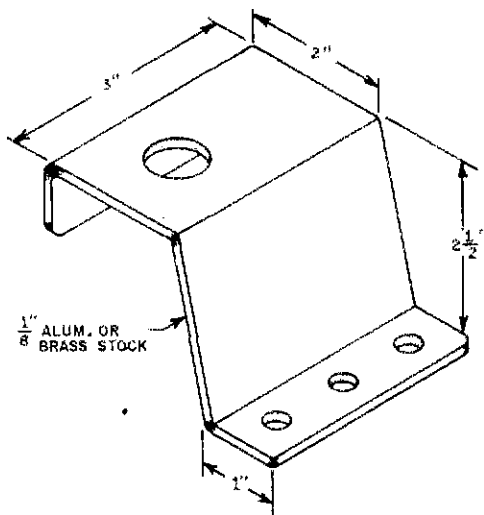


mounted under the dash on the passenger's side of the front seat. This arrangement permits a very short length of 50-ohm coaxial feed line to be used between the rig and the antenna — approximately 3 feet.

The aluminum bracket is made from 1/8-inch-thick stock. The heavy-grade material is necessary to assure rigidity and long life for the bracket. Attachment to the car body is made inside the trunk lid by means of three No. 8 sheet-metal screws. The coaxial cable is simply routed through the mating surfaces of the trunk lid and car body, and is held in place (without undue crimping) by the weather seal of the lid.

The advantage of using this mounting technique is that no exterior holes need to be made in the car body. By installing the antenna at the front of the car, ignition noise is less likely to cause a problem with reception because the VW engine is at the rear of the vehicle.

Performance has been good with the antenna side-mounted as shown. No troublesome lobes have been evident. WIKLK has his antenna mounted in a like manner on his VW Squareback, and reports good results. — *WICER*



Sketch of the aluminum bracket showing the approximate pitch of the bends. Some experimenting may be necessary to obtain the precise bend angle needed to provide a true vertical positioning of the whip.

Photo showing the antenna attached to its homemade bracket. The bracket has been painted to match the color of the car. The feed line is routed through the crack between the trunk lid and fender.

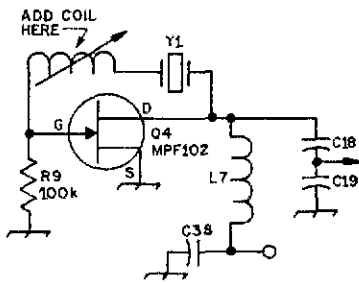


## 2-METER CONVERTER MODIFICATION

I had difficulty in getting the local-oscillator crystal on frequency after building the "High Performance 2-Meter Converter" from June, 1971, *QST*. The trimmer capacitor suggested in Fig. 1 (C36) did not have significant effect in my model. In fact, my oscillator was operating 7 kHz higher than 58 MHz.

My cure for the problem was the addition of a small variable inductor in series with one leg of the crystal, as shown in the diagram. I used a 1/4-inch-diameter iron-core slug-tuned form with approximately 5 turns of wire wound over it.

I substituted Motorola HEP53s for the 40637s specified in the article. I was unable to get the 4 volts pk-pk output at the junction of C29 and C30 while using these transistors. The problem was solved by changing R13 to 100 ohms.



Modification of crystal oscillator showing addition of variable inductor in series with crystal.

Performance with this converter is outstanding! I'm hearing distant stations (60 miles or more away) while using a 19-inch ground-plane antenna 55 feet in the air. Others in Kansas City need beams to obtain equal reception! ~ *Bob Keplinger, K4CTK*

## ELIMINATION OF STATIC IN FAN DRIVE BELTS

Receiver static is sometimes a problem for me when my forced-air furnace operates. I traced the trouble to the fan belt. I had heard that a belt dressing was available that would cure static, but I wanted to eliminate the noise as quickly as possible. Using a rag saturated with alcohol, I cleaned the belt thoroughly and the static completely disappeared. ~ *James S. Collier, W2QBB*

## HOLDING LIGHT-WEIGHT EQUIPMENT IN PLACE

Years ago, amateur equipment would stay put by sheer weight alone. Today, light-weight transceivers and the like will scoot off the desk with just a slight nudge.

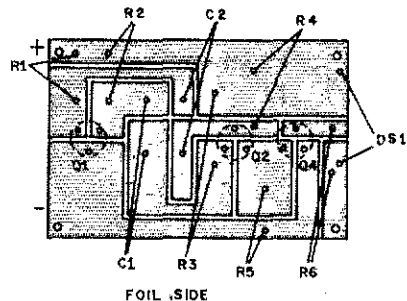
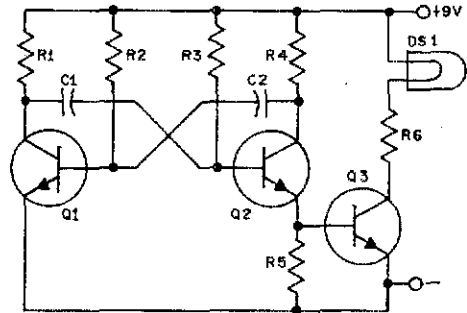
I have found that a piece of indoor-outdoor carpeting will hold them in place. The equipment feet nestle down into the nap of the carpet. The rubber backing holds the carpet material firmly to the desk top or other surface.

When stacking gear, put a piece of carpeting under the feet of the top unit. This should not be used on a vented cabinet of course, but is great for solid ones, such as speaker enclosures. ~ *Ed Heubach, W9AO*

## ETCHED CIRCUIT BOARDS WITH NO FUSS

In the course of making a considerable number of circuit boards during the past few years, I have arrived at a style, which though not suited for many commercial requirements, is sufficient for most amateur needs. Instead of etching an elaborate pattern of lines, circles, dots, and curves, I have designed all of my boards in a mosaic, or floor-tile pattern. I find three distinct advantages to this method of layout. First, there is less copper foil to be etched away; second, there are no fine lines of foil to pop off the board when extra heat is applied; and third, there is a much greater latitude available in the placement of parts.

Anyone who has access to a Dremel-type drill can make his own boards without resorting to chemical etching. After laying out the desired pattern on paper and transferring the design to the copper foil, it is a simple matter to cut through the foil with a fine rotary saw, or a small emery saw wheel.



Shown is a light flasher board and the pattern for the etched circuit board to build it on.

Shown is a typical circuit and the board that I would etch, drill, place components on, and have in operation in about 30 minutes time. Although this is a simple design, I have made more complex circuits in about the same time and they have remained in operation a long while without foil failure. ~ *F. T. McAllister, WSHKT/4*

# Technical Correspondence

## SIMPLE OSCILLOSCOPE PREAMPLIFIER REVISITED

Technical Editor, *QST*:

In the October, 1971, issue of *QST* on page 56 (Hints and Kinks), the "Simple Oscilloscope Preamplifier" is said to have an output impedance of "roughly 20,000 ohms." This value is evidently estimated from the assumed Darling-ton-transistor collector impedance alone. The 3900-ohm collector resistor will assure that the output impedance is no greater than this value. In fact, if a 20k $\Omega$  device output impedance is assumed, the output impedance is the equivalent resistance of 3900 and 20,000 ohms in parallel. This is about 3300 ohms.

Also, a simple amplifier like the one shown should have a flat frequency response many times higher than the 30 kHz given, unless the output is fed through a long cable to a relatively low-impedance or high-capacitance load. It would be desirable in most cases to eliminate the 9-volt battery by using some internal scope voltage, even if it had to be rectified and filtered filament voltage. — *Franklin Swan, W9SIA, Instructor, Missionary Radio Dept., Moody Bible Inst., 820 N. LaSalle Street, Chicago, IL 60610.*

## LOW-LOSS PASSIVE BANDPASS CW FILTERS

Technical Editor, *QST*:

The article, "Low-Loss Passive Bandpass CW Filters," by D. C. Rife, which appeared in the September, 1971, issue of *QST*, discussed an interesting application of Norton's impedance transformation as applied to filter design. Capacitive impedance transformers were used to change the impedance of the series-tuned circuit in the bandpass filter discussed in the article. This allowed a standard 44-mH surplus loading coil to be used instead of a nonstandard 542-mH coil. (See

Figs. 5 and 6, page 44, September, 1971, *QST*). The disadvantage of this procedure is that additional capacitors are required, two of which have the relatively high value of 1  $\mu$ F. An alternative method of transforming the impedance of the center series-tuned section is available. The fact that the 44- and 88-mH coils both have center taps makes this alternative method possible. Of course, for the 11- and 22-mH values, this is not feasible.

Mr. Rife's design example on page 43 used an impedance transformation of  $(3.51)^2$  or about 12, so the required center inductor is only 44 mH. However, by using the input and output inductor center taps (to obtain an impedance transformation of 4) and by slightly changing the values of center frequency and the filter bandpass, it is possible to obtain a filter design in which only the standard loading-coil values are required. The alternative filter design schematic diagram and measured response curve are shown in Fig. 1.

Note this alternative filter design corresponds to Rife's design of Figs. 5B and 6 where  $f_{\text{mean}} = 875$  Hz,  $L1 = 44$  mH, and  $B/2\pi = 353$  Hz. In order for the center inductor to be a convenient 132 mH (sum of 44 and 88), Rife's  $f_m$  value of 875 was increased by 1.26 percent to 886 Hz and the value of  $B/2\pi$  was increased by 2.5 percent to 362 Hz. Comparing the attenuation response curves of the two filters shows that they are essentially identical. The disadvantage of the alternative filter design is that an extra 88-mH coil is required, but this, I believe, is preferable to the capacitors which are required for the design published in Fig. 5B. The capacitors required for the alternative design can be assembled with 0.22- and .022, and 0.68- and .05- $\mu$ F capacitors, making it very convenient in this respect.

The filter response curve demonstrates some interesting characteristics of the Butterworth bandpass filter. The 3-dB passband, 362 Hz, was identical to the design value, and the values of  $f_1$  and  $f_2$  were measured as 724 and 1086 Hz, respectively. Since this bandpass filter was derived from the 3-element Butterworth low-pass prototype, the response should show an attenuation of 18 and 36 dB at two times and four times the 3-dB cutoff frequency, respectively. Thus, for a perfect filter, the 18-dB bandpass will be  $2(f_2 - f_1)$  and the 36-dB bandpass will be  $4(f_2 - f_1)$ . The calculated (and measured) 18- and 36-dB bandpass values were 724 (735) Hz and 1448 (1465) Hz respectively. The fact that the measured 18- and 36-dB bandpass values were slightly greater than the calculated values is attributed to the coil and capacitor losses. The good agreement between the measured and calculated values of the filter response confirms that the use of the inductor taps is feasible and this possibility should be explored before considering other means of impedance transformation. — *Edward E. Wetheroid, W3NQN, 102 Archwood Ave., Annapolis, MD 21401.*

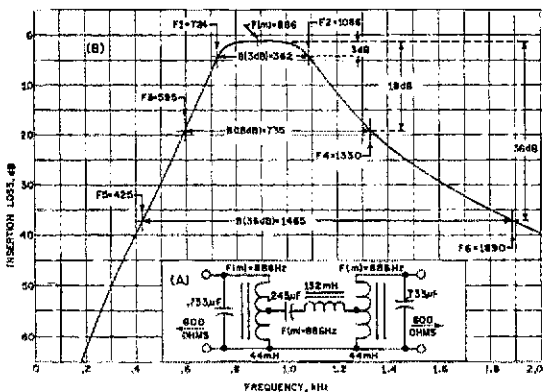


Fig. 1 — Butterworth-response bandpass filter with input and output inductors tapped for impedance transformation. Graph at B is measured response for circuit of A.

Technical Editor, *QST*:

In the article, "Low-Loss Passive Bandpass CW Filters," by D. C. Rife (September, 1971, *QST*), there are a few minor errors which should be called to attention. First of all, the equation for C3 in Fig. 4C, page 43, has a minus sign missing. [EDITOR'S NOTE: See Feedback, December, 1971, *QST*, page 47.] With reference to Fig. 1 of that article, a constant- $k$  or 3-pole Butterworth bandpass filter is shown, and not a 6-pole filter, as is mentioned in the text. Some authors use the

terms, third-order,<sup>1</sup> or three-stage.<sup>2</sup> The statement, "As can be seen, the computed bandwidth has almost been realized," may be all right with regard to the use of these filters, but the measured bandwidth was 427 Hz, which is 20.9 percent greater than the design bandwidth of 353 Hz.<sup>3</sup>

There seems to be some misunderstanding or misconception on the part of a few would-be filter designers. This may be in part because of the fact that many of the books on modern network filter design published in the 1960s have errors in them. — Joseph A. Gutowski, 1833 Caroline Ave., Linden, NJ 07036.

## MORE ON THE SOLID-STATE PREAMPLIFIER

Technical Editor, *QST*:

I built the solid-state preamplifier by WA4JVE and WA4MGX in September, 1971, *QST*.<sup>4</sup> May I suggest if anyone builds this unit for multiband work with switching, a resistor should be installed in series with the base of each transistor. The

<sup>1</sup> Zverev, *Handbook of Filter Synthesis*, Wiley, New York, 1967.

<sup>2</sup> Hansell, *Filter Designs and Evaluation*, Van Nostrand, New York, 1969.

<sup>3</sup> [EDITOR'S NOTE: The departure of the measured response from the theoretical attenuation curve occurs partly because Rife selected commonly available values of capacitors, shown in his Fig. 6, as opposed to the design values shown in Fig. 5. It may be seen that the values of these two diagrams differ in some instances by an amount greater than 15 percent.]

<sup>4</sup> Belcher and Victor, "A General Purpose Solid-State Preamplifier," *QST*, Gimmicks and Gadgets, September, 1971.

resistance value should be approximately 100 ohms, and the resistor should have short leads. The preamplifier does have considerable gain, and it may "take off" without these resistors.

With a good receiver the preamplifier still may be of use to those working 10, 15, and 20 meters on a quiet morning. It is doubtful that any improvement will be found on the lower frequencies when the preamplifier is used with a receiver of good modern design. — Paul T. Atkins, WB2OZW, 56 Ormsay St., Park Ridge, NJ 07656.

## FEEDBACK

The code-practice oscillator described in the Hints & Kinks column of *QST* for December, 1971, should have the emitter of Q1 connected to the negative side of the 10  $\mu$ F capacitor and the positive side should be connected to chassis ground.

In the 1971 Field Day Results in November *QST*, the score of W1SYE/1, the Newport County RC, was inadvertently omitted from the results. It should have read: 620-B-10-1640 under Class 3A.

In the 1971 Field Day results, *QST*, November, 1971, the score of W4KVK/4, the Henderson (Ky) ARC was inadvertently omitted from the results. The score should have read: 1059-B-12-2368 under Class 2A.

## Tentative dates for major 1972 ARRL operating activities.

January	February	March
6 Qualifying Run, W6OWP 8-9 VHF SS 12 Qualifying Run, W1AW 15-16 CD Party, cw 22-23 CD Party, phone 29-30 Simulated Emergency Test	2 Qualifying Run, W6OWP 5-6 DX Competition, phone 5-13 Novice Roundup 10 Qualifying Run, W1AW 13 Frequency Measuring Test 19-20 DX Competition, cw	2 Qualifying Run, W6OWP 4-5 DX Competition, phone 10 Qualifying Run, W1AW 18-19 DX Competition, cw 27 Morning Qual. Run, W1AW
April	May	June
5 Qualifying Run, W6OWP 11 Qualifying Run, W1AW 15-16 CD Party, cw 22-23 CD Party, phone	4 Qualifying Run, W6OWP 10 Qualifying Run, W1AW 13 Frequency Measuring Test	7 Qualifying Run, W6OWP 10-11 VHF QSO Party 15 Qualifying Run, W1AW 24-25 Field Day 28 Morning Qual. Run, W1AW
July	August	September
6 Qualifying Run, W6OWP 14 Qualifying Run, W1AW 15-16 "Open" CD Party, cw 22-23 "Open" CD Party, phone	9 Qualifying Run, W6OWP 15 Qualifying Run, W1AW	7 Qualifying Run, W6OWP 9-10 VHF QSO Party 10 Frequency Measuring Test 13 Qualifying Run, W1AW 26 Morning Qual. Run, W1AW
October	November	December
4 Qualifying Run, W6OWP 12 Qualifying Run, W1AW 14-15 CD Party, phone 21-22 CD Party, cw	2 Qualifying Run, W6OWP 10 Qualifying Run, W1AW 11 Frequency Measuring Test 11-12 SS, phone 18-19 SS, cw	6 Qualifying Run, W6OWP 9-10 160-Meter Contest 12 Qualifying Run, W1AW 30 Morning Qual. Run, W1AW 31 Straight-Key Nite



# Recent Equipment



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

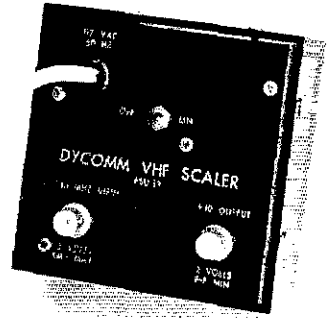
## Dycom PSU-13 VHF Scaler

DYCOM HAS just introduced a vhf scaler for use with hf counters. Designated the PSU-13, the unit will divide any input frequency in the range from 10 to 240 MHz by a factor of 10. Only 100 mV of input signal is needed at 144 MHz, an indication of the excellent sensitivity of the scaler. Another use for the PSU-13 is to divide a vhf signal so that it can trigger the sweep circuit of an oscilloscope. Some 'scopes have sufficient vertical sensitivity to display vhf signals but lack vhf synchronization capability.

The PSU-13 scaler is housed in a heavy-duty aluminum case. All components are mounted on two pc boards. Input and output connections are via BNC connectors. The unit is very robust, so it should be able to endure the rigors of service work indefinitely.

All of the circuitry for the input amplifier and the divide-by-ten counter is contained in a single integrated circuit. The IC package is marked only with a manufacturer's house number; it is probably a special item made for Dycom, as this writer could find no equivalent IC listed in any of the manufacturer's catalogs. Output from the IC drives a buffer consisting of Q1 and Q2. This circuit, shown in Fig. 1, provides approximately 2 volts peak-to-peak output, enough to drive any of the popular hf counters, even when a long intercon-

necting cable is employed. The input circuit of the IC is protected against high rf voltages by back-to-back silicon diodes. Dycom rates the maximum input level at 2 volts rms, which seems to be conservative, as other scalars with similar input circuits are rated for up to 50 volts. — WIKLK



**Dycom PSU-13 VHF Scaler**  
Dimensions (HWD) and Weight: 4 x 4 x 2 3/4 inches, 1 1/4 pounds.  
Price Class: \$90.  
Power Requirements: 117 V ac, 5 W.  
Manufacturer: Dynamic Communications, Inc., P.O. Box 10116, Riviera Beach, FL 33404.

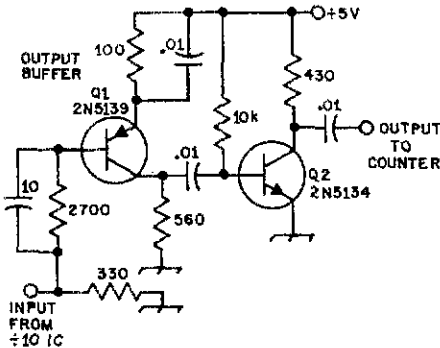
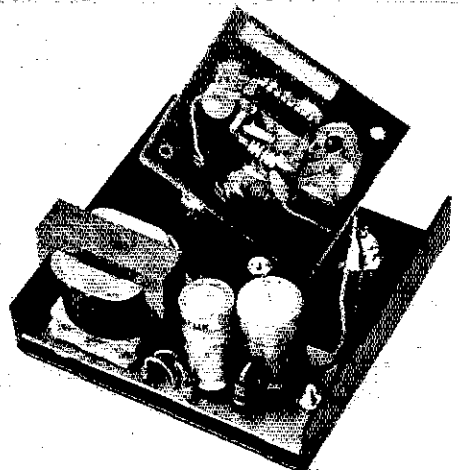


Fig. 1 — Circuit diagram of the PSU-13 output amplifier.

The power supply for the PSU-13 is located on the lower circuit board. The frequency-divider IC and output buffer are located on a second board which is mounted over the input and output jacks to allow short interconnecting leads.



## The Heath HW-101 SSB Transceiver

**T**HOUGH SOMEWHAT similar in appearance to the earlier HW-100 ssb/cw transceiver, the Heath HW-101 has been subjected to a face lifting. The interior has been modified to some extent to provide greater flexibility for the cw/phone operator. The HW-100 had just one i-f filter.<sup>1</sup> Thus, the operator found himself equipped with a receiver section whose i-f bandwidth was set only for ssb work. If he wanted to use the transceiver for cw operation he was limited to phone selectivity. Alternatively, a cw filter could be purchased from the manufacturer and installed in place of the phone filter. That arrangement was rather a grievous one for the person who liked to work both ssb and reduced-QRM cw because the cw filter was unsuitable for ssb reception. Now, with the HW-101, chassis hardware is included with the kit to enable selection of a 2.1-kHz filter for ssb use, or a 400-Hz filter when using the cw mode. The 400-Hz filter does not come with the kit; it must be purchased separately.

A unique style of drive assembly was employed in the HW-100, but it was subject to backlash after several months of use. A more reliable dial-drive mechanism has now replaced the plastic-gear type used in the earlier model. The HW-101 uses a backlash-free ball drive which tunes smoothly and resets to a chosen dial position with accuracy. The tunable oscillator is generally the same as far as the circuit is concerned, but a different-style variable capacitor is used because of the change in mechanical layout of the drive control. The new parts can be purchased from Heath and installed in the HW-100 if one is willing to remove the VFO assembly and replace the variable capacitor. The new dial drive will fit into older units, according to the manufacturer.<sup>2</sup>

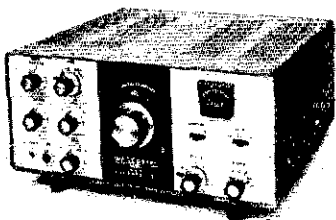
The remainder of the circuit and mechanical characteristics pretty much reflect the makeup of the HW-100. However, some subtle changes have been made in the receiver front end to provide better uniformity of overall gain from 3.5 to 30 MHz. (Some owners of the HW-100 reported reduced gain on the 15- and 10-meter bands, though the noise figure was satisfactory.) The unit built by this writer does, indeed, seem to have plenty of "whomp" on both 10 and 15 meters.

### Construction

Approximately 50 hours were devoted to the assembly job when building the HW-101 with an additional 10 hours to test and align the equipment. The builder has had very little experience in constructing amateur gear, homemade or other-

<sup>1</sup> The HW-100 transceiver was reviewed in *QST* for January, 1969, p. 51.

<sup>2</sup> If the reader contemplates modifying an HW-100 for use with the HW-101 dial mechanism, it is suggested that he purchase the HW-101 assembly manual first. Then, study the dial assembly instructions, write down the parts needed for the modification, and order accordingly.



wise. The HW-101 seemed like a formidable undertaking for a Novice on the brink of becoming a General. Happily, things went smoothly, and the end result was well worth the time spent in getting the piece together. The testing process was complicated by the writer's lack of test gear.

There were a few problems. Two of the slug-tuned coils on one of the exciter pc boards were defective, having shorted B-plus leads. The fault caused two decoupling resistors to go up in smoke when the power was first turned on. Upon locating the short circuits, the offending coil wires were pried away from the coil-form lugs against which they were shorting. The burned-out resistors were replaced; then all worked as the book had outlined. The PA plate rf choke went up in smoke later on during the checkout process. The cause of the failure was traced to the writer's carelessness when snipping off the pigtailed of one of the parts in the PA compartment. The sharp end of a pigtail had been pressing into the choke winding, finally causing it to short out.

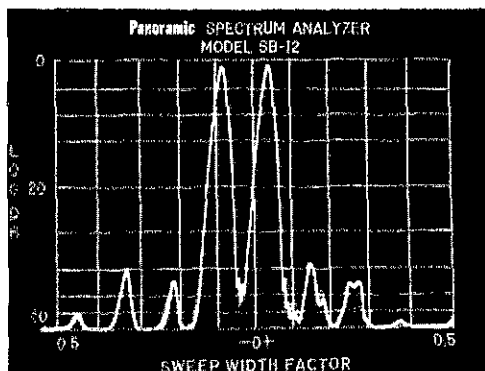
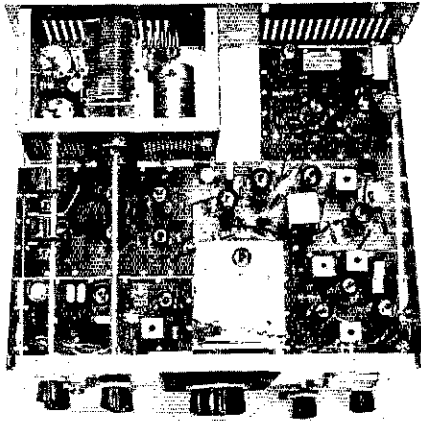


Fig. 1 — Spectral display of the HW-101 output signal during two-tone testing. The third- and fifth-order distortion products are down better than 30 dB below PEP output. (The scale is calibrated in dB below a single-tone test, which may be converted to Heath's system by subtracting 6 dB.)



Interior view of the HW-101 topside. The VFO is at the lower center. The cover has been removed from the PA compartment to show that plenty of room for air flow has been allowed — an aid to tube life.

### Performance

Generally speaking, the HW-101 showed performance traits which were similar to those of the OM's HW-100. However, the 400-Hz selectivity enables the HW-101 to run circles around the HW-100 when operating cw. The dial mechanism has a more positive feel, and no backlash could be detected even when using the 400-Hz filter. Frequency stability is excellent, as is characteristic of the HW-100. On-the-air cw tests were performed at the ARRL lab, and reports of RST 599 were frequent. On phone, reports of good audio quality were obtained from all of the stations contacted.

Tests were made with the ARRL's spectrum analyzer to determine whether the carrier suppres-

sion, harmonic output, and distortion (IMD) were within bounds. All tests showed the results to be well within the manufacturer's specifications. A spectral display is shown in Fig. 1.

In closing, the writer would like to say that the less experienced amateur should not be afraid to purchase and build the HW-101. If you can follow instructions carefully (the assembly manual is worded in clear language and is profusely illustrated), and if you can use a soldering iron properly, no problems should result. The rig will get its work-out once that General Class license is in hand! — *Ex-WN1LZQ*

### Heath HW-101 Transceiver

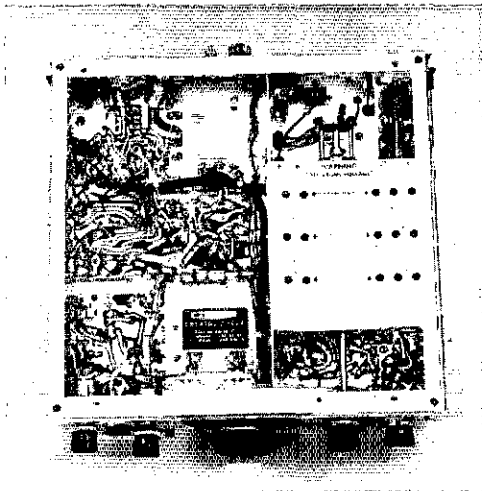
Dimensions (HWD) and Weight:

6 5/16 × 14 13/16 × 13 3/8 inches,  
17 pounds.

Power requirements: 700 to 850 volts dc at 250 mA, 300 volts dc at 150 mA, — 115 volts dc at 10 mA, and 12 volts ac or dc at 4.76 A. (The Heath HP-23 ac supply can be used for fixed-station use. The HP-13 dc supply is available for mobile operation.)

Price Class: \$250.

Manufacturer: Heath Company, Benton Harbor, MI 49022.



The 400-Hz and 2.1-kHz *i-f* filters are located on a mounting plate near the filter-selector switch (lower foreground). The selector switch is mounted concentrically with the rf gain control on the front panel. The cable harness is factory made. The various cable breakouts connect to the bottom sides of the five pc-board modules.

## Strays

Because of an FCC rule violation, the multioperator score of WA6IQM in the 1971 ARRL DX Competition (p. 61, Sept. *QST*) has been disqualified.

### Stolen Equipment

During the past summer the entire club station at the Colorado State University, Fort Collins, was stolen. The club is particularly interested in recovering the following Collins equipment: 75S-3B receiver, serial 15640; 32S-3 transmitter, serial 12000; and 516F2 power supply, serial 1649. Contact W. H. Solfermoser, KØDVI, Administration Building, Colorado State University, Fort Collins, CO 80521.

A G.E. Port-O-Unit, Model HN-36263, serial 4410629, R.R. No. 95 — MRO 12121, property of the Penn Central Transportation Company, was recently stolen. Contact Patrolman Donald J. Parker, Metropolitan Region, Office of Superintendent of Police, Penn Central Transportation Company, Grand Central Terminal, New York, NY 10017.

# What You Always Wanted to Know About SSTV

But were afraid to ask . . .

BY EUGENE H. HASTINGS,\* W1VRK

**Y**OU MEAN you can actually see the other fellow?" he asked. "Of course!" I replied, and thence started a long session of questions and answers about a new facet of ham radio just beginning to be noticed: slow-scan television, or SSTV.

This article was written as the result of phone calls and on-the-air questioning, questioning, questioning — just as I once questioned the *what*, *where*, and *why* of this exciting new medium. It is not a how-to-build-it article — it's a how-to-do-it commentary.

## Does It Really Work?

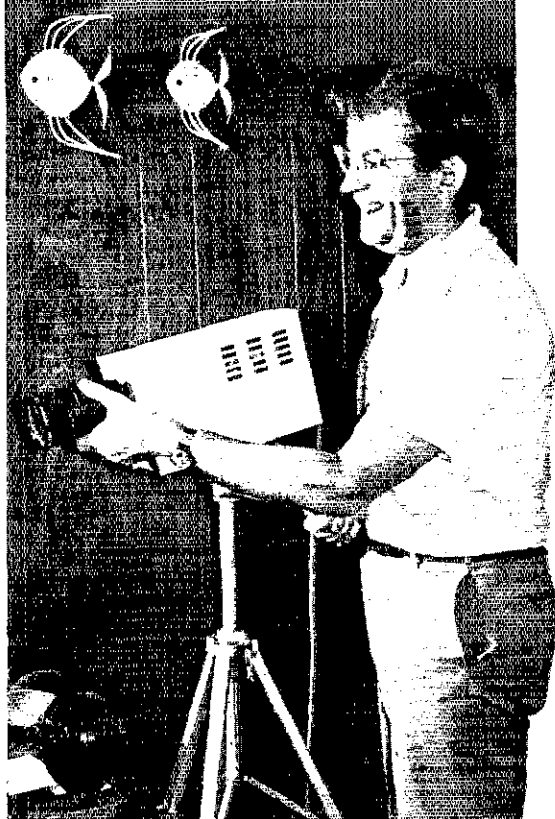
First of all, SSTV does work, and it works better than most hams think it probably will when they first hear about it. Credit must be given to the dozens of pioneers who, with no commercial equipment to call upon, designed and built the first units from all sort of exotic and surplus parts. The technical expertise of several of the active slow scanners on the air today is truly amazing — these chaps are constantly revising and trying new circuit approaches, and now there are circuits available, in some cases complete with printed boards,<sup>1</sup> that enable one to receive pictures for about \$50, depending on how much junk is in the junk box! The Robot commercially available gear,<sup>2</sup> which I must admit I have been using for a year now, really caused slow scan to grow by leaps and bounds. Not only was it perfected, but the pictures were of excellent quality using, not "junk-box" parts, but the best parts available for the job at hand.

But what can you *do* with it? What good is it? Well, a large number of hams now active on slow scan have made the comment, "This is the best thing that has happened to amateur radio since ssb. It has completely rekindled my interest." It is interesting to observe the large number of two-letter-call stations sending and receiving pictures — hour after hour, day after day. "This is

\* 28 Forest Ave., Swampscott, MA 01907.

<sup>1</sup> Through W6MXV, 2843 Mayglen Way, San Diego, CA 95133.

<sup>2</sup> Robot Research, Inc., 7591 Convoy Court, San Diego, CA 92111. (See "Recent Equipment," *QST* for November, 1971, "Robot Research Model 70 SSTV Monitor and Model 80 Camera.")



The author in one corner of his shack is shown adjusting a Cosmimar 22- to 66-mm zoom lens on a Robot camera mounted on a Sunset 3000 tripod. From this spot 8 feet from the operating position, pictures can be shot of the operator and the radio gear for taping or live transmissions.

CQ — W1VRK, photographed from the face of the TV monitor. The original was made from a Sunday-supplement newspaper ad (girl), part of a QSL card (W1VRK), and a 1965 magazine cover (CQ), and was recorded on a reel-type tape recorder. The tape was then cut and spliced into a continuous loop of exactly the right length, and can be run endlessly through the recorder as needed for calling CQ.



how ham radio was meant to be," one chap said. "I just had a great QSO with this fellow up in Michigan and then he sent me his picture and scenes of his shack. And then his XYL came in, and boy, what a good-looker she was. . . ." The thrill and excitement of slow-scan TV in the author's estimation is simply this — you can actually SEE the fellow you are talking to, and he is sending you his picture because he wants to do so, then and there — not later, in an envelope. It is a *personal* communication, and a very real one. Not just a voice, but an entire translation of language and personality.

Of course there are other aspects too. Using a bit of detective work one time I questioned a chap I was talking with about what it was in the picture of his shack that looked like a Collins S-line *under* his Collins S-line. (I thought he had made some dandy matching gear for phone patches or something.) He sheepishly admitted that I had spotted his SPARE S-line no less! (Just in case!) Then there is that ham out west who has hanging in his shack an unusual decoration — a complete human skeleton! One fellow last winter who had just received his new slow-scan gear that day was working me as one of his first contacts. "Can you see anything?" he asked. "Yes," I replied, "you are sitting there at noontime in your pajamas." He shut off his camera.

Admittedly, those hams with a moderate interest in photography do a better job of composing and exposing pictures — at least at first they do. For a noncamera bug it takes a little longer, as basic principles of composition, focusing, lighting, and so on, have to be learned all at once. But everyone is anxious to help, and pretty soon good pictures are the order of the day.

### What Bands Can I Use?

Slow scan is permitted on all bands except 160 meters. In license-segregated bands such as 75 and 20 meters, only those hams with Advanced or Extra Class licenses are permitted to transmit pictures. This, by the way, is why so many operate on, for example, 14.230 MHz and not 14.340 MHz

This shows W4MS artistry; it was recorded from a fading 20-meter signal which caused the wiggly lines. QSB can also cause ghosts and gray overlay.



as the DXers often ask us to. We can't move where the FCC won't allow us! The best pictures are those from S-9 or better signals on the higher frequencies such as 15 or 10 meters. This provides "closed-circuit" quality. Band conditions, unfortunately, have precluded much activity above 21 MHz except on a local basis (some have used 2-meter repeaters!). Most activity is found on 20 meters. However, because of QRM and fading (fast QSB causes "multipath" or "ghosts"), several hams have sought to increase activity on other frequencies. The 40-meter band (7.220 MHz) is very popular in the West and Midwest where European broadcast is not a big problem in the evenings, and 75 meters (3.845 MHz) is good locally, although usually plagued with ghost images as fading sets in.

When fading is minimal on 20 meters, superb pictures have been received on a world-wide basis. In the Boston area for example, I have received excellent pictures from Wales, England, and the Netherlands with S-9 signals or better, quite often. And quite acceptable pictures from Greece and Israel have been received with S-7 signals. Nine-plus signals from the southern slow-scan stations in Puerto Rico, Guadeloupe, Nicaragua, and the like, have produced pictures as clear as locals. Marginal pictures for myself on the East Coast are from stations in Australia and New Zealand whose little electrons get rather tired after bouncing those thousands of extra miles. Still it's fun — and one Aussie's kangaroo trademark has no substitute!

"Can SSTV be run on a-m?" I was asked. No, the FCC has limited the bandwidth on the 10-through 80-meter bands to that consistent with an ssb transmitter. Above 10-meter frequencies the rules vary a bit and of course on 440 MHz you can run regular "fast scan" TV with its wide bandwidth. SSTV runs audio tones from 1200 Hz to 2300 Hz, and this is narrower than many phone signals. This narrow range, incidentally, is why slow scan can be recorded on virtually any tape recorder, including the cassette variety. The big quality factor here is speed regulation of the recorder, not frequency response. Usually 7 1/2-in./s speed gives superior picture quality but hams

This picture was transmitted by PA0LAM, Arthur, who sends excellent pictures from the Netherlands using homemade cameras and receivers. The lighting for this picture was provided by his regular workshop fluorescent lights.







being hams, the amount of tape saved at 1 7/8 in./s is often a deciding factor. I personally advocate 7 1/2 in./s.

### *You Mean I Can Record Right off the Air?*

You certainly can, and most hams do. A video record of the ZS6 contact can be lots of fun. Tape is used as a regular tool on SSTV. Your station identification, your own picture (your best pose and profile!), those of the family, anything that takes time and patience to compose, are best done once and recorded so that you won't have to set up the same shot all over again for the next contact. My own CQ call, for example, is on a continuous loop of tape 8 seconds (one complete frame) long, and keeps running for as long as I wish to call CQ without bothering the camera each time. Another good factor with tape is that you can erase poor pictures and not transmit anything that isn't just perfect. At 7 1/2 in./s speed the recorded picture should be absolutely as good as the live original.

Hams have often wondered how complicated it is to modify their present equipment to accept slow scan. Good news — you don't. The audio from the picture (whether it be tape or camera) is merely fed into the ssb transmitter mic input, and the SSTV receiver — for some reason referred to as a "monitor" — is connected to your regular communications-receiver speaker terminals, in parallel with the loudspeaker. That's all there is to it!

These two frames from W5GQV illustrate the excellent quality available on 10 meters — when and if the band opens! Both pictures were sent on a homemade flying-spot scanner of top quality. A "reversing" circuit can give the white-on-black effect.

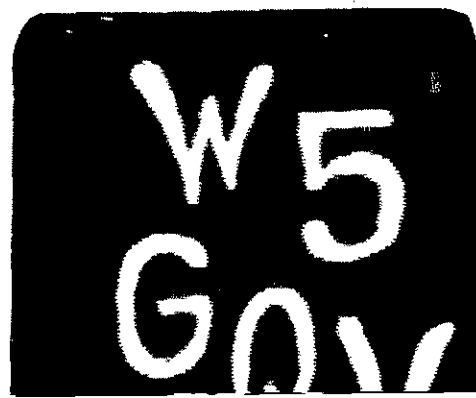


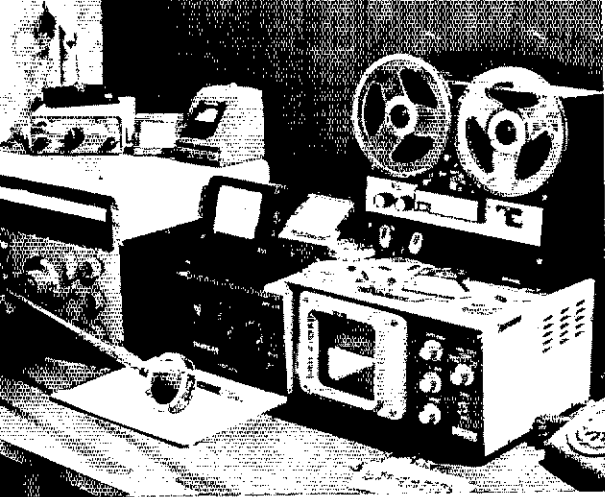
Another DXer, ON4DN, from a 15-meter transmission. The slight overtrace of raster is caused by the European 50-Hz ac mains that conflict with the sync pulses of our American 60-Hz units. Although this is noticeable, the quality is still quite good. Our signals received in 50-Hz countries also have a similar change of raster.

The ssb receiver or transceiver is tuned in for proper zero beat to the station you are copying, usually on the fellow's voice, just as you normally would, and then the circuitry in the TV monitor goes to work and sorts out the thousands of pulses of white, grey, and black into a picture on the screen. Now this is different. Rather than seeing a continuously moving image as you do on NBC, you get a still picture each 8 seconds. This time period is primarily a function of bandwidth, and with what the FCC allows us, the 8-second 120-line picture is the best compromise. If you have ever watched a radar screen during operation, you remember how the picture sweeps across the screen, refreshing and brightening the image as the trace line washes across the picture. Slow scan is quite similar — the trace runs from top to bottom in 8 seconds, tracing a new picture as it goes. The same type of tube that is used in radar, the P-7 phosphor (long persistence, slow fade), is used in slow scan. Some of the older surplus tubes use low voltage but the newer tubes, such as in the Robot equipment, have 12 kV on the anode — providing a brighter, sharper picture. Still in all, the best pictures are seen in a dimly lighted room so the eye can see the glow of the entire screen, not just the trace area alone. In a dark room you can shut the set off and still see the last picture for nearly a full minute, glowing eerily at you like the ghost of Christmas past! (If Charles Dickens were alive today, he no doubt would be a ham!)

### *How Can I Make Photographs of SSTV Pictures?*

Many slow scanners have developed a new side hobby — they have been photographing the screen and sending the pictures to the transmitting amateur to show how well his pictures were received. This can be done easily with a Polaroid camera or any other camera that allows you to





The somewhat crowded operating position at W1VRK is lighted for slow-scan TV with a 150-watt reflector flood lamp to the right of the picture and a 75-watt reflector flood lamp to the left giving an approximate 2:1 lighting ratio for contrast. In addition, a 75-watt reflector spot lamp is used for back lighting (also serves as an excellent reading lamp for QST!). The TV monitor is shown next to the panadaptor under the tape recorder. Transmitting equipment is under the counter.

hold the shutter open on "B" or "T." On Polaroid electric-eye models (recent vintage) you mount the camera on a tripod or other rock-steady surface, focus carefully, preferably with a close-up attachment, then cover the electric eye with your finger or a piece of black tape. Dim the room lights to practically zero and at the beginning of a picture trace, open the shutter. Hold the button down during the entire 8-second trace, then quickly release the shutter. One or two pictures later you will have determined the correct exposure and focus, and there is your picture! On other cameras the procedure is similar, but you have to wait to see your pictures.

This leads us to another believe-it-or-not special. There is an inner group of slow scanners that is sending **COLOR SLOW SCAN** And they tell me that the results are surprisingly good! Pictures are taken as above, but color filtration is used on both the sending and receiving ends. A red "A" (No. 25), a blue (No. 47) and a green (No. 58) filter are used, with each person using the same filter at the same time. Color film is used in the camera, and without advancing the film exposure is first made for the red, then the blue with the blue filter on, and then the green. The camera must be extremely steady. Good results have been obtained using both slide and negative color films. You have to determine the best exposure yourself, as everyone sets his TV monitor at a slightly different

brightness level, but starting exposures (for Daylight high-speed Ektachrome ASA 160) are red f/2, blue f/2, and green f/5.6, one frame of each color. Other films can, of course, be used. Scale the exposures according to ASA ratings. Do not remove your monitor scope-tube amber filter, if it has one. This filter removes much invisible high-intensity blue light to which the color film is overly sensitive, and removal can cause a bluish cast. There may also be a red spectrum present to a lesser degree, again to which films are quite sensitive although not noticed by the human eye. The black and white pictures illustrating this article were taken on 35mm TriEx film at f/11.

### *Can I Get on SSTV Without Buying an Expensive Camera?*

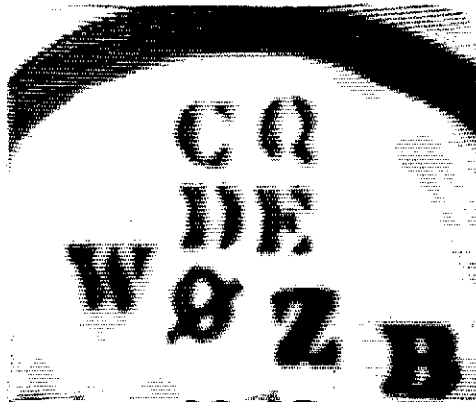
You will hear references to a flying-spot scanner on slow-scan TV. The early pioneers of the hobby usually built these scanners rather than a camera because they were less complicated and less expensive. There are a number of hams on today who can transmit excellent quality pictures with their scanners! You have to put a picture or sign or what-have-you into a target area (such as you might put a slide into a slide projector) and you are on the air! You cannot "aim" it live at anyone, so here the camera has the advantage. Several articles have appeared in ham publications on different types of flying-spot scanners.<sup>3</sup> Another sidelight has recently been introduced, that of converting closed-circuit TV cameras (used in security installations - banks, shopping centers, etc.) to

<sup>3</sup> See, for example, Macdonald, "A New Narrow-Band Image Transmission System," Parts I and II, QST, August and September, 1958.

G5ZT sent this picture through moderate QRM on 20 meters.



W0ZB called CQ on 15 meters. No one answered that time, but I took his picture nevertheless.



slow-scan operation. W3EFG developed such a conversion and HAL devices<sup>4</sup> is marketing the parts and printed board for around \$55 so if you can snag a camera . . . One enterprising ham recently bought a beautiful closed-circuit camera system from a frustrated shopping-center owner who was tired of paying service calls, for under \$50! A little investigation showed the trouble to be one burned-out tube in the monitor. Talk about a bargain!

Once you have heard an SSTV signal it is readily identifiable as such again, although many hams unfamiliar with the sound refer to it as Teletype or "foreign-broadcast" QRM. If you listen long enough, however, you soon will hear the audio identification required by the FCC. Actually, most QSOs between slow scanners consist of a major portion of normal audio rag chewing with an occasional picture thrown in for good measure. Seldom is a QSO nearly all pictures and no conversation. On Saturday afternoons, starting at 2:00 Eastern time on 14.230 MHz, there is a cross-country SSTV net where pictures and information are exchanged. This is one of the first places that newcomers learn about SSTV, and the net control stations are most patient in their attempts to help the call-ins who have questions.

As with regular ham radio, there is a good amount of interest in DX on slow-scan TV. Many SSTV operators have worked WAC and several are working on their WAS. DXCC will, of course, be a bit more difficult although one W4 has 21 countries confirmed so far.<sup>5</sup> Several countries do not yet permit their amateurs to transmit SSTV. There is one active USSR station who anxiously receives pictures but is not yet allowed to transmit any in return. Japan is another ham-active nation not yet permitting SSTV transmissions, although recently a personal visit to my shack by an active Japanese amateur provided him with a video tape of himself and his call, ready to roll when permission is received!

The subject material for SSTV is quite varied, but best results are had with relatively simple subjects photographed close to the camera. Harsh, contrasty scenes are to be avoided, but a moderate amount of contrast is desirable to enhance detail. If the subject is complicated such as a long, overall view of a ham shack loaded with equipment, it is advisable to explain ahead of time just what the fellow on the other end is going to see so that he can figure out details as the picture is transmitted.

<sup>4</sup> Box 365A, Urbana, IL 61801.

<sup>5</sup> [EDITOR'S NOTE: While endorsements for two-way SSTV contacts are available for WAS and WAC awards, no special recognition is offered for SSTV operation in earning the DXCC award.]

Close-up and title work is done with a 25-mm lens and two goose-neck reflector lamps. By using 16-mm movie-camera extension tubes, the camera can get as close as 1/4-inch to the subject material. Here it is 4 1/2 in. away, providing full screen size to a field 1 1/2-in. square. The illumination is provided by two 25-watt bulbs although at this close distance 15-watt lamps are more than adequate. Average f-stop setting is f/4.

Later close-ups of specific installations are self-explanatory, and shots of the operator and his family need little explanation unless the OM has long hair like his XYL! One active SSTV'er recently has been transmitting two pictures of himself, one before and one after he grew his mustache, and he has been taking an on-the-air poll on which looks better. Here is your chance to "talk back" to a TV pollster!

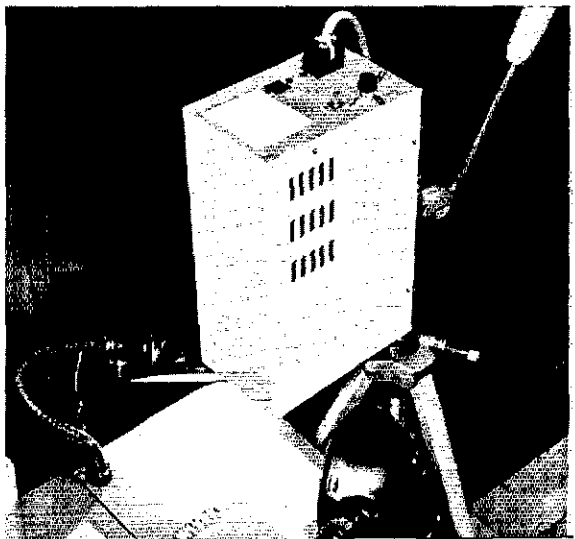
### How Much Power Can I Run on SSTV?

The maximum legal power on SSTV is one kilowatt dc input. The TV signal acts like a continuous carrier, so your transmitter ratings must be carefully checked before running much power. If your rig instruction manual cautions you not to tune for over 30 seconds or such, you know that you cannot run its full power level on SSTV. Often the cw input is wired for Class C operation and this is acceptable if carrier and unwanted sideband suppression are good. This has a much higher efficiency with resultant greater output and less overheating (plate dissipation) than linear operation. In any event, a careful observation of the transmitter or transceiver instruction manual is recommended before you run any SSTV signals through your transmitter and/or linear amplifier. Use an a-m or RTTY rating, if given. If in doubt contact the manufacturer of the equipment you are intending to use! While awaiting their reply, run reduced input (simply turn the audio gain down). Cutting your power in half merely trims 3 dB from the output, so don't worry about it.

I hope that this introduction to hundreds of hours of ham fun has been helpful. Now there's a whole new world of enjoyment from your receiver and transmitter available to you that was virtually unheard of a few short years ago. Get with it, and actually SEE those you are talking to for the first time. You'll enjoy yourself thoroughly, and literally you can say "CUL, OM!" and mean it! CUL.

**QST**

[EDITOR'S NOTE: A complete bibliography of all articles on the subject of slow-scan TV which have appeared in QST is available upon request. Send a stamped self-addressed envelope to SSTV T.I.S., A.R.R.L., 225 Main St., Newington, CT 06111.]





Need An

Audio Filter?

Use Your Head!

BY MELVILLE M. ZEMEK, \*WS1K

Reprinted from *RCA Electronic Age*

AS EVERY Radio Amateur knows, selectivity, or the ability to separate the desired signal from undesired signals, is extremely important when working in the present crowded amateur bands. Every effort is usually made to design the receiver to have as narrow a passband as possible with a steep-skirted selectivity curve and still obtain intelligent reception of information. Fig. 1 illustrates a typical selectivity curve for a modern superheterodyne receiver. The bandwidth is usually defined as the width of this resonance curve at the 6 dB attenuation point. There are limits as to how narrow this band width can be made and it has generally been agreed these limits are 2000 Hz for a-m, 1000 to 1500 Hz for ssb, and 150 to 200 Hz for cw.

### I-F Selectivity

This selectivity is usually obtained in the i-f portion of the receiver by employing low frequencies in the order of 50 or 100 KHz and high Q inductances in the i-f stages. It should be remembered that the selectivity characteristics are obtained from these inductances and not from the i-f tubes which are needed solely to overcome the signal loss in the circuitry. A more recent approach is to use special crystal or mechanical filters designed specifically for the i-f stage to create this steep-skirted, narrow passband effect. With this arrangement the selectivity can be placed nearer to the receiver's antenna input with additional advantages as pointed out by Byron Goodman<sup>1</sup> several years ago.

\*7857 La Sobana, Dallas, TX 75240.

<sup>1</sup>Goodman, "What's Wrong with Our Present Receivers?" *QST*, May 1957.

### Audio Selectivity

Another arrangement which can assist greatly in improving selectivity is the audio filter. The audio filter for cw use is a very narrow passband filter having a center design frequency usually in the vicinity of 1000 Hz. This is to permit the passing of one audio beat note frequency, and the rejection of other beat notes on either side of the center design frequency. Numerous articles have appeared in *QST*<sup>2</sup> and the *ARRL Handbook* describing the construction of such units.

Recently while taking my annual physical examination I requested, out of curiosity, a test of my hearing. This simple test indicates the hearing loss in decibels, from some adopted medical standard, for various frequencies. The results really astounded me, not from the standpoint that my hearing loss was particularly unusual, but because my ears were frequency sensitive or selective. As Fig. 2 indicates, my left ear has a flat frequency response from 2000 Hz to 4000 Hz with a rather steep attenuation on either side. The right ear, illustrated in Fig. 3, is sharply peaked at 2000 Hz with steep-skirted selectivity on either side.

### You as an Audio Filter!

The approach was now obvious. I constructed an audio filter with a center frequency of 2000 Hz and steep-skirted selectivity characteristics. What could be better? I now have a receiver with narrow passband i-f and my ears, especially the right ear, in conjunction with the audio filter, provide the final touch in separating the undesired signals from the desired cw signal. Since my left ear has the widest bandwidth of 2000 Hz, this is reserved for phone work with another, wider passband receiver using no audio filter. If you are contemplating the construction of such an audio filter for cw use, it is suggested that a test of your hearing selectivity characteristics be made and from this data you can determine the proper center frequency to be incorporated in the audio filter.

While the test of my hearing ability was made by a physician using a small, commercially-made unit constructed specifically for this purpose, any amateur can make this test himself and probably with greater accuracy. All you need is a calibrated audio frequency generator of reasonable accuracy and some means of measuring the output voltage. For various frequencies in the audio spectrum the signal generator output is reduced until the signal is just barely audible and the output voltage noted and recorded for that particular frequency. This should be done separately for each individual ear. The next step is to plot the loss or attenuation in decibels from some fixed point for each frequency. Since we are not particularly interested in this from a medical standpoint, it is suggested that the fixed point or standard chosen be that lowest output voltage that you are able to hear at all the frequencies tested. The loss in decibels from this

<sup>2</sup>McCoy, "The Selectoroid," *QST*, Dec. 1966.

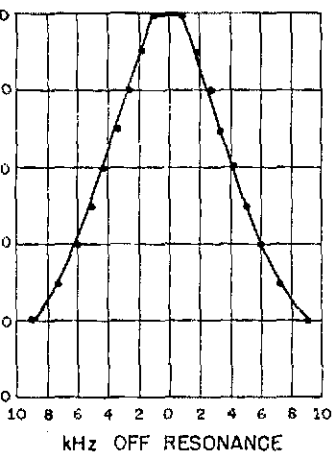


Fig. 1

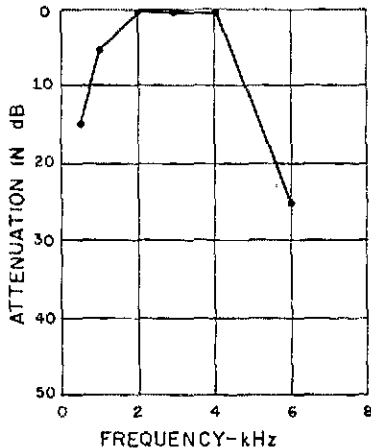


Fig. 2

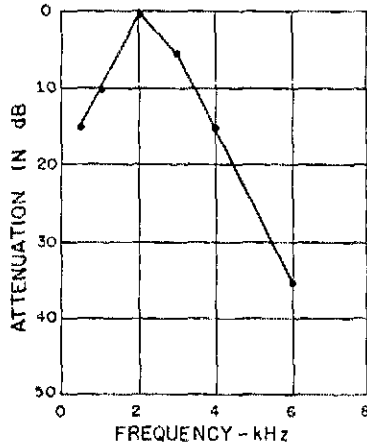


Fig. 3

standard for each frequency is then determined from the usual equation:

$$\text{Loss in Db} = 20 \log_{10} \frac{E_2}{E_1}$$

where  $E_2$  = lowest voltage audible at the particular frequency

$E_1$  = lowest voltage audible at all frequencies tested.

It is well known that the upper frequency limit of hearing for young people is approximately 16,000 Hz, gradually dropping to approximately 22,000 Hz as one gets older. However, I was astounded that mine dropped off so rapidly. The only explanation that I can come up with is that this was brought about through 35 years of cw operating in the amateur bands with the Bedlam associated with DX pile-ups, QRM, and QRN. **QST**

## HF Receiving Converter

(Continued from page 53)

should be 250 ohms or higher. A low-resistance reading indicates a fault which should be corrected before power is applied.

The hf crystal oscillator is aligned first. Some means of detecting the oscillator signal, such as an hf oscilloscope, general-coverage receiver or wavemeter, will be needed. Whatever the indicating device used, it should be loosely coupled to the oscillator tank circuit to be checked. Oscillation is started by varying the inductance of the tank inductor, moving the slug in the coil form. Best operation is achieved when the slug is set just above the point of maximum oscillator output, on the high-frequency side of resonance. After an oscillator coil has been set, the 12-volt supply should be switched on and off a few times to see that the oscillator starts reliably. If not, try a setting that provides slightly less inductance.

Adjustment of the mixer-output circuit is the next alignment task. The mixer tank circuit is adjusted by moving the slug in L11, which should be set for maximum output noise when the receiver is tuned to the center of the i-f band to be used. A broad peak will be obtained. This is normal and desirable.

Peaking the front-end circuits requires a weak-signal source; a signal generator or on-the-air signal may be employed. Align the 40-meter band first. Using C1, peak the incoming signal for

maximum S-meter reading on the associated receiver. Next, peak C1C, the trimmer that is part of the TUNING capacitor, and C2. Then, rotate C1 and observe that only one peak occurs on the S meter. If a double peak is obtained, repeat the adjustments of C1C and C2. Then align C3 and C4 on the 20- and 10-meter bands, respectively. (Don't move the setting of C1C during these adjustments.)

On the 160-, 40-, and 10-meter bands the oscillator operates at a higher frequency than the incoming signal. The receiver tunes in the reverse direction, when using an 80-meter i-f. Thus, 7 MHz is heard at 4 MHz and 7.5 MHz at 3.5 MHz. Because the 20- and 15-meter bands have the oscillator set on the low-frequency side, they will tune in the conventional manner. If the values shown in the chart are chosen for a 28-MHz i-f, all bands will tune from 28.5 to 28 MHz, as the signal is always lower in frequency than that of the hf crystal oscillator. **QST**



# The Eyes Have It

BY LEW FITCH,\* W4VRV

NOWADAYS, WHAT WITH semiconductors being the rage, and all the top-notch laboratories looking for new devices, it seems that the amateur is being displaced from his position as a discoverer. Hams did some good circuit work in the early days of transistors, and came up with some cute stuff, but the transistors that worked well cost so darn much at first that the engineers working on government projects got all the experience before the hams got into the action. After all, you practically have to overload something in the process of learning about it, and those \$40 germanium three-wire fuses got out of pocketbook range after the first goof.

Up until a couple of months ago, it looked as though hams were getting pushed into the background. On September 11, 1971 (Nobel Awards Committee, please note), a ham down the street called me on the phone. Fred, WC8QQQ, is an incurable home-brew and mess-around type. "What's an organic semiconductor?" he asked me. "I've been reading about these here holes and electrons and tunnels and stuff, and about the time I got that worked out to where I can design a circuit, I see where they're trying to spring a new set on me." I told him all I knew about organic chemistry (that being about three sentences worth), saying that living organisms were mostly made out of carbon and hydrogen and oxygen with little bits of other atoms stuck on. The only thing we seemed to settle on was that if it was alive, or had been, it was probably full of organic chemicals and that some of these chemicals probably conducted some way, and that some nuts were trying to make transistors out of it. This seemed to satisfy us both, so he went back to his book, and I went back to listening to the noise on six meters.

## Electro-Chemistry

Twenty minutes later, the phone rang again. The noise hadn't changed any, so I answered. It was Fred again. "When I got my first chemistry set," he said, "they had an experiment where you hooked a couple of wires to a dry cell and stuck the other ends in a potato. The positive wire was supposed to turn green, or something, and I think I remember that it really did. Is that the thing they're getting at?" I said I guessed it must be, and after a minute or so he hung up again. I got to wondering about the whole business, and went up

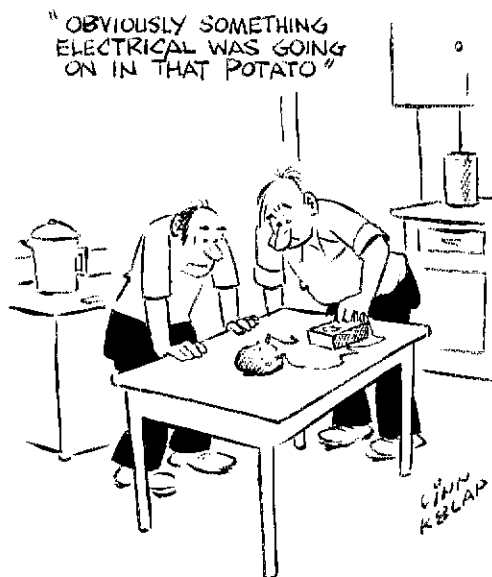
*The indomitable spirit of the typical radio amateur, always willing to try what accepted scientific theory labels unlikely and even impossible, is once again illustrated in this story of another technical breakthrough.*

to my oldest boy's room. Under the Erector set parts, the pieces of an auto race set, the remains of two alarm clocks, and last summer's camp newspaper, was his chemistry set. After using up all of every chemical that went bang or made a stink, he'd stowed it away. His instruction book had the experiment with the potato, too, but it didn't explain it any better than Fred had.

I went to the kitchen, cut a spud in half, and stuck the leads of my ohmmeter in it. The meter read about 500 ohms and after a while a little green appeared around one of the leads in the potato. The setup was obviously conducting, but not real well, and there was some sort of polarity effect taking place. As near as I could remember, that was about all they could say for germanium at first, so maybe there were some possibilities here that the long-hair scientists had overlooked — what with anthracene and all the other expensive stuff they had to play with. I called Fred, and after a while he came over and we settled down to do some serious fooling around.

Obviously, something electrical was going on in that potato. For lack of anything better, we called the conducting particles "Greenons," since they were certainly green. Sticking other wires in the potato with various voltages on them caused fluctuations on the ohmmeter, and it became increasingly evident that we had something pretty new on the table. The crucial part of the experiment was whether or not it could be made to show a power gain. After some tinkering, it did,

*(Continued on page 45)*



\* Box 648, Clemson, SC 29631.

# Annual ARRL Novice Roundup

## Announcement

February 5 through February 13

As February draws ever closer, it's once again time to get ready for the Novice Roundup, a contest designed expressly to acquaint the newcomer to amateur radio with contest operating. At the same time it can help him improve code speed as well as QSO new states to add to his WAS total.

As a result of an extensive study by and recommendations from the ARRL Contest Advisory Committee (see "Op News," this issue), this year's competition will undergo the following changes:

Duration limited to a 9-day period, encompassing two weekends  
 Maximum operating time of 30 hours  
 15-minute minimum time-off periods mandatory  
 Contest exchange to include call, RST and section

A listing of the TOP TEN W/VE entrants will be included in the results. Should participation warrant, a similar listing will appear for TOP DX entrants. You can read the results of last year's NR beginning on page 58 of Aug. 1971, *QST*.

Contest log forms, dupe sheets (Op Aid 6), WAS maps, and other handy operating aids are now available from your ARRL Hq; send for yours right away! And after the NR is over, send us your contest log, along with comments and photos; results will appear in *QST* soon afterwards. Logs must be received no later than March 6, 1972.

WNS, this is *your* contest, be sure to participate; you'll find it to be time well spent! And if you finish first in your section, you'll receive a handsome certificate award. — *WA1KQM*.

### How to Participate

Contest QSOs are much briefer than ordinary ragchews. You should not repeat your transmission (call, RST and section) at all unless you're requested to do so. Here's the way a typical exchange might go:

CQ NR CQ NR DE WN4VMC WN4VMC  
 WN4VMC NR K  
 WN4VMC WN4VMC WN4VMC DE WN9AXP  
 WN9AXP WN9AXP AR  
 WN9AXP DE WN4VMC 579 TENN BK  
 WN4VMC DE WN9AXP R 569 ILL K  
 WN9AXP R TNX 73 SK DE WN4VMC NR K

In most cases your state is your section. However, new hams in PA NJ NY MA CA FLA & TX should check page 6 of any issue of *QST* to learn their exact section (within the 16 ARRL divisions). If you still don't know your ARRL section after referring to page 6 of *QST*, drop us a card and we'll help you out. Generals: *don't* call CQ NR; answer Novice CQ NRs.

Note that time is expressed in Greenwich Mean Time (GMT). If you're unfamiliar with GMT, remember that it's 5 hours ahead of EST, 6 ahead of CST, 7 ahead of MST and 8 ahead of PST. Better yet, send for our handy Operating Aid #14, which contains, among other goodies, a time conversion chart and explanation of the RST system.

### ROUNDUP PERIOD

Starts	Ends
February 5 0001 (12:01 A.M.) Greenwich Mean Time	February 13 2359 (11:59 P.M.) Greenwich Mean Time

### Scoring

Count one point for each contact (you may work a station only once, regardless of band); add your ARRL Code Proficiency credit, then multiply by the total number of multipliers (sections + countries) worked. And remember, KH6 KL7 KP4/KV4 KZ5 and VE districts are sections and as such, cannot be counted a second time as a country. If you work 100 stations in 31 sections + 3 foreign countries and have an ARRL (not FCC) Code Proficiency credit of 10 wpm from W1AW or W6CWP, then your score is 100-plus-10 X total multipliers (31+3) or 34, for a total of 3740 points. For details on the Code Proficiency program, see OP-News of this issue. You may work DX stations for contest credit, a multiplier of 1 is earned for each separate foreign country worked.

### Go To It!

Read the rules carefully. Keep a check-sheet of stations worked (we have Operating Aid #6 available free) so that you don't have duplicate QSOs. Log sheets, OP Aid 6 and a map of the United States are now available from your ARRL Headquarters. *Unless first-class postage is included with your request, log sheets will be sent by third-class mail.* To aid us in getting these forms to you as quickly as possible, please be sure to include with each request a self-addressed and stamped envelope containing: your full name, call and mailing address complete with Zip code. We suggest a minimum of 8 cents postage attached. This will assure your receiving 3 log-sheets (enough for 300 QSOs), 1 Op Aid 6 and a WAS map (if desired). Using this as a guideline, you can adjust the postage according to the number of logs you anticipate needing.

B C N U in the NR! — *WA1KQM*.

### Rules

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

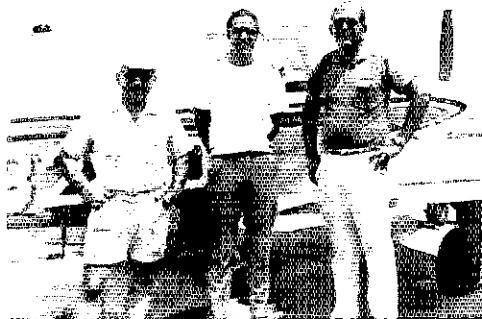
2) *Time:* All contacts must be made during the contest period starting at 0001 (12:01 A.M.) Greenwich Mean Time on the first Saturday of February and continuing until 2359 (11:59 P.M.) Greenwich Mean Time the second Sunday of February. Time may be divided as desired but *must not* exceed 30 hours total. Off periods *may not* be less than 15 minutes at a time. Times on and off *must* be entered in your log.

3) *QSOs:* Contacts must include certain information sent in the form as shown in the example. QSOs may take place on the 80-, 40-, 15-, or 2-meter bands. Crossband contacts are not per-

(Continued on page 87)



The JPL Amateur Radio Club was responsible for organization of the test flight, Amsat Aircraft-2. Members shown from left are (seated) W6HCD, WA6ULA, W6IIN, K6ASK, (standing) W6ZGC, WA6OPB, K6KVC, W6BFO, and K6PGC.



The AA-2 flight crew consisted of (from left) WA6OPB, co-pilot and project engineer; K6KVC, pilot; and K6KCY, flight test engineer.

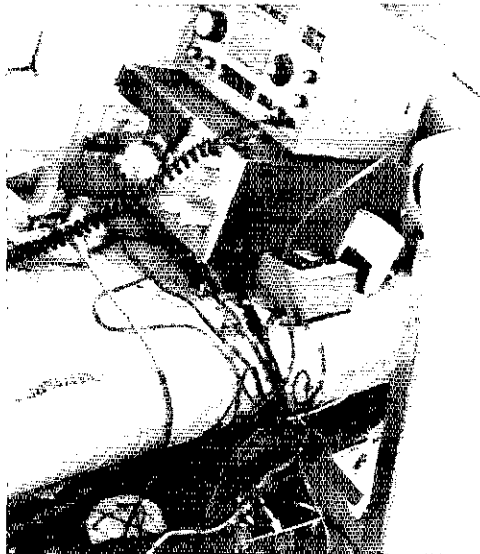
# Amsat Aircraft Test

West Coast Style

TESTING A prototype of a repeater which is eventually to orbit the Earth, West Coast amateurs tuned their receivers to 10 meters transmitters to 2 meters, and for a day captured some of the excitement of amateur satellite communication! Flight test Amsat Aircraft-2 began at 0900 PDT on September 25, 1971, from Van Nuys airport northwest of Los Angeles. A Bonanza-J single-engine airplane took off for an 1100-mile trip over California. Aboard was the prototype of the 10- to 2-meter repeater scheduled for launch on Amsat-Oscar B (see *QST* for March 1971, page S8). This was the second such aircraft test; the first took place in May, 1971, over the East Coast.

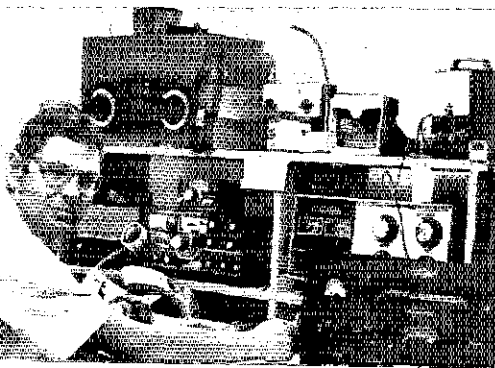
The successful AA-2 test, organized by the JPL Amateur Radio Club with Amsat sponsorship received the participation of hundreds of amateurs. While an accurate count of the contacts made via the repeater could not be made, almost every mode of emission — ssb, cw, fm, a-m, and RTTY — was observed. Credit for the greatest number of contacts goes to W6RP who had 18 QSOs. Novice operator WN6DGV took the DX honors with his Mt. Pinos to San Jose contact. — WA2INB

Novices Steve Warner (left), and Wally Linstrut erect antennas atop 8800-foot Mt. Pinos for Field-Day-type operation through the Amsat-Oscar repeater.



This is the aircraft operating position manned by K6KCY. Dick supervised operation of the repeater and also maintained liaison with ground stations.

"Where's the aircraft now?" and many other questions were answered by W6HDO, control station for a net on 7225 kHz.





# AMATEUR RADIO PUBLIC SERVICE

## NTS RACES AREC

*In the Public Interest, Convenience, Necessity* MRH

CONDUCTED BY GEORGE HART,\* WINJM

### A DAYTIME SUPPLEMENT FOR NTS?

AT THE MEETING of the Pacific Area Staff of the National Traffic System last July, Chairman W6BGF presented a proposal for a daytime supplement to the ARRL National Traffic System, designed principally to afford an opportunity for the increasing number of daytime operators (mostly ssb) to be a part of the national ARRL-sponsored system, with a side benefit to increase the speed of systematic handling of traffic, especially from west to east. Some of the details were mentioned in Sept. '71 *QST* (p. 73). Since then there have been a number of developments, and although we have not yet arrived at a conclusion as to how or if this proposal will be implemented, it does seem time to give it more exposure to the public-service-interested membership.

In October the Central Area Staff of NTS met at Sioux Falls, S.D., and considered the PAS proposal, among other things, resulting in a decision to support an alternative to the W6BGF proposal submitted by W1DGL. The Eastern Area Staff has expressed no sentiment on the matter as yet.

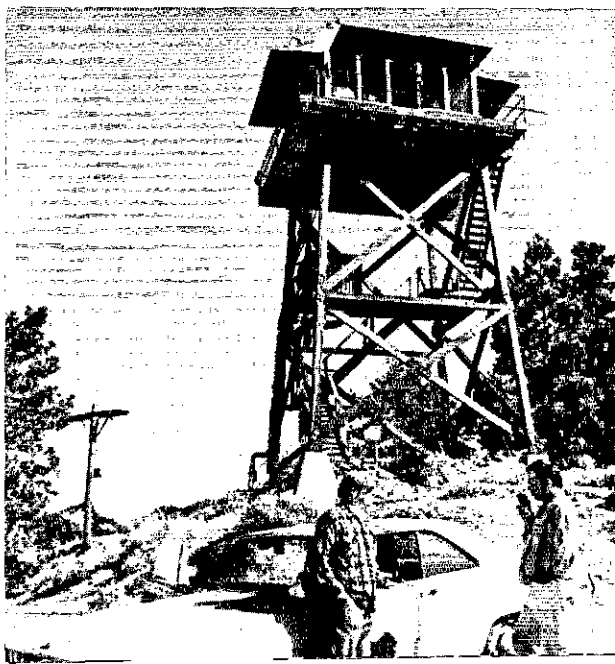
As might be imagined, the comments from within the NTS organization have been hot and heavy. Some feel that it is high time the NTS recognize that a place must be made at higher levels of the NTS structure for those operators who are more comfortable on voice than cw — a big majority of operators. Others contend that those who prefer to restrict their horizons in this manner should be content with a lesser role, and that the advantages of cw should not be dispensed with because a majority of operators are too lazy to acquire the necessary skill. It depends on whom you are talking to. At the area staff level, you would be surprised at the number of excellent cw operators who espouse the former stand and insist that something be done to augment NTS facilities at region, area and transcontinental levels utilizing modes other than cw.

This is what is known as a "motherhood" objective: something in itself so patently favorable by nature that it cannot be argued against. If there are a substantial number of traffic-interested phone-oriented amateurs who are genuinely interested in organized traffic handling at the national level, it seems basically wrong to deny them an opportunity to participate at the higher levels. In fact, some would go a great deal further than this; they would reorganize the entire NTS structure to provide for immediate traffic handling (in most cases) from point to point instead of relying on "pyramid-type (or hour-glass type) construction, flow patterns, time sequences and all the other methods now being used which they consider obsolete. One enthusiast even went so far as to opine (and even offer to bet) that once a phone NTS is set up, the cw NTS would disappear within a year.

As most NTSers know, the system has never knowingly or deliberately discriminated against phone, although the number of phone operators who think so seems rather high. Back in the an days there was some pressure to use phone at higher-than-section levels, and this was tried in IRN but failed. Why did it fail? Well, some said because the NTS official trying it was a cw man, others said that the phone-oriented amateur was

\*Communications Manager, ARRL.

The Los Angeles AREC was busy assisting the U.S. Forest Service on the opening day of deer hunting season. Here's Bill, WA6QZY (left) and Skip, WB6TXX on South Mt. Hawkins operating a portable two meter fm repeater. (Photo by K6VGH)





Here's K1PNB, RM for Eastern Mass. Paul was one of many amateurs who attended the New England Division League Officials meeting at ARRL Headquarters in Sept.

too casual in his approach and failed to comprehend the system concept. Again, it depended on whom you were talking to. More recently, a phone session of the NTS Twelfth Region Net was attempted, this time on sideband. Again, failure, for the same contradicting reasons, resulting in the conclusion, among many, that phone and cw operators just will not and cannot work together, so we may as well organize separate phone and cw NTSs and be done with it.

Actually, phone and cw traffic nets have been working together in NTS for many years, to the extent that today there are just as many phone nets as cw nets in the system, maybe more — and certainly more phone operators than cw operators in the system; but the phone nets are all at local and section level, and there are no phone-only operators at present in the three area staffs, which serve as advisory committees for NTS.

The proposals for NTS daytime operation are geared to *ssb phone*, but they are not an attempt to cut into the operation of the existing monitoring services, which are becoming increasingly popular and have been praised in this column. Rather, what is intended is that those amateurs who prefer a more highly organized and less casual type of operation, but who operate mostly daytimes and by sideband, shall be enabled to participate in NTS. It is intended that only those with some experience and expertise in record traffic handling shall participate (beginners should

get their experience at local or section levels), but this includes quite a large number of retirees, housewives, shut-ins, even students who can get on often during the day. It is also intended that the daytime part of NTS make liaison with the regular (evening) NTS session so that traffic not reaching delivery level by late afternoon or early evening can do so through the evening NTS cycle.

The principal implementation of the daytime sessions will be aimed at region, area and TCC levels. Exact details of proposed operation have not yet been worked out — nor indeed has the decision yet been made whether or not the principle will be accepted. But most thinking traffic organizers feel that it is at least a step in the right direction.

What do you think?

### Reports, Reports. . . .

Every month headquarters receives many reports. Some think there are entirely too many (this includes some HQ workers!), but receipt, analysis and tabulation of reports is the only concrete way of measuring performance in terms of quantity. Admittedly, *quality* is more important than quantity, but this does not negate the importance of the latter. Quality can be indicated by supplemental reporting; in fact, it is *most* indicative of effort to receive, each month, a long letter from appointees detailing activities during the month. But it is also important to receive indication that the appointee is still around, still active, still interested.

Your Section Communications Manager is in the same boat as headquarters; in fact, most of the reports received at headquarters are filtered through the SCM. When reports received are not on the prescribed form, are incomplete, indecipherable, or incorrectly executed, it "louses up the detail" and distorts a statistical picture that could otherwise be *most* indicative. Just as one example, in September out of 39 SEC reports received, three were too late to be included, one didn't indicate what section was being reported, and six had the words "same as last month" scrawled over them. (Usually, the same report was made "last month" and for many months back.) Another example, PSHR reports are received with the submitter claiming more than the maximum possible points in the different categories. Another: independent net reports are received on NTS forms, while NTS reports are received on scraps of paper. And so on.

No big sweat, of course. Your staff at headquarters usually manages to plow through the maze somehow; but the time used for this process detracts from the time that could be used for other things — time that is badly needed.

What does all this boil down to? First and foremost, please report — better on the wrong form, or no form at all, than not to report at all. Second, please use the correct form. If you don't know the correct form, ask us or ask your SCM either will be glad to inform you and supply you. Third, fill it out accurately and completely. Finally, get it to your SCM, SEC or headquarters as the case may be, on time. Most reports go to the SCM. EC reports go to the SEC, who then himself reports to the SCM. Station appointees (ORS, OPs included) go directly to the SCM or via the RM or PAM, depending on the procedure used in your section. In any case, the monthly SCM report to headquarters is due here the 15th of the month

This means he must mail it not later than the tenth, and *this* means he must receive your report several days before in order to have time to prepare his.

Enuf said? The moral is, submit your report as soon as possible after the end of the month!

- WINJM.

### Public Service Diary

On Sept. 27, amateurs were requested to provide communications for a search of a lost hunter near Adrian Lake, Ont. Drizzle and fog limited the visibility in the search area to an eighth of a mile and the search was hampered further by rough terrain. Early the next morning the hunter was located, presumably in good condition. Amateurs participating included VE3s AYZ ECR kFW EFL. - VE3AYZ, EC Thunder Bay, Ont.

While driving on the Crosstown Expressway in Oklahoma City on Oct. 27, WA5EQW saw smoke coming from a truck in the lane ahead. The truck suddenly stopped and its occupants jumped out. A call on the Oklahoma City repeater was answered by WA5AOB who called the fire department. W5OJZ, monitoring at the city emergency center, broke to determine if additional help was needed. He was advised to notify police as traffic was beginning to back up. Within three minutes police and fire equipment were on the scene. - WA5FSN, SEC Okla.

While traveling on IH-35 near Oklahoma City on Oct. 29, W5EYB came upon the scene of a hit and run accident. A passenger in one of the cars involved appeared to be seriously injured. W5EYB put out a call on the Oklahoma City repeater and was answered by K5PJR who summoned police, an ambulance and the victim's personal physician. - WA5FSN, SEC Okla.

During Hurricane Ginger, the town of Aurora, N.C. lost all electricity and telephone service on Sept. 30. The only link to the outside was provided by W4EYZ, who was in communications with K4AJR located in the town of Washington. A number of messages were handled during the day in addition to coordination of rescue attempts for a family stranded on the second floor of their home. - K4AJR.

On Aug. 22, WB4USB was participating in a twenty meter net when ELØK - maritime mobile entered to net to report that a ship had gone aground off the coast of Honduras. WB4USB

attempted to run a phone patch to the ship's office in Miami, without success. WB4USB then asked K4AF for assistance. The patch was finally put through by K4AF and aid was dispatched to the scene. During this time G3TMN was busy trying to keep the frequency clear while the call was being completed. - WA4PBG, SEC Va.

On Oct. 3, K4WQS came upon an automobile accident three miles south of the Va.-N.C. state line. A call was made on the Danville, Va., repeater for a N.C. station to notify the state police. Hearing no reply, W4WWQ in Lynchburg, Va. offered to call the Va. authorities to see if they had interstate contact. Upon learning they didn't, a call was put out on the Lynchburg repeater for a N.C. station. WB4AXH replied and called the proper authorities. Police were on the scene in minutes and had the situation under control. - WA4PBG, SEC Va.

On Oct. 29, a truck car-carrier carrying eight new cars caught fire on Highway 259 near Smithville, Okla. W5TI mobile was one of the first on the scene and reported the emergency on MIDCARS. K8HPS in Flint, Mich., telephoned the Okla. highway patrol and reported the accident. The truck and three of the autos were destroyed but help arrived in time to save the remaining five cars. - WB8ESK.

On Nov. 2, W4YDY saw an automobile veer out of control and crash into an embankment about fifteen miles south of Raleigh, N.C. Contact was made with K4ITL via the K4ITI repeater and the highway patrol was notified. W4YDY then assisted the driver, who had sustained minor injuries from the car. - W4FMN, EC Wake Co., N.C.

On Oct. 29, Hayes Co., Neb., was hit by a severe ice storm. WØEWF checked with local officials and discovered the telephone and electric services were out in the rural areas. Utilizing the Nebraska Storm Net, he reported the situation to the proper authorities in North Platte and was advised that repairmen would be in the area the following morning. Other amateurs participating were WØs DEQ YBZ EYX VYX UOV. - WØEWF.

On the night of Oct. 30, amateurs in Columbia, Conn., assisted local authorities with a Halloween patrol. A total of five mobiles patrolled the area. The Pioneer Valley Repeater Club assisted by offering the use of their repeater and by

This picture of the Central Area Staff of NTS was taken at Sioux Falls, Iowa during the Dakota Division Convention on Oct. 9. Pictured standing, left to right, are: W5MI, WØLCX, WØHI, WØZHN. Seated: W9HRY, WØINH, W9QLW.



Public Service Honor Roll October, 1977

This listing is available to amateurs whose public service performance during the month indicated qualifies for 30 or more total points in the nine categories below. 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)	Total
Max. Pts.	10	10	12	12	12	20	3	5	5	
W3FCS	10	10	12	12	12			5		65
W3DCE	10	10	12	12	12		3	5		64
WB2ALH	10	10	12	12	12			5		61
WA2ICU	10	10	12	12	12	5				61
WB2ZUE/GS	10	10	12	12	12			5		61
W3EZF	10	7	12	12	12	3				61
WA3DGM	10	10	12	12	12			5		61
WB4EHD	10	10	12	12	12	5				61
W7BO	10	10	12	12	12			5		61
E7CTP	10	10	12	12	12	5				61
W0LRW	8	10	12	12	12			5		59
E3ZNP	10	10	12	12	12	1				57
WB8BMV	10	10	12	12	12			1		57
WA9VA5	10		12	12	20	3				57
W1BYK	10	10	12	12	12					56
W48BO	10	10	12	12	12					56
WB8SDEK	10	10	12	12	12	10				54
WB9ANT	10	10	12	3	12	1		5		53
WA0VYV	10	10	12	12	9					53
W7MCW	10	10	12	12	20					52
WA2EH	2	10	12	12	12	3				51
W1YNE	10	10	12	6	12					50
WA2UOO	10	10	9	12	9					50
W3MXY	10	10	12	12	12	1		5		50
WB4OK1	10	10	12	12	12					49
WB4PNG	10	10	12	12	12					49
WB6ZVC	10	10	12	12	12					49
W7HRY	10	10	12	12	12					49
K9MRI	10	10	12	12	12					49
G4QFM	10	10	12	12	12					49
WA0VYB	10	10	3	12	9	5				49
WA9KUH	10		6	12	18					48
WA3NAZ	10	10	12	3	12	20				47
W3MCG	10		12	12	20					47
W3DCG	10	5	3	12	12					47
WB4SVX	10	10	12	12	12	3				47
W2BI	44									44
WA2NLF	44									44
WA2VLS	44									44
K20H	44									44
W44ME	44									44
WB4SVH	44									44
WB411B	44									44
W5EDT	44									44
K5ROZ	44									44
W5SSM	44									44
W7AXT	44									44
W0PVB	44									44
WA0JFC	44									44
VE3IQZ	44									44
WA6AAW	42									42
K0UYK	42									42
W7PH	41									41
WB4DAJ	40									40
W6MNY	40									40
W2RUF	39									39
WA3JPU	39									39
W3LOS	39									39
W3NEM	39									39
W4OGG	39									39
W4ZLY	39									39
W5RBB	39									39
W0HI	39									39
W6INH	39									39
W7LBK	39									39
VE3ARS	39									39
VE3CYR	39									39
VE3FRU	39									39
E1FTR	39									39
WA2NPO	38									38
WB4EKJ	38									38
W4JHV	38									38
W4JHY	38									38
W3TIN	37									37
WA6TYA	37									37
W4UO	36									36
W4LYY	36									36
WA5TMC	35									35
W6GAW	35									35
WB6YIZ	35									35
WA0YJW	35									35
W4JTM	34									34
K4SKF	34									34
WB4CDI	34									34
WA2ELD	34									34
K2KTK	34									34
W2TPV/J	34									34
W3OKN	34									34
W1YA	34									34
WB4KSL	34									34
WB4KSL	34									34
W0Q1V	34									34
WB4HTN	34									34
VE3AWE	34									34
VE3BV	34									34
VE3EXI	34									34
WB6DE	32									32
WB6BG	32									32
W2MTA	30									30
VE3CQT	30									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 on cw nets, 3 points each; (4) NCS phone/RTTY nets, 3 points each; (5) Performing assigned function, 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.

maintaining a clear frequency. One request for assistance from the police and one fire report were handled. A total of seven amateurs took part. *W1HHR, SEC Conn.*

A total of eight amateurs took part in a Halloween patrol on Oct. 30, in Sergeant Bluffs, Iowa. Three mobile units patrolled the area while the Woodbury Co. c.d. radio club station,

WA0UBP, monitored the frequency in case extra assistance was needed. No unusual events were reported. - *K0MMS, EC Zone C-3, Iowa.*

On Nov. 2, members of the Tusco Radio Club and the Tri-County VHF Radio Association set up two two-meter fm portable stations at a local TV station in Newcomerstown, Ohio, to relay local election results. Results from a total of seventy-one precincts were reported. Eighteen amateurs participated in this highly successful public service event. - *WA8SHIP, Asst. EC Tuscarawas Co., Ohio.*

Another Halloween patrol took place in Marysville, Wash., on Oct. 30-31. Two-meter fm was utilized and a number of mobile units assisted local authorities. Seventeen amateurs took part in this "pumpkin patrol." - *WA7CYY, EC Area 2, Wash.*

One more Halloween report comes to us via Va. SEC WA4PBG. Eight mobiles equipped with two-meter fm equipment patrolled the streets. Each mobile had a police officer assigned to his car and operated under the officer's direction. The amateur units were dispatched to handle "prank" calls, leaving the regular police units free for more serious incidents. *WA4PBG, SEC Va.*

Thirty-six SEC reports were received for the month of October representing 13,332 AREC members. This compares with forty reports representing 13,001 AREC members received during October 1970, a decrease of four reports but an increase of 331 members. Sections reporting: Alta, Ariz, Colo, Conn, EFla, EMass, ENY, EPa, Ind, Iowa, Kans, LA, Mich, Mont, Nebr, NDak, NNJ, NC, NTex, Ohio, Okla, Ont, Org, Oreg, SV, SBArb, Sask, SNJ, Tenn, Utah, Wash, WMass, WNY, WPa, WVa.

Traffic Talk

Among the hoarse cries of "More! More!" are the cries for more credit for originations - again. That's right, *again*. A few years back, originations counted one each, *period*. That is, no extra credit toward BPL, *as now*. At that time there was also pressure to give originations two credits, one for *getting the message*, one for *transmitting it*; but the final decision was to make originations, along with deliveries, count toward BPL on an "originations + deliveries = 100" basis.

How come? Because it was felt that a flat extra credit for originations would result in a great deal more "junk" traffic - the kind of traffic strongly objected to by those doing it for the service it performs rather than for the count toward BPL it gives. It was felt that an extra credit for originations would cause more traffic mills at fairs, expositions, hobby shows and whatnot, traffic milked from the general public by persuasion, and usually ineptly handled. So, the credit toward BPL was a compromise which has seemed to suffice all these years but is now no longer enough.

It is quite true, of course, that originating a message usually requires more work than relaying and therefore should get more credit in one way or another. Originations are important. Without them we would all be sitting around in our highly organized nets without anything to do. Nevertheless, the fears of "junk" traffic are to be reckoned with. Assuming for the purpose of discussion that they are wellfounded, can we credit the goo traffic without crediting "junk"?

Well, to begin with, we could put the same type of restrictions on originations that we have on deliveries — that is, a message originated by you or someone in your immediate family does not receive an extra origination count. Only those messages originated from the "outside" can be counted. The matter of restricting or eliminating "fair" traffic or other mass-originations is even stickier, again assuming we want to do it. In fact, at the moment it appears well nigh impossible.

If we simply want to give originations an extra count "cold turkey," regardless of by whom originated, for what purpose or under what circumstances, a renaming of one of the categories appears to be in order. That is, instead of getting one *origination* credit for *sending* an original message, you would get an "origination" credit for preparing the message for sending, plus a "sent" credit for transmitting it. Thus, the four categories would be: (1) Originations — Each message prepared for sending by amateur radio for the first time. (2) Received — Each message received by amateur radio, whether received for relay or delivery. (3) Sent — Each message transmitted by amateur radio, after having been either received or originated. (4) Delivered — Same as now.

Your reactions, please, traffic men? — WINJM.

**National Traffic System.** This will announce and make official the transfer of Saskatchewan from the Seventh Region Net (RN7) in the Pacific Area to the Tenth Region Net (TEN) in the Central Area. This comes about from recommendations of the Pacific and Central Area Staffs, after consulting both the SCM of the section concerned (VE5BC) and the TEN manager (WØHI). Saskatchewan is half in the Central Time Zone, half in the Mountain Time Zone, normally, but apparently does not switch to "daylight saving" time, so during six months of the year this would throw things slightly out of kilter. However, the two VE provinces now in TEN have pledged to work together to effect the best possible coverage via the existing setup.

Let's set the record straight. The traffic total for EAN as listed in Nov. *QST* is incorrect. The correct total is 1595, not 595. RN7 Manager W7BQ sez "This year the first serious effects of the downward sunspot cycle are being felt early in the year with the present late schedule already a washout." 9RN Manager W9HRY comments on NCSs that don't report, as follows: "Blast and Blinkety blank, these guys that disappear." An RN6 certificate was earned by WB6ZVC this month. Comments for this column are getting few and far between. How about some news, fellows?

### TWENTY YEARS IN THE BPL

A long long time ago, to be exact back in 1910, a young lad in Browns Valley, Minnesota, became very much interested in amateur radio, when he and a neighbor boy set up a means of communication between their homes a short distance away. This youngster was none other than Loyd Peek now W7BA of Seattle, Washington. He was first licensed as an amateur radio operator back in 1913 under the call 7LP (his initials). In 1917 he began his traffic handling activities as a commercial operator aboard the SS *Admiral Farragut* of the Pacific Steamship Lines, plying between Seattle and Alaska. While at sea he sent the SOS from the SS *Umatilla*, wrecked off the coast of Japan in February of 1918. Subsequently he became Chief Operator of the SS *Matsonia* on the coveted San Francisco-Honolulu run. After his roaming days at sea were over he returned to the shores of Puget Sound and found to his surprise that his amateur license had expired and his original call had been re-assigned. Subsequently he obtained the call of W7BA, which he now holds. In 1921 he entered the insurance business, retiring as

### BRASS POUNDERS LEAGUE

Winners of BPL Certificates for Oct. Traffic

Call	Orig.	Recd.	Rel.	Del.	Total
W3CUL	210	1591	1434	129	3364
K8ONK	151	659	617	72	1349
WA2UWA	110	320	680	8	1018
W3VR	102	397	351	19	949
W7BA	104	417	374	37	942
K3NSN	100	200	200	8	508
W0LCX	119	287	216	7	529
WA2ICU	119	258	235	7	519
WB4OMG	125	246	240	3	513
K9ONK(Sept.)	132	755	739	23	1649

More-Than-One Operator Station

W2ZV 1107

BPL for 100 or more originations-plus deliveries

K6DYK	228	W3MPX	133	WA2EPI	113
WB6VLR	155	K8ONA	127	WB4SVX	107
WB0CU	139	K0CSF	123	W2OE	104
W3TN	134			WA1EY	102

More-Than-One Operator Station

W4NVU 176, W2SZ 118

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 as 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.

a Vice President of the Northern Life Insurance Company in 1963.

Last October, Loyd completed 20 years, a record breaking two-hundred-and-forty consecutive months without a break in the BPL. During this period he had a traffic count of more than 5100 pieces one month, and once he handled over 260 Alaskan messages in one day. His station was the key communication outlet during two Alaska disasters. W7BA is a Charter Member of the Society of Wireless Pioneers. Among other Awards he holds are three Special Citations from the Edison Amateur Radio group, and one from the Governor of Washington State for his long years of services to the public in Amateur Radio.

Now that his goal of twenty years has been achieved as a BPLer, what next? His earnest hope and desire is for a bigger and better BPL program, so that the younger generation now coming up will be encouraged to further good Public Relations by furnishing dependable service to the public, when and where the aid of Amateur Radio is needed. To W7BA, our most hearty congratulations on his twenty solid years of Outstanding Public Service. — W7PGY.

### W7BA



October Reports

Net	Sessions	Traffic	Rate	Avg. Rep.(%)
PAN	.31	1483	1.171	47.8
CAN	.31	768	.863	34.8
1RN	.62	565	.384	9.1
2RN	.61	538	.816	8.8
3RN	.61	383	.372	6.3
4RN	.62	558	.336	9.0
RN5	.62	521	.325	8.4
RN6	.62	746	.433	12.0
RN7	.61	188	.204	3.1
8RN	.61	465	.435	7.6
9RN	.60	359	.399	6.0
TFN	.62	430	.456	6.9
TWN	.41	146	.233	3.6
TCC Eastern	.124 <sup>1</sup>	419		
TCC Central	.93	394		
TCC Pacific	.124	715		
Sections <sup>2</sup>		12490		3.7
Summary	.4045	21168	EAN	11.2
Record	.2930	30735	1,408	15.2

<sup>1</sup>TCC functions not counted as net sessions.

<sup>2</sup>Section nets reporting (90): OZK, OSN (Ark.); AENM, AENB, AEND, AFNR (Ala.); ALEN (Ariz.); CCN, CN, CHN (Colo.); NVHF, CPN, CN (Conn.); DEPN (Del.); QFTN, GN, WFPN, FMTN, EAST, VEN, QFN (Fla.); QIN, ITFCN (Ind.); ILN (Ill.); QKS (Kan.); KYN, KSSN (Ky.); LAN, MTN (La.); MIN, PAW (Minn.); QMN (Mich.); SGN, PJN (Maine); WMM, WMEN, GNBN (Mass.); MIN (Miss.); WEN, MSN (Mo.); NJN, ECFTN, NJSN, MCVHFTN, NJEPTN, PVTEN (N.J.); NYCLIPN, NYS, NLI (N.Y.); RIN (N.M.); CNL, CNE (N.C.-S.C.); OSN, BSN (Oreg.); BN, SAAREC, BNR, OSSB, SCPMEN, AMN (Ohio); Epa, PTTN, WPa, EPTN, GSN (Pa.); RISP (R.I.); TFX, TTN (Tex.); BUN (Utah); VN, VSNH (Va.); WSN, NSN, PSEN (Wash.); WSN, SWORN, WIN, BWN, BEN (W.V.); WVA (W.Va.); NUN, SUN (Calif.); SATN (Sask.); WQVUHF (Que.); GBN (Ont.); MTN (Mant.); APSN (Altb.); APN (Mari.).

Transcontinental Corps. W3FMI reports that this Oct. was definitely not one of their better months, with a total of eleven failures, mostly due to lousy conditions. W6VNO reports eight failures for the month. A TCC certificate was issued to W7EKB. October Reports:

Area	Functions	% Successful	Traffic	Out-of-Net Traffic
Eastern	.124	91.1	1700	419
Central	.93	95.6	818	394
Pacific	.124	93.5	1430	715

The TCC roster: Eastern Area (W3EML, Dir.) - W1s BIC, EJJ, NJM, QYY, YNE, KISSH, WA1JTM, W2s FR, GKZ, K2KTK, WA2HCU, UWA, W3EML, K3MVO, W4s NLC, SQQ, UQ, K4KNP, WB4NNO, W4s PMJ, RYP, K8KMQ, WA8PIM. Central Area (W0LCX, Dir.) - W4s OGG, ZY, WB4KPE, W5s QU, MI, SBM, W9s CXV, DND, YB, WA9VZM, W0s HI, INH, LCX, ZHN, K0AEM, WA9LAW. Pacific Area (W6VNO, Dir.) - W5RE, K5MAT, K6JYX, W6s BGF, EOT, IPW, MLF, MNY, VNO, VZT, WA6s DEI, LA-A, W7s BQ, EM, KZ, PI, DZX, FKB, GHT, K0JSP.

Independent Net Reports (Oct)

Net	Sessions	Traffic	Check-ins
H & B Morning Watch	.31	904	332
U. P. Eve Net	.30	33	36.5
N.E. Area Barnyard		1	802
Forty Meter CW Traffic & Emergency	.22	44	95
20 Meter ISSB	.21	1210	356
Clearing House	.26	251	439
Eastern Area Novice	.1		2
7290 Traffic Net	.42	468	1849
North American Traffic	.26	217	502
Early Eighty Free	.31	104	214
Inter-State SSB	.31	211	1219

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 4 1/4 by 9 1/2 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.

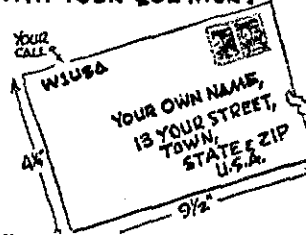
- W1, K1, WA1, WN1<sup>1</sup> - Hampden County Radio Association, Box 216, Forest Park Station, Springfield, MA 01108.
- W2, K2, WA2, WB2, WN2<sup>1</sup> - North Jersey DX Assn., P.O. Box 505, Ridgewood, NJ 07451.
- W3, K3, WA3, WN3<sup>1</sup> - Jesse Bieberman, W3KTT, RD 1, Box 66, Valley Hill Rd., Malvern, PA 19355.
- W4, K4 - North Alabama DX Club, P.O. Box 2035, Huntsville, AL 35804.
- WA4, WB4, WN4<sup>1</sup> - I. R. Baker, W4LR, P.O. Box 1989, Melbourne, FL 32901.
- W5, K5, WA5, WB5, WN5<sup>1</sup> - Kenneth F. Isbell, W5QMJ, 306 Kesterfield Blvd., Enid, OK 73701.
- W6, K6, WA6, WB6, WN6<sup>1</sup> - No. California DX Club, Box 11, Los Altos, CA 94022.
- W7, K7, WA7, WN7<sup>1</sup> - Willamette Valley DX Club, Inc., P.O. Box 555, Portland, OR 97207.
- W8, K8, WA8, WB8, WN8<sup>1</sup> - Columbus Amateur Radio Assn., Radio Room, 280 E. Broad St., Columbus, OH 43215.
- W9, K9, WA9, WB9, WN9<sup>1</sup> - Northern Illinois DX Assn., Box 519, Elmhurst, IL 60126.
- W0<sup>1</sup> - Reggie Harve, W0OYP, P.O. Box 115, Mitchellville, IA 50169.
- WA9<sup>1</sup> - Lloyd Harvey, W0QGI, P.O. Box 7, Attica, IA 50024.
- K0, WB0, WN0<sup>1</sup> - Dr. Phillip D. Kowley, K0ZFL, Route 1, Box 455, Alamosa, CO 81101.
- KP4 - Alicia Rodriguez, KP4CL, P.O. Box 1060, San Juan, PR 00902.
- KZ5 - Canal Zone Amateur Radio Association, Box 407, Balboa, C.Z.
- KH6, WH6 - John H. Oka, KH6DQ, P.O. Box 101, Aiea, Oahu, HI 96701.
- KL7, WL7 - Alaska QSL Bureau, Star Route Box 65, Wasila, AK 99687.
- VE1 - L. J. Fader, VE1EQ, P.O. Box 663, Halifax, NS.
- VE2 - A. G. Daemen, VE2IS, 2960 Douglas Avenue, Montreal 301, PQ.
- VE3 - R. H. Buckley, VE3UW, 20 Almont Road, Downview, ON.
- VE4 - D. E. McVittie, VE4OX, 647 Academy Road, Winnipeg, 9, MB.
- VE5 - A. Lloyd Jones, VE5JL, 2328 Grant Road, Regina, SK.
- VE6 - Karel Tettelaar, VE6AAV, Sub. Po 55, N. Edmonton 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 - Goose Bay Amateur Radio Club, P.O. Box 232, Goose Bay, LB.
- SW1 - Leroy Waite, 39 Hannum St., Ballston Spa, NY 12020.

<sup>1</sup>These bureaus prefer 5 x 8 inch or No. 50 manila envelopes.

QSL Bureaus for other U.S. Possessions and for other countries appear in the June and December issues of QST.

Note: First Class mail in the U.S. is now 8¢ an ounce. QSL Bureau users should send their manager enough two-cent stamp to cover the envelopes on file.

IS YOURS ON FILE WITH YOUR QSL MGR?



# Strays



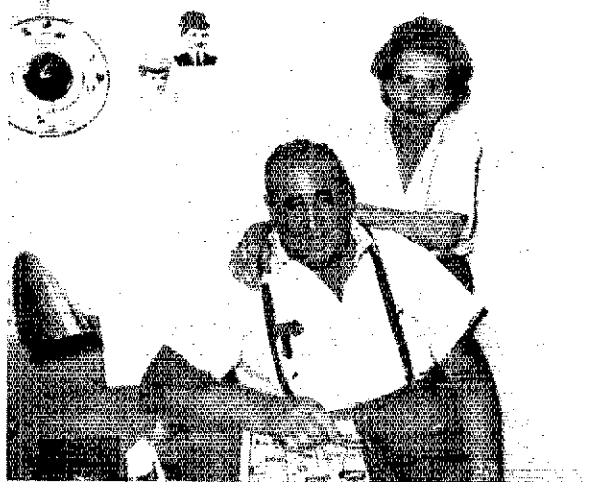
During the 1971 Miss America Pageant in Atlantic City, New Jersey, the Southern Counties Amateur Radio Association operated special events station WX2MAP. Taking a breather from Pageant activities, Sheila Bernhagen, Miss Minnesota, paused to say hello to some lucky amateurs as W2BZL and WB2QXX look on.



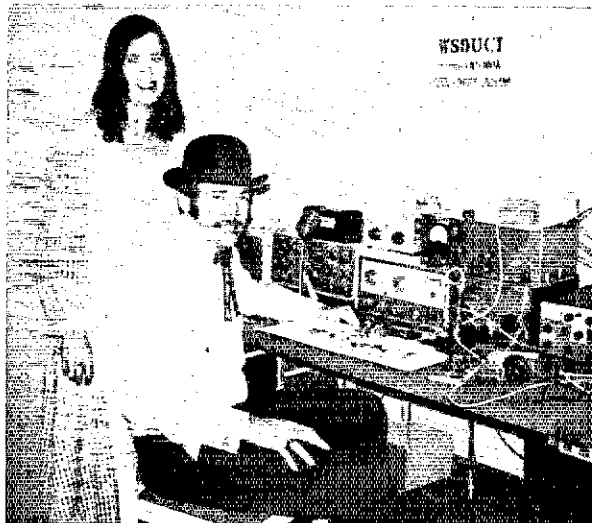
Among recent visitors to Hq. was the Friedman family which includes OM Jordan, WN2QX; Edward, WN2QY; Jay, WN2PTL; and 8-year-old Beverly, WN2QW. The family shares a Globe Scout 680A and a Hammarlund HQ-200 with which they keep Levittown, N.Y. well represented on the Novice bands.

Here's a group of contest/DX types really "with it" snapped during a recent impromptu gathering hosted by W1CW. (l. to r.) bottom, WABTBQ, W8FAW, WA1KQM, W1CW; top, K1ZND, W1BGD, WABVRB, W1FBY.

January 1972



Mayor Graham of Las Cruces, New Mexico, took time out during a city council meeting recently to present a certificate of appreciation from the regional Office of Civil Defense to George and Rose Stewart, K5YRY and WA5ALX, for providing communications during emergencies.



As part of the Union County, Indiana, Sesquicentennial Celebration, local amateurs manned special events station WS9UCT September 19-26 on 160 through 10 meters. Shown here are W9LVH and XYL WN9HGN. A commemorative QSL is available via W9LVH.



## SECTION EMERGENCY COORDINATORS OF THE AMATEUR RADIO EMERGENCY CORPS

The Section Emergency Coordinator is appointed by the SCM to take charge of the promotion of the Amateur Radio Emergency Corps organization throughout the section. He acts as the SCM's executive in the furthering of provisions for emergency amateur radio communications in every community likely to suffer in case of a communications emergency. One of the duties of the SEC is to recommend the appointment of Emergency Coordinators for the various communities in his Section. Does your locality have an EC? If not, recommend the name of a likely prospect to the SEC. The SEC invites your questions concerning the status of the AREC in your Section.

ATLANTIC DIVISION				
Delaware	W3DKX	Roger Cole	345 E. Roosevelt Ave.	New Castle 19720
Eastern Pennsylvania	W3TBI	Paul D. Mercado	55 Lindberg Ave.	Broomall 19008
Maryland-D.C.	W3LQY	Marianne E. Payton	412 Audrey Ave.	Baltimore 21225
Southern New Jersey	W2LWV	James Peck	810 Indian Trail Ave.	Deptford 08096
Western New York	W2RUF	Clara C. Reger	435 West St.	Buffalo 14208
Western Pennsylvania	W3KPI	Henry L. Schneider	1806 Water St.	Westleyville 16510
CENTRAL DIVISION				
Illinois	W9RYU	Harry J. Stader	705 Hillcrest Rd., R.E.D. 3	Milan 61264
Indiana	W9IC	Clifford C. McConyer	2900 East Oak Street	Evansville 47714
Wisconsin	W9NGI	Sherman C. Carr	756 W. Washington Ave.	Hartford 53027
DAKOTA DIVISION				
Minnesota	K0LAV	Paul R. Emerott	1080 E. 3rd Street	St. Paul 55106
North Dakota	W40AYL	David E. Beach	Apt. 7, 1116-19th Ave., S.	Grand Forks 58201
South Dakota	W400VR	Donald E. Ericson	865 Sherman	Sturgis 57788
DELTA DIVISION				
Arkansas	W8RXU	Dale E. Temple	1209 Southedge Drive	Little Rock 72207
Louisiana	W5OB	John L. Robertson	2609 Halsey Ave.	New Orleans 70114
Mississippi	W4SJD	Gene McGahey	Rt. 5, 146 Rustwood Dr	Blount 39534
Tennessee	WB4ANX	John H. Saunders	2149 Heatherly Rd.	Kingsport 37660
GREAT LAKES DIVISION				
Kentucky	K4YZU	M. W. Wright	1758 W. Gaulbert St.	Louisville 40210
Michigan	W8MPD	Stanley J. Briggs	1885 PineTree Rd.	Trenton 48183
Ohio	W8OUU	James W. Benson	2463 Kingspath Dr.	Cincinnati 45231
HUDSON DIVISION				
Eastern New York	W2URP	Charles A. Starks	1041 Argo Boulevard	Rotterdam 12303
N.Y.C. & Long Island	E2OYN	John S. Brandau	1659 East 46th St.	Brooklyn 11234
Northern New Jersey	E2KQJ	Jack D. Wilk	P.O. Box 1175	Passaic 07085
MIDWEST DIVISION				
Iowa	K0LYR	Gregg D. Miller	R.R. 4	Marshalltown 50158
Kansas	K0LPI	Joseph E. Hoover	226 East 11th, Box 263	Concordia 66401
Missouri	W0ENW	Gregory K. Hibbard	2413 Golf Street	Sedalia 65301
Nebraska	K0ODI	Lyon Bilyeu	406 Henkens Dr	Chadron 69337
NEW ENGLAND DIVISION				
Connecticut	W1HHR	John C. Sullivan	Whitney Rd.	Columbia 06237
Eastern Massachusetts	W1AOL	Donald F. Gupill	17 Park St. Ct.	Medford 02155
Maine	K1CIE	Allen E. Schark	42 Maple St.	Presque Isle 04769
New Hampshire				
Rhode Island	W1YNE	Gordon E. Fox	1 York Drive	Coventry 02816
Vermont	W1VSA	H. A. Preston, Jr.	RFD 1	Charlotte 05445
Western Massachusetts	W41DNB	Robert H. Phoenix	Box 431, N. Washington St.	Belchertown 01007
NORTHWESTERN DIVISION				
Alaska	K17ENX	William D. Crowl	Box 4407	Spennard 99503
Idaho	W47WV	Dale A. Brock	1508 Alder Drive	Lewiston 83501
Montana	W7WTN	Joseph D'Arcy	1916 Hugau Ave.	Anaconda 59711
Oregon	W7HLE	Hwight J. Albright	1678 Orchard Home Dr.	Medford 97501
Washington	W7IWT	Raymond McCausland	2812 Hayton Ave.	Bremerton 98310
PACIFIC DIVISION				
East Bay				
Hawaii				
Nevada	W47BD	L. L. "Mike" Blain	560 Cherry St.	Boulder City 89005
Sacramento Valley	W6SMU	Theodore W. Rast	7512 Winding Way	Fair Oaks 95628
San Francisco				
San Joaquin Valley				
Santa Clara Valley	W46RXB	Ralph W. Michelson	19150 Portos Dr.	Saratoga 95070
ROANOKE DIVISION				
North Carolina	W4EVN	Herschel H. Haney	Box 935	Lumberton 28358
South Carolina	W4ECL	Richard H. Miller	1509 Highland Ave.	Camden 29020
Virginia	W4PBG	Monte F. Cone	317 Van Buren St.	Falls Church 22046
West Virginia	W48NDY	Delf A. Norona	P.O. Box 523	Buckhannon 26201
ROCKY MOUNTAIN DIVISION				
Colorado	W40QOY	Kent Simcoe	1844 W. 31st Street	Loveland 80537
New Mexico				
Utah	W7WKF	McCarroll Petersen	4816 Yorktown Drive	Salt Lake City 84117
Wyoming	K7NQX	Glen Blackburn	R.D. Box 164, 1734 E. 22nd St.	Cheyenne 82001
SOUTHEASTERN DIVISION				
Alabama	W4DGH	Raymond E. Ringer	Box 1	Valley Head 35989
Canal Zone	K25GW	George W. Rae	Box 8	Gambou
Eastern Florida	W4VTV	Andrew T. Clark	41 Lenape Drive	Miami Springs 33166
Georgia	W44VWV	Stephen D. Smith	5258 Seaton Dr.	Woodwoody 30538
West Indies (P.R., V.I.)				
Western Florida	W41KB	G. D. McKechnie	P.O. Box 545	Chipley 32428
SOUTHWESTERN DIVISION				
Arizona	K7GPE	Elmer Olson	5733 N. 41st Place	Phoenix 85018
Los Angeles	W40QZY	Bill Carpenter	4622 Center Street	Baldwin Park 91206
Orange	W46CJH	Jilly C. Hall	Hlt O'Home Lodge, Space 56	Santa Ana 92704
San Diego	W6SRN	Paul Thompson	7331 Hamlet Avenue	San Diego 92120
Santa Barbara	W6JTA	Robert W. Gause	2133 Fresno St.	Los Osos 93401
WEST GULF DIVISION				
Northern Texas	W45VJW	M. Ruth Chance	836 Woodcrest St.	Hurst 76653
Oklahoma	W45ESN	Leonard Hollar	710 So. 10th St.	Kingfisher 73750
Southern Texas	K5HXR	James K. Freeman	10202 Aves	Houston 77034
CANADIAN DIVISION				
Alberta	VE6XC	Roy Ellis	Box 2, R.R. 1	Ed. Saskatchewan
British Columbia	VE7FB	Harold E. Savage	4553 West 12th Ave.	Vancouver 8
Manitoba	VE4WC	Claude Bivson	245 Bertrand St.	St. Boniface
Maritime	VE1IH	I. R. Fraser	40 Murray Hill Drive	Dartmouth, N.S.
Ontario	VE3WU	Ed W. Doyle	301 Leasure Blvd.	Tecumseh, Windsor
Quebec	VE20Z	Jean-Marie Desranleau	125 rue D'Abaco	St. Lambert, Comte de Chambly
Saskatchewan	VE50U	W. H. Parker	1008-10th St. E.	Saskatoon



# Announcing the 1972 ARRL Simulated Emergency Test

January 29-30, 1972

**B**Y THE TIME you read this the holiday season will be coming to a close for another year and the 1972 SET will be drawing nearer. All amateurs should be planning to participate in this annual communications exercise.

The 1972 SET will be a bit different from those of recent previous years, although the general objectives remain the same. They are: (1) to provide a test of local amateur emergency communications organizations such as AREC and RACES; (2) to provide a test of the ability of the National Traffic System, the long-haul traffic facility of ARPSC, to function under emergency conditions; (3) to demonstrate, to served agencies and the public, amateur radio's ability to function as an emergency communications service; and (4) to provide operator training and experience in emergency communications practices.

The SET is not a contest and will not be reported as such. Participating groups and nets will submit "scores" — not to be compared with the scores of other groups, but rather with that group's last year's score, or a score previously tabulated, if any. The score is added to the national total, which hopefully will exceed that of the previous year. The greatest credit will be given to *improvement*.

## The Local Test

If you have not taken part in the SET before, your best bet is to participate at the local level, under your appointed emergency coordinator. Increased emphasis is being applied at this level. Your EC, if there is one appointed for your locality, will already have made some plans for participation; we suggest contacting him immediately so you can be worked in, if possible. His identity can be obtained from your Section Emergency Coordinator, whose

name and address appears on the previous page, or directly from ARRL headquarters. Most ECs are appointed by county, so when inquiring please indicate the county in which you live.

If there is no EC in your locality, try contacting the local civil defense radio officer through your civil defense people. He may be planning some participation. If still no soap, don't give up; get in touch with other amateurs in the area and organize something. Ask us for a copy of the SET Bulletin to ECs. The SET is for *every* amateur. Those already a part of the organization are of the greatest value, but this is a good time to get *your* feet wet in the part of amateur radio that makes it a service rather than just a hobby.

Your EC, when you contact him, will probably ask you to show up for an in-person briefing session or two prior to the fateful weekend. However, don't expect him to divulge detailed plans. In most local SETs the operation is spontaneous, the amount of information being divulged depending on how much the EC feels he must divulge in order to secure attendance and participation. A typical local test will occupy perhaps three hours on a Saturday or Sunday afternoon. Participants, after being screened as to potential, may be asked to stand by for alert some time during the weekend or, if this isn't specific enough to insure maximum participation, between certain hours during the weekend. In a *real* emergency, of course, it is assumed all would be available whenever the emergency occurred.

## National Traffic System Participation

If your local test is typical, you will have some time left to take part in the national aspect of the  
(Continued on page 87)

Here is a sample SET message in proper form. Note the handling instruction HXB and also the addition of the word *test* in the preamble and the words *test message* in the text. All SET traffic must be indicated as such to avoid confusion with normal messages.

TO		TEST	HXB	WALPMD	LL	NEW BRITAIN, CONN	2330Z	JAN 29
1		JOHN SULLIVAN W4HHY SEC. COORDINATOR AR (CITY) BUREAU COLUMBIA CONNECTION				IF TO RADIO MESSAGE WAS RECEIVED		
TEST MESSAGE X THIS STATION		PARTICIPATING IN THE 1972 SIMULATED						
EMERGENCY TEST X 73								
				FRANK CONNELLY WALPMD				
SENT		W4HHY		JAN 29		2330Z		

## It Seems to Us

(Continued from page 9)

have to pay renewal fees as high as \$75,000 instead of the former \$150!) And a petition filed by an individual amateur seeking specific rules to allow political discussions on the air, RM-1631, was dismissed as unnecessary in one respect, moot in another.

Turning now to League affairs, the highlight on the organization level was adoption of revised Articles and By-laws calling for two Board meetings per year, in January and July. Late in the year, the Planning and Executive Committees also studied restructuring Board meetings along international conference lines, with time for ad hoc and standing committees to meet after an initial Thursday session, and it seems likely such a plan will be followed at the meeting later this month. Another amendment allows for appointment of vice directors by the president when vacancies occur: Ed Gray, WA0CPX, received the first such appointment in the Dakota Division. The Advisory Committees' permitted membership was expanded to eleven, so that all ten U.S. call areas and Canada can be represented on each. Affiliation requirements for school and college clubs were eased: such a club may now be affiliated if its sponsor, adviser, president, or station trustee is a licensed amateur and member of ARRL. The matter of a dues increase was deferred until the meeting later this month; however — some increase soon seems a foregone conclusion — the questions seemed to be only on "when?" and "how much?"

Life membership is attracting more and more League supporters — the 1000 mark was passed in May and at this writing we have 1285 fully paid life members, and some 450 more working toward it on the eight-payment plan. The By-laws were broadened at the May meeting of the Board, permitting Associate Members both at home and overseas to apply for Life Membership. Incidentally, we now have five husband-and-wife LM teams, and one all-life-member family (W1CW, W1YL, and WA1NNC) — sorry, no cut rates for quantity: it's \$130 in the U.S. and Canada, \$140 elsewhere, for each. (Both figures will increase with the rise in dues.)

The League's Technical Merit Award for 1970 went to Louis N. Anciaux, WB6NMT; Paul J. Snyder, K2CBA; and Lester L. Whitaker, W7CNK, for their pioneering work on 220-MHz "moonbounce." On the receiving end, the ARRL *Handbook* took a first prize in a regional competition organized by the Society for Technical Communications, and will be a contender this spring in the national contest. Covering the social side of amateur radio, six division and four state ARRL conventions were held,

along with 162 hamfests, auctions, flea markets, and banquets which were recorded at ARRL Hq — and who knows how many others. (Twenty such events are already recorded at Hq for 1972 — make sure we have your club's date down so we can help you avoid conflicts with other nearby groups.) Two headquarters staff members, Cecilia Christensen Hatch and Charlotte A. Clark, retired from active service after 42 and 25 years, respectively. Sadder farewells were noted in *QST* obituaries for past directors R. E. Cowan, W5CF; Kenneth T. Hill, W2AHC; Rudy Jepson, W6KEI; past vice director Reg Town, VE7AC; and former ITU Secretary-General Gerald C. Gross, W3GG. There were comings and goings at FCC, too, with Bill Grenfell, W4GF, and Ev Henry, W3BG, retiring; Ray Spence, W4QAW, and Merle Glunt, W3OKN, getting promoted to chief and assistant chief engineer, respectively; and Prose Walker, W4BW, rejoining the Commission to be chief of the Amateur and Citizens Division.

Communications is the payoff for our amateur radio "game" — the big one this year was the California earthquake. Not only were rescue operations heavily reliant on amateur radio, but thousands upon thousands of messages were handled between people in the stricken area and those outside. There were more than eighty other emergencies — floods, hurricanes, ice storms, lost persons, fires, and auto accidents — where amateurs performed emergency communications, reported in the pages of *QST*. The best preparation for real emergencies, perhaps, is planned assistance at parades, carnivals, and other large gatherings of people — more than 50 of these were described in 1971 issues, with perhaps that many more waiting for space in the magazine! Or is it the Simulated Emergency Test, with 13,000 amateurs reported to have participated in organized teams?

Before communications are possible, equipment must be designed and built. The technical side of amateur radio remained as popular as ever. Antennas alone accounted for nearly fifty *QST* items during 1971. Reports of amateur use of lasers and the transmission of cardiograms by ham radio also appeared. Digital ICs, flip-flops, Morse Code generators, and printed circuit techniques all got a great deal of attention during the year. Receivers and receiving converters, particularly for the vhf-fm mode, were a major subject of *QST* technical articles. And plans for future orbital satellites carrying amateur radio moved forward with approval of NASA and new recognition of the amateur-satellite service by the ITU.

Less important in the long run, but lots of fun here and now were the contests and operating activities — two new ones, Straight

Key Night and the 160-Meter contest, made the pages of *QST* during the year and attracted some fans additional to those who always enjoy the CommDept parties, the Sweepstakes, VHF QSO parties, the DX Test, the Novice Roundup, and the various state QSO parties. And there's Field Day — a contest, a campout, a testing ground for equipment, and an emergency training session all rolled into one.

Finally, these odds and ends, hard to group — Barry Goldwater, K7UGA, was elected as national president of the Quarter Century Wireless Association. Dave Porter, K2BPP, was honored by the Navy for his phone patch work with the Antarctic by the chance to visit there as the sailors' guest. Carl J. Dettmar, W8NCV, won the right to put up an antenna in a court case which further strengthens the precedents established in support of amateurs; the court report has been added to the League's "Legal Kit" available to any amateur in need of it.

Well, the scroll for 1971 has proved long and fascinating. What will 1972 bring? Tune in next year . . . meanwhile, we hope it's happy and prosperous for you.

**QST**



S	M	T	W	T	F	S	
	2	3	4	5	6	7	8
	9	10	11	12	13	14	15
	16	17	18	19	20	21	22
23	24	25	26	27	28	29	

**California** — Set aside the weekend of January 22-23 for the 23rd Annual DX Conference at the Del Webb Towne House in Fresno. The Southern California DX Club will host this year's affair and invites all hams to attend. Speakers, DX forum, cocktail party, steak dinner, and the big DX breakfast on Sunday morning. Pre-registration fee is \$14.50. Make checks payable to the Southern Calif. DX Club and please include an s.a.s.e. if you wish a receipt. Pre-registration deadline is January 7; \$16.00 is the fee after this date. Send to SCDXC, Jack Hollander, WB6UDC, 13531 Malena Dr., Tustin, CA 92680.

**Illinois** — The Wheaton Community Radio Amateurs will hold their Tenth Annual Mid-Winter Swap and Shop on Sunday, February 20, at the DuPage County Fair Grounds, Wheaton. Hours: 8 A.M. to 5 P.M. Donation is \$1, \$1.50 at the door. Send s.a.s.e. for advance tickets to P.O. Box QSL, Wheaton, IL 60187. Refreshments and unlimited parking. Bring your own tables. Free coffee and doughnuts 9 to 9:30 A.M. Hams, CBers, electronic hobbyists, friends, and commercial exhibitors are cordially invited.

**Indiana** — The Lake County ARC proudly announces its 18th Annual Banquet at 6:30 P.M., February 12, at the Scherwood Club, 600 E. Joliet St., Schererville. Join us with your YL or XYL and enjoy good food, entertainment, speeches, awards, and fellowship. Tickets are \$5. Positively no tickets will be sold at the door. For tickets and map write Herbert S. Brier, W9EGQ, 385 Johnson St., Gary, IN 46402.

**COMING A.R.R.L. CONVENTIONS**

January 22-23 — Southeastern Division, Miami, Florida

March 17-18 — Great Lakes Division, Muskegon, Michigan

July 1-2 — West Virginia State, Jackson's Mill

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.

**SOUTHEASTERN DIVISION CONVENTION**

Miami, Florida

January 22-23

The ARRL Southeastern Division Convention/12th Annual Tropical Hamboree will be held at the Miami Bayfront Park Auditorium and Everglades Hotel on January 22-23, 1972, in sunny, warm Miami. Convention/Hamboree activities include tech talks, organizational meetings, DX program, fm, MARS, manufacturers exhibits, hams only swap shop, commercial bargain booths, Wouff Hong ceremony. The ARRL Forum will have a report from the January Board Meeting within 24 hours after the meeting adjourns. ARRL Headquarters representatives will be W1CW and W1FBY. An added attraction for the ladies attending the convention will be a program entitled "Preserving, Enhancing, and Highlighting Your Own Natural Beauty," presented by Bryna Cosmetics, which will also include free facials and gifts for every lady.

Saturday night, group dinners will be followed by an auditorium meeting to hear A. Prose Walker, W4BW, chief, Amateur and Citizens Radio Division FCC.

The luxurious M/V Freeport awaits for your fun-filled pre- or post-convention cruise to the Bahamas with visits to Freeport and Nassau and a full program of activities, shows, dinners, dancing throughout the cruise, plus aboard-ship casino and duty-free shops.

Here are the rates for the entire convention-cruise-vacation package: Convention registration before January 22nd — \$1.00. Special rates at Everglades Hotel are \$14.00 single, \$17.00 double (no advance deposit required). Pre-convention 4 day/3 night cruise \$99.00 plus tax. Post-convention 3 day/2 night cruise \$69.00 plus tax. For registration tickets, hotel reservations, and cruise brochure write: Dade Radio Club, P.O. Box 73, Biscayne Annex, Miami, FL 33152. Please make checks or money orders for tickets payable to Dade Radio Club.

**Michigan** — The Southfield High School ARC 6th Annual Swap and Shop is from 9 A.M. to 5 P.M. on January 16 at Southfield High, 24675 Lasher Rd., Southfield (just northwest of Detroit near 10 Mile Rd. and Telegraph Rd.). Refreshments will be available.

# Happenings of the Month

## ELECTION RESULTS

League elections for director and vice director are held each autumn in half of the divisions. Where there is more than one valid candidate for an office, ballots are mailed to all Full Members of record September 20 in that division, returnable by November 20. Elections completed late last year saw four contested elections for director and six for vice director.

Starting alphabetically with the Atlantic Division, incumbent Harry A. McConaghy, W3SW, tallied 2942 votes to 2077 for G. W. "Bud" Hippisley, K2KIR, thereby winning a second term as director. In the Great Lakes Division, Alban A. Michel, W8WC/W8SMQ, director since 1968, chalked up 2887 ballots against 1513 for Leonard M. Nathanson, W8DQJ. H. Dale Strieter, W4DOS, "freshman" director in the Southeastern Division, earned a resounding 1941 votes against 691 for Philip A. McMasters, W4BCZ.

In the Midwest Division, where incumbent director Sumner H. Foster, W0GQ, was not running, victory went to Ralph V. Anderson, K0NL, in a crowded race:

Mr. Anderson	963
Raymond L. Keller, W0DU	563
Bruce A. Osmundson, WA0IRP	522
C. W. Wade, W0INH	331
Eugene V. Weiner, K0CKX	123

Andy has just finished four years as vice director. Earlier he had been an assistant director of the Midwest Division (1966-1967) and of the Atlantic Division (1965-1966). He's an honorary member, founder, and past secretary of the Maritime Mobile Amateur Radio Club; adviser, Amateur Radio Explorer Post 717, BSA; editor of the *Amateur Radio News Service Bulletin*, and past managing editor of *Auto-Call*. Now 62, Andy was first licensed in 1929 as W9BWV, and since then as W9NL, W3JRT, W3NL, and, following his return

to the Midwest in 1966, as K0NL. A retired cryptologist for the Department of State and retired captain, U.S. Naval Reserve, he lives in Holton, Kansas.

On the vice director side, Jesse Bieberman, W3KT, garnered a third term in the Atlantic Division, polling 2302 votes to 1425 for Harold C. Smith, WA2KND, and 1294 for George S. Van Dyke, Jr., W3HK. In the Delta Division, two-term Franklin Cassen, W4WBK, outpaced John H. Sanders, WB4ANX, 921 to 599 in the vice director contest.

Ohio SCM Richard A. Egbert, W8ETU, of Reynoldsburg, was newly elected as vice director from the Great Lakes Division, winning handily against three other candidates:

Mr. Egbert	2284
Currin L. Skutt, W8FSZ/K8EPT	826
Mary Ryden, K8ONV	823
Henry F. Zimmerman, K4FU/W8YJE	549

Dick earns his living as an engineering manager for North American Rockwell. He's been an assistant director of the ARRL Great Lakes Division this year; SCM since 1968; secretary, Order of Boiled Owls, Ohio Chapter; and a former emergency coordinator/RACES radio officer for Franklin County. Holder of an ORS appointment, member of the A-1 Operator Club, and *QST* author (October 1955), Dick is 47 years old and has been licensed and active as an amateur since 1946.

There was a five-way race for vice director from the Midwest Division:

Paul Grauer, WA0LLC	709
Russell R. Ritzman, WA0LGR	557
Richard W. Pitner, W0FZO	473
Ronald M. Schweppe, K0FXN	415
L. C. "Chuck" Miller, WA0KUH	350

Paul has won elections before; he is mayor of Wilson, Kansas! His full-time job is as president of the Wilson Telephone Company. Emergency co-



The Ontario Science Center Amateur Radio Club, VE3OSC, held a special exhibition, "Ham and His World," October 16 and 17, featuring low-power equipment, homemade gear, a "whitecaner's" HW-12 station, Morse code demonstration, fm station (through which two mobiles reported actual auto accidents during the exhibit), and slow-scan television. The station also took part in Jamboree on the Air. Al d'Eon, VE3AND (left), was exhibition chairman; Tom Atkins, VE3CDM, is chairman of the club's PR committee, and Bob Rotenberg, VE3AKN (right), is club president. (VE3CJK photograph)

Last day at the office for "Sis" Hatch after 43 years! Treasurer David H. Houghton, her boss for most of them, wishes her well.



ordinator of the Kansas Weather Net and NCS of the Ham Butchers net. Paul is an OPS and OBS, member of Army MARS and the AREC, and a Life Member of ARRL. He earned the Kansas Amateur of the Year Award in 1967. First licensed as 9FIR in 1928, he is 60 years old.

The Pacific Division also chose one of its SCMs (Santa Clara Valley, since 1968) as vice director — Albert F. Gaetano, W6VZT, who rang up 1344 votes to 607 for Larry M. Reed, W6CTH, and 476 for Lee R. Wicat, KH6BZF/K8HQR. Al is 46, lives in Los Gatos, and manages the Electronics Division at Lockheed Missile and Space Co. He's a past vice president, Santa Clara County Amateur Radio Association; past vice president, Northern California Traffic Association; president, past secretary 4H-1 Club; 1965 ARRL National Convention Committeeman; program chairman, 1971 ARRL Pacific Division Convention; member, Transcontinental Corps, ARRL National Traffic System; SEC, ORS, and member, AREC and the A-1 Operator Club. Al has been licensed since 1943.

A close vice director race in the Southeastern Division resulted in the election of Larry E. Price, W4DQD, over John F. Porter, W4KGJ, 1356 votes to 1269. Larry is a professor at Georgia Southern College in Statesboro and is 37 years old. He's been an assistant director, ARRL Southeastern Division, for the past two years; past president, past vice president, University of Arkansas Radio Club; past faculty sponsor and secretary, Georgia Southern College Radio Club; trustee of WA4DTF and special events stations WC4GSC, KF4GSC, and WE4SUN. Larry holds an OPS appointment, is registered in AREC and Army MARS, and serves as communications officer for Statesboro-Bulloch County Civil Defense. A Life Member of ARRL, he was first licensed in 1951 as W5TIA, and later held K7BIT and K9MJA.

Four directors and two vice directors were the sole candidates for their respective offices and so were declared reelected without membership balloting: Director Noel Eaton, VE3CJ, and Vice Director A. George Spencer, VE2MS, of the Canadian Division; from the Dakota, Larry J. Shima, W0PAN, as director and Edward C. Gray, WA0CPX, as vice director; Max Arnold, W4WHN, director from the Delta Division; and Pacific Director J. A. "Doc" Gmelin, W6ZRJ.

For all of these offices, the term runs from noon on January 1, 1972, to noon, January 1, 1974.

#### STAFF NOTES

Lots of comings and goings this past year at ARRL Hq. — Cecilia Christensen Hatch, supervisor of the membership records section, retired September 30 after being aboard since February 17, 1928! When we told "all about" Sis in "Behind the

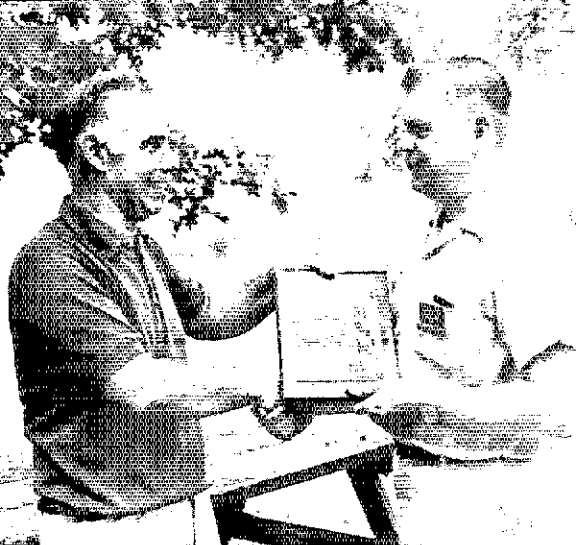
Diamond" July, 1969, we reported that she had only one hobby — grandchild watching. Now she has made that into her profession; she's baby-sitting for four-year-old Lisa, while mother Valerie works as a registered nurse.

A month later, another retirement: Charlotte A. Clark, who has handled our Accounts Payable and other bookkeeping chores since 1946. Enconced in a full-sized, four-room mobile home, Charlotte will have plenty of time for her many pastimes and hobbies: attending plays, opera, and concerts; reading, especially mystery stories; working crossword puzzles; sewing; and travel — even the house can go, if it really becomes necessary!

Other departures: William O. Reichert, WA9HHH, who had been working in public service in the Communications Department, has returned to southern Illinois, where he's now a police radio dispatcher. Richard A. Bitzer, WB2KZW, is now a teacher in DeVry Technical Institute in Union, New Jersey, after a short stint as an editorial assistant in the Technical Department. Dave DeMaw, ex-WN1LJQ, who spent about a year as DXCC Aide in the Communications Department, went back to college at the beginning of the school year.

On the "comings" side, at the start of the year Morgan W. Godwin, W4WFL, of Sebring, Florida (and WA2WOR of New York City) joined the staff as an assistant secretary, doing membership services work. He sometimes likes to do things the hard way — he operated 160 meters from an apartment in New York, continuing from another apartment in Hartford. Things have improved now, though — he and the next two men on this list went searching for "a salt marsh on a hill" and settled for a high soggy plain in nearby Farmington, with room enough for both wire and beam antennas, and a six-room house as combination bachelor pad and hanishack.

John H. Nelson, W0DRE, came east — also about a year ago — from Newton, Iowa, to be assistant circulation manager. Incidentally, he now is QSL manager for another famous Newtonite, ARRL President W0DX/VP2VL, etc. Only a Pop-



An article in April *QST*, "The Five-Finger Keyer" won a cover plaque award for R. H. Turrin, W2IMU (left). Making the presentation is Hudson Division Director Harry J. Dannals, W2TUK.

Tart will persuade him to leave the rig during Sweepstakes, his roommates say.

In early September, Frederick Niswander, WA8VRR, climbed on the ARRL wagon as DXCC Aide in the Communications Department. Rick is from Okemos, Michigan, and enjoys DX and contest work, with a little traffic thrown in when the 80-meter antenna stays up. All three are members of Murphy's Marauders, a gung-ho contest club which ran up a fantastic score in the 1971 Field Day under the call W1ARR/1 - 3000 QSOs in the three-plus-Novice class!

Manning the Public Service post now is Frank J. Connelly, Jr., WA7GWL, from Bremerton, Washington, where he worked ten through eighty, and two meters, cw, ssb, fm, and RTTY - contests, DX, and traffic. He's also been active in the ARRL Field Organization and in radio clubs.

The word "retired" conjures up age, but Walt Woolen, WINTH, who just retired as a Master Chief Radioman (E-9) in the Navy, is only in the middle thirties. He's an editorial assistant in the Technical Department, a utility man who can handle hf as well as vhf, solid-state or tubes. He's cofounder of the Southern Connecticut Radio Amateur Mobile Stations, which operates a 146.19-146.94 machine, KIIGF, at New London.

Tom McMullen, W1SL, whose automobile license plates have been the envy of the Hq. staff for two decades (Would you believe "QST"?) has returned to the staff, also as an editorial assistant in the Technical Department. He's definitely a specialist - uhf and vhf rigs - and is on the executive committee of the Insurance City Repeater Club, WA1KHK, 28-88. A WIAW attendant years ago, he's been more recently the chief engineer of WHNB-TV 30, the NBC outlet for greater Hartford.

Anthony A. Dorbeck, W1YNC, of New Britain, Conn., has come back on the staff as maintenance engineer at WIAW; he had been a WIAW attendant and editorial assistant in the late '50s during summer vacations from the University of Connecticut. More recently he has been an engineer for Singer Electronics. He's a member of the Connecticut Wireless Association and has been active in traffic work in the past.

## QRX FOR FCC SKED

The examination schedules for 1972 were not yet available from FCC at our deadline; we expect to have them in time for the February issue. Meanwhile, if you were planning a January visit to your friendly FCC examiner, better check the schedule with the FCC office in advance. The most recent full list was on page 75, February, 1971, *QST*, with amendments page 80, April; 83, August; and 87, October applying to Norfolk, Virginia, Helena, Montana, and Washington, DC, respectively.

## FUTURE CITIZENS LICENSED

On August 10, 1971, the President signed Public Law 92-81, the Goldwater Bill, which permits aliens (who are permanent residents and have filed declaration of intention to become citizens) to obtain FCC amateur licenses. The first two licenses under this bill became effective October 26, 1971: Derek John Brook, a citizen of Great Britain, got Novice license WN2ZVQ, and Hartman E. A. Weiss, ex-D14UG, a citizen of Germany, received Extra Class license WA3KWD.

## FOUR SPEEDS FOR RTTY

Speeds of 60, 67, 75, and 100 words per minute may be used by amateurs engaged in radio teleprinter operations, effective January 7, 1972. The change was announced by FCC in a Report and Order in Docket 19110 dated November 24, 1971. Transmitting speed should be adjusted as closely as possible to 60, 67, 75, or 100 wpm, and in any event, within the range of plus or minus five wpm of the selected speed.

At the same time, FCC declined to set a bandwidth for RTTY at the new speeds, saying that the difference in width of signals at 60 and 100 wpm is only a little more than 100 Hz., and further, that other parts of the Commission rules may be used as a guide in determining "good engineering and good amateur practice."

FCC further declined to provide for the 8-level ASCH code. It said that government and non-government users of radio teleprinters in the hf. bands "conservatively estimate that they will not use the ASCH code for the next ten years because of the large quantities of five-level equipment now on hand." Therefore, it would not be "economically feasible to spend public funds for the purchase of eight-level equipment to be used solely for the purpose of determining compliance by stations in the Amateur Radio Service."

The speed changes were originally proposed by Keith B. Petersen, W8SDZ, (RM-1392) and R. Bruce Peters, WB2LRS, (RM-1538). ARRL filed in favor of the changes and suggested that the time

Noel B. Eaton, VE3CJ, was named "Amateur of the Year" at the annual convention of the Radio Society of Ontario on October 23, at Hespeler. Making the presentation is Ted Hamer, O.C., VE3LI (left), RSO's Legal Counsel. (VE3CJ/K photo)

had come to leave the [technical] standards up to the individual within broad outlines of good engineering practice. FCC apparently wasn't willing to go that far at the moment, probably again because of monitoring considerations.

### OSL BUREAU CHANGES

*Alaska* - a slight change in address has taken place: the correct form is Alaska QSL Bureau, Star Route Box 65, Wasilla, AK 99687.

*Quebec* - Jack Ravenscroft, VE2NV, has resigned as manager of the VE2 QSL Bureau. A. G. Daemen, VE2IJ, 2960 Douglas Avenue, Montreal 301, PQ, has been appointed manager, effective January 1, 1972.

*British Columbia* - H. R. Hough, VE7HR, remains the manager, but the street address has been changed to 1291 McKenzie Avenue, Victoria.

*VE8* - George Kondo, VE8RX, has been transferred to VE6. The Yellowknife Centennial Radio Club, VE8NWT, has been appointed as the operator of the bureau. The address is: Post Office Box 1944, Yellowknife, NWT, Canada.

### EX-CBER DENIED TECHNICIAN LICENSE

William E. Richardson, of Walnut, California, has been denied an amateur radio station license and Technician Class operator license after an FCC hearing. The examiner found that Richardson's CB license had been revoked June 30, 1969, for violation of rules, and that he had operated on at least four occasions since then without a license. In summing up, the examiner said:

The record . . . shows that Mr. Richardson has a past history of violations of the Commission's Rules. He has repeatedly operated a radio transmitter without a license, despite warnings from the Commission that such operations were unlawful. Further, Mr. Richardson has tried to conceal his unlicensed operations by using a false call sign. Respondent's operation . . . has . . . interfered with the television reception . . . He has repeatedly operated his radio transmitter on 26.800 MHz, a U.S. Government frequency . . . From the above facts, it is clear that he lacks the integrity deemed necessary in an applicant for a license in the Amateur Radio Service . . ."

### EXECUTIVE COMMITTEE MINUTES

No. 337 November 19, 1971

Pursuant to due notice, the Executive Committee of The American Radio Relay League, Inc., was called to order at 1:40 P.M., November 19, 1971, at the headquarters office of the League in



Newington, Conn. Present: President Robert W. Denniston, WØDX, in the Chair; First Vice President Charles G. Compton, WØBUO; Directors Victor C. Clark, W4KFC, Harry J. Dannals, W2-TUK, Noel B. Eaton, VE3CJ, and Robert B. Thurston, W7PGY; and General Manager John Huntton, W1RW. Also present were Rocky Mountain Division Director Charles Cotterell, WØSIN, and Assistant General Manager Richard L. Baldwin, W1RU.

On motion of Mr. Thurston, affiliation was unanimously GRANTED to the following societies:

Adams School Amateur Radio Club, New York, N.Y.; Alpha Sigma Delta Radio Society of the Univ. of Oklahoma, Norman, Oklahoma; Carbon County Area Vo-Teck Amateur Radio Association, Jim Thorpe, Pa.; Chetek Senior High Amateur Radio Club, Chetek, Wisconsin; Covington Radio Club, Andalusia, Alabama; Cresskill H.S. Radio Club, Cresskill, N.J.; Largo High Amateur Radio Club, Largo, Florida; Middlebury College Amateur Radio Club, Middlebury, Vermont; Poweshiek Radio Club, Grinnell, Iowa; Prescott High School Radio Club, Prescott, Arizona; Rho Epsilon Amateur Radio Association of I.I.T., Chicago, Illinois; Sylvan High Amateur Radio Club (SHARC), Atlanta, Georgia; Troy High Amateur Radio Club, Fullerton, Calif.; University of California Riverside Amateur Radio Club, Riverside, Calif.; University of Iowa Amateur Radio Club, Iowa City, Iowa; University of Massachusetts Amateur Radio Association, Amherst, Mass.; Wedixie Amateur Radio Club, Atlanta, Georgia.

On motion of Mr. Dannals, unanimously VOTED to grant approval for the holding of a Southwestern Division Convention at Santa Maria, California, on October 21-22, 1972; and a Hudson Division Convention at Tarrytown, N.Y., on October 21-22, 1972.

On motion of Mr. Eaton, Life Membership in the League was unanimously GRANTED the following applicants:

Bertram S. Aaron, K2IZN; Chilton W. Alter; Kenneth Andras, VE3UU; Fred D. Armes, K4RX; George P. Bartlett, WB4MMI; David L. Bell, W6BVN; Arnold E. Berger, W6LHI; Robert L. Bingham, K9WMP; Dennis Bodson, W4PWF; Herbert J. Brady, W1FIY; Karl C. Bretz, K9BGL; Richard L. Brocaw, K5VYT; Harold F. Byrd, W8HY; William L. Cary, K6RTW; Ted A. Cham-



Eunice Bernon, K8ONA, receives the Veterans Award for 1971 from the Joint Veterans Commission of Cuyahoga County, Ohio. From left: Atty. Bernard J. Stupinski, president of the Commission; Chester Koch, secretary/treasurer; Mrs. Bernon; Mrs. Koch, representing Gold Star Mothers. The award recognized the public service work of the Apricot Net, of which Eunice is president. (Photo by WA&PCT)

pagne, WB4FLW; Kenneth A. Christiansen, WA0OVT; Andrew C. Clark, W4IYT; Richard M. Cobb, W0HI; C. P. Cook, W5YOU; Thomas R. Crawford, WB2COE; Alva R. Davis, W6NT; Robert H. Decker, K2ORA/W6ECO; Norman M. Dennis, WA4EJA; Noel H. B. Deslites, W1FBH; Thomas J. Eavenson, Jr., K5BWZ; Frank A. Exum, W0GIL/WA7RNI; Glen A. Filer, W3MOZ/K3FLO; J. L. Ferns, VE3BZF; Emery Flinn, Jr., W4QEK; John S. Forchtner, W6MUL; Carlo Frey, HB9AQH; Harley C. Gabrielson, K6DS; Charles J. Gambill, III, WB4LEK; John H. Garrett, G5APC/W5WC; Joe D. Gault, W4NDH; Alvin H. Groff, K0VQM; Ronald J. Grzelak, WA1ABW; Richard A. Hade, K9HSK; Donald J. Havlicek, W8QHW/W4KSR; Howard B. Hayes, W3JH; Fred A. Helwig, W6IHU; Fred J. Hufft, W4PLM; Charles L. Hutchinson, K8UDJ; Travis R. Jarman, WB4IES; Michael Johl, VE2APT; Robert A. Johnson, K9KFR; Horace A. Jones, VE3BWH; R. L. Jones, W2AEV; James J. Joyce, WB2MEE; Dale T. Justice, K7WWR/WA7KTV; Charles Kigel, W1BDL; David R. Klimaj, W4JVN; Kenneth W. Kussmann, W9UNU; Laurence H. Laitinen, WA6JYJ; Layfield Lynn Lamb, W3BWZ/W4HZI; James M. Lasley, WA0OTQ; David S. Lloyd, VE3AW; Brad MacKay, WB4OYA; Robert P. Marsh, Jr., W1JVC; Arthur S. Mayoff, VE2AQV/K6; Mayo J. McAllister, W0CW; W. Dale McCurley, WA3JCV; Martin J. McGowan, Jr., W0UGV; Karl R. Medrow, W3FA; Fred P. Mellers, K0FTZ; E. J. Melton, Jr., W4KTU; Kjell Midtseter, LA3SG; H. Stephen Miller, WA0SSU; James A. Mose; Elbert R. Moses, Jr., WA3IYA; Norman E. Nielsen, WA0SOP; Fumio Nishino, HS1AEY; J.

Everett Norfleet, W4MII; Howard J. O'Byrne, VE7BNK; William W. Olsen, W6CCZ; Roger T. Omori, KH6EUZ; Matthew J. Palumbo, WA1CHS; James Pashalidis, Jr., WA2FDL; Harcourt S. Patterson, Jr., WA8LTD; John A. Plummer, W1VN; Fred W. Postman, Jr., WA4YYX; Wilbur A. Rimer, W3IE; Adolf J. Rohrmaier, K8SCA; R. L. Rothrock, K7RNO/9; Thomas L. Rothwell, Jr., W6ZQZ; Bayard F. Rowan, K9PZF/2; Billy Joe Sandlin, W5NWX; Edmund Schneider, K2RCO; Winston W. Scott, Jr., K0TEP; Jack S. Seimas, WA6IHR; George L. Sensibar, W9FJO; James J. Shea, WA3EMO; Robert Siegel, W2EVC; Joseph J. Slemenda, K3PZU; James V. Smith, WA0ZZZ; James C. Stafford, W2CJC/K9MAF; Gerald F. Starkey, WA6LU; Carl W. Stengel, W6JEO; Barry D. Strong, WA7QZJ; Richard W. Thimmesch, WA5NYG; David L. Timmerman, WB9CER; J. Stater Tubman, VESOA; Paul B. G. Twomey; A. Earl Vivino, W3AAF; Kevin J. Ward, K2BFQ; Richard J. Warren, WA9HWH; Robert H. Weibrecht, W6NRM; Frederick G. Williams, VE1FH; Paul R. Wilson, WA6FZE; Gregory P. Winner, WA3EIO; Peter A. Witcosky, KZ5PW; William M. Wooding, W2DNF; James Arlen White, WA1NNC; Glendon R. Whitehouse, K1DIK; R. Alfred Whiting, K3BRS; Robert J. Wyland, W0LHD.

Mr. Clark read a letter of application from the Raleigh (N.C.) Amateur Radio Club for authority to hold an ARRL National Convention in that city in 1973. The Committee expressed considerable interest, but noted that approval could only be given by a full Board of Directors, and meanwhile requested that more information on facilities, etc., be made available. During the course of the above discussion, Atlantic Division Director Harry A. McConaghy, W3SW, and Treasurer David H. Houghton joined the meeting.

On motion of Mr. Eaton, after discussion, unanimously VOTED to authorize the purchase of up to 50 prints of the ARRL film, "This Is Ham Radio," for distribution to schools and youth groups through a free loan agency.

On motion of Mr. Clark, after discussion, unanimously VOTED that the Board of Directors be polled on a proposal to convene the 1972 annual meeting at 9:30 A.M. Thursday, January 20, 1972, instead of the January 21 date provided for in the By-Laws.

At this point the President reported extensively on various developments in the telecommunications regulatory field, with particular respect to a possible forthcoming world allocations conference dealing with the high frequency spectrum. After discussion, on motion of Mr. Clark, unanimously VOTED that the Executive Committee endorses the program outlined by the President whereby the General Manager is instructed to develop and submit in writing to the Board of Directors, at its January 1972 meeting, a comprehensive program for insuring effective representation of amateur radio interests at the next world administrative radio conference on the high frequencies, said program to include estimates of costs and personnel required.

On motion of Mr. Clark, after discussion, unanimously VOTED that the General Manager is instructed to re-examine the matter of WIAW frequencies and to take appropriate action.

There being no further business, the Committee adjourned, at 5:30 P.M.

Respectfully submitted,  
JOHN HUNTOON, W1RW  
Secretary



## Novice Roundup

(Continued from page 69)

mitted. Novices work any amateur stations; non-Novices work Novices only. Valid points can be scored by contacting stations not working in the contest, upon acceptance of your RST and section and receipt of a RST and section/country. A station may be worked only once, regardless of band.

A Novice may operate in the Novice portion of the competition until he receives his General Class license, then he must participate as a non-Novice only.

4) *Scoring:* Each exchange counts one point. Only one point may be earned by contacting any one station, regardless of the frequency band. The number of ARRL sections (see page 6 of any *QST*) + foreign countries worked during the contest is the "total multiplier." Yukon-N.W.T. (VE8) also counts as a multiplier. A fixed scoring credit may be earned by entrants who hold the ARRL Code Proficiency certificates. FCC code credit *cannot* be used in lieu of the above. If an entrant does not hold a ARRL CP Award, he can apply for credit by attaching to his Novice Roundup report a copy of the qualifying run from WIAW or W6OWP for January or February. Cp credit equals the wpm speed indicated on the latest ARRL certificate or sticker held by the entrant. The final score equals the "total points" plus "ARRL Code Proficiency credit" multiplied by the "total multiplier."

5) *Reporting:* Contest work must be reported as shown in the sample form. Reporting forms and a map of the United States will be sent free upon request. Indicate starting and ending times for each period on the air. All NR reports become the property of ARRL and none can be returned. Entries must be received at ARRL Hq. 225 Main St. Newington, CT. 06111, no later than 3 weeks following the end of the test.

6) *Awards:* A certificate will be given to the highest scoring Novice in each ARRL section. Multioperator or General-class licensees and above are not eligible for awards. However, a box containing the TOP TEN W/VE higher-class licensees will be incorporated in the results. And should participation warrant, a similar box will show TOP DX entrants.

7) *Disqualification:* Failure to comply with the contest rules or FCC regulations is grounds for disqualification. ARRL Awards Committee decisions are final. [QST]

## SET Announcement

(Continued from page 79)

test, too. To do this, you check in with your local or section net - depending on what you have in the area and where your participation will be most helpful. The National Traffic System ties together all the local tests through a systematic organization of liaisons and relays. NTS will operate a total of sixteen hours, eight hours during each day of the test, beginning at 1400 (2 P.M.) local time and ending at 2200 (10 P.M.). However, NTS operation does not require each participant to be on hand the full time. The system is designed so that each operator performs a certain function - perhaps to get traffic out of his section net and report and clear it into his region net. Once this is done, this

particular function is terminated. You can handle one function or several, depending on your willingness, your ability, and the need. But if you handle only one, this is a help; if everyone did so, no one would need do more than one.

If this aspect of the test appeals to you more than the local aspect (or if there is no local test), find out where the section net hangs out and contact the manager. (See the League's Net Directory.) He'll probably be glad to hear from you. Take a listen on the net frequency, familiarize yourself with the operation, report in and offer your services.

### Additional Information

Each participant in the SET is asked to originate at least two messages during the test. One of these should be to your SEC informing him of your participation and the other can be to a friend in your region or, preferably, in your section of NTS. In previous years we requested that you send a message to a friend in a distant part of the country. This resulted in a heavy load of traffic at the higher levels of NTS while the section and local nets were left with little to keep them busy. By originating a message to someone closer to home some of the pressure will be taken off the higher levels of NTS and transferred to the section and local levels where the need for practice and experience is greater.

All SET messages should include the word *test* in the preamble and the words "test message" at the beginning of the text. Additionally, all test messages should include the handling instruction HXB. If the message is not delivered by the time the SET is over, it should be cancelled and the originating station serviced. A sample radiogram in proper form is shown herein. Most messages will carry a "test routine" (TEST R) precedence and preferably be in fifteen words or less. Messages of inquiry may carry "test inquiry" (TEST Q). Messages originated by served agencies or leadership personnel may carry test priority (TEST P) or TEST EMERGENCY (this precedence is always spelled out in full) precedences. TEST EMERGENCY should be extremely rare and should not be used indiscriminately. Use of standard ARL texts is recommended where applicable.

A word to the wise: make sure your emergency-powered equipment is all checked out before the start of the SET. It will be well worth the effort.

That should give you about all the basic information you will need to participate in the SET. As mentioned before, this is not a contest and nothing is gained by artificially inflating your score. The only reward gained by participating in the SET is the satisfaction that you will be better prepared if and when an actual emergency condition develops. Isn't that enough? [QST]

- . . . -

Remember the "Let's Talk Transistors" series by Robert E. Stoffels, WB9ESH? We've put together a reprint booklet of this 9-part transistor primer and it is available from ARRL for \$1 including postage.



# Correspondence From Members -

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

## IMPROVING *QST*

● I hope that you can improve *QST* by making the type large enough to read and eliminating page after page of rubbish, club news, etc. How about a few more articles written as if they were the result of some intelligent research rather than as a need to fill up so many pages of space. Eliminate the senile living in the past. We have had quite enough nostalgic articles about the museum, etc.

Also print a cross section of letters, not just those throwing orchids your way. *Benjamin P. Lane, W7FNE, Tolovana Park, OR*

● I would like to commend you on *QST* both as to articles contained therein, and on the excellent typography since I do not have to use a magnifying glass to read it as is necessary with another ham magazine. — *Otto J. Goohs, K3AG, Pittsburgh, PA*

● My membership places me as I should be, in support of ARRL; however, it does not signify my approval of *QST*'s merits.

The exorbitant space used to recount numerical statistics of contests, dreary repetition of unimportant regional club gossip whose call signs one seldom, if ever, recognizes, and able but far too extensive comments on DX activities, have resulted in a publication more stereotyped than the *Journal of the AMA*. The latter is read by those too busy to read anything else.

Articles in close relationship to the fundamentals of electronics are sadly missing. This paucity is a severe restriction on the progress of tyros who wish to advance. I feel that a compilation of Lew McCoy's writings of the past several years, together with addenda of practical procedures and some elementary math hints to clear solution of hazy answers to problems always encountered by the eager Novice, is long overdue.

We plan to increase membership. By the same token, if you plan to acquire a horse, you must arrange to feed him. — *H. W. Hawkins, M.D., K6RY, Poway, CA*

● Beginning with your articles on transistors, and now the ones on fm, it appears that after being dead for years, *QST* is once again coming to life. How about a complete and comprehensive series on ssb? Also, a section on modern surplus gear now showing up? — *James A. Wilson, W5DVL, El Paso, TX*

## FLAGS AND STEREOTYPES

● I believe the guest editorial by W8BU ["It Seems to Us. . . Nov. *QST*"] represents a new low in material selected for *QST*. Sufficient quantities of such trite nationalism already appear in the admittedly politically directed circulars.

When followers lack the fact and faith to provide a rational basis for their actions, reliance and emphasis is converted to such artificial foci as signs and idols, including those cloth items called flags. When the system has little to offer, it is forced to rally to mystic and meaningless symbol-

ism in desperation. This is also a useful and tried tactic employed by those responsible for the failure, or those seeking to exploit the weak position of the system, in an attempt to consolidate their base of power. Does the editorial imply such a state for our organization (ARRL) by the attempted analogy?

In both cases, our nation and the League, while the institutions are far from fault free and require considerable refinement, such apologies are completely unnecessary. *Richard Klinman, K3OIO, Philadelphia, PA*

● It seems to me that the last five paragraphs of W8BU's piece were informative and nicely put — I agree with his meaning there, and would suggest to those amateurs who are not League members to consider what he is saying.

In his first two paragraphs, however, I do feel that his analogy of the lady with the flag on her pants was ill-chosen. I would like to think that we amateurs could keep our politics off the air and out of our magazines. It is also my feeling that the employment of a minority group stereotype by way of implication is inappropriate for publication in *QST*, even if the minority group implied happens to be the one evidently considered currently fashionable and safe by the tabloids.

In my view, this guest editorial was not as "direct to the point and well stated" as it might have been. — *Jan Peter Schultz, WA2COO/1, Plainfield, VT*

● Nice guest editorial in November *QST*. That should make some heads hang in shame. — *Robert B. Walton, WA2CAK, Rahway, N.J.*

## NO RESTRICTIONS

● My membership in ARRL expires in December. I do *not* wish to renew. If you are interested in why still another amateur is leaving the League, here they are:

1. Refusal of ARRL to admit that the cw requirement is out-of-date, biased in favor of ex-Signal Corps members, and is a discriminatory and undemocratic infringement of the People's rights to the airwaves.

2. Opposition of ARRL to the logical and democratic petition of the EIA to transfer some of the 220-MHz band to the Citizens Radio Service. Even the name, Citizens Band, bothers you I bet!

3. Continuing evidences of poor taste in *QST* through snide remarks about "CBers"; a really adolescent attitude.

I shall continue my work toward helping our elected legislators to see the need to eliminate the Amateur Service and transfer these frequency assignments to the Citizens Radio Service.

It is my opinion that radio is only a hobby, and that any citizen should be able to enter it without having to hurdle a set of restrictive admissions requirements. — *Benny R. Copeland, Ph.D., KBX 4026, WB5BCA, Denton, TX*

## THE HANDBOOK

● Editor Doug DeMaw and the entire staff who worked on the production of the 48th edition of the *Handbook* should be roundly congratulated for their efforts.

During my 38 years of enjoyment of amateur radio I have owned at least 25 editions of the *Handbook*. I use it constantly, not only in my hamming but in my teaching of electronics. I believe that this year's edition has made a greater leap forward toward the current state of the art than any of the earlier editions. — *Charles (Cy) Perkins, WAVMO, Florida State University, Tallahassee, FL*

[EDITOR'S NOTE: Thanks. But wait 'til you see the 1972 edition!]

## SLAPPED?

● I'm with WB9BUV in his comments in "Correspondence." October *QST*. "Type-approved" anything in amateur radio marks the very nadir in FCC confidence in the amateur Novice Class or any other. How great a slap in the face can the amateur receive?

If the Commission has no confidence in an amateur's ability to build and adjust any amateur transmitter to radiate a reasonably clean signal, it should not grant that individual an operator's license. Maybe the solution to such questions as this would lie in a meaningful license examination procedure. That such doubts exist in the Commission's mind reflects directly upon the silly jokes they have been calling "license examinations" for years, and is the Commission's default, not ours. The FCC gets just the kind of people it wants through its licensing philosophy. If it wants only capable amateurs, let it redesign its examination program to eliminate all or most of the others. Then it will not have to treat the amateur as a silly juvenile who cannot put a decent signal on the air. I've taken every FCC radio license exam for which I am eligible, thus excepting only the amateur Novice Class and the commercial radiotelegraph first. In my opinion, none of the Commission's radio license examinations are either stiff enough or representative enough to assure anything beyond the applicant's ability to memorize. This includes the radiotelephone first class examination.

The day the FCC requires me to turn in my slightly antiquated, sloppily constructed, crazy looking, but electronically adequate homebrew gear for anything "type-approved," is the day I will turn in my amateur license. — *C. F. Rockety, W9SCH, Deerfield, IL*

## NOVICE ACCENT

● I have received, read, and will follow the advice given in "Your Novice Accent" by Keith Williams. Thank you.

His advice, if followed, will make better "Old Men" of a lot of boys, but I'm not sure I like the way he tries to get his message across.

Apparently Keith has been doing a lot of listening because he has the facts. No mistake about that; however, was he ever a Novice?

Bring back the DXers Keith — the kindergarten class has something to say.

He talks about "birds" cluttering up the air. Let's take a typical Novice. He hopes he can handle 8 wpm. He's spent two year's pin money and three month's work putting a rig together. He's fallen out of a tree putting up a wire, and finally gets a

feeble answer to his first CQ. He acknowledges the call, and there's a long pause. The "oaf" hasn't suffered a heart attack, Keith. He's so nervous he's forgotten his name and is looking for his Social Security card. Finally, he gets going. He's thinking so hard of what to say next that right in the middle of a sentence he's forgotten what he said. Those aren't extra dots he's throwing in for luck, his heartbeats is getting into the transmitter. Finally, his partner in crime, who just broke through an FBI road block, gets to sending his location back. Then, just at the ultimate moment of truth, some eagle with 200 watts and a 40 wpm bug, who has been laying in wait for fledglings all this time, starts warming up and practicing right in the middle of the Novice band. *Who's cluttering up who's air?*

I'm fifty-five years old and have held a responsible position with GE for over thirty years, and not too many people consider me a pest, on or off the air. I'm not really upset; merely asking if this is the right attitude.

I learned my grammar and my manners from my elders, and your Novices are learning from theirs. Articles like this should go a long way in helping your beginners, but Old Timers should instruct, not berate; suggest, not ridicule; and above all, set good examples. If some Novice gets up the nerve to answer a K2 call, don't brush him off and practically ask him to get off "your air." Slow down and help him out. He may do the same for your kids some day.

Incidentally, I know the Novice I described personally, and he's having a helluva good time in spite of QRN, QRM, and QVaver. — *E. H. Hoffman, WN2ANF, Syracuse, NY*

● I became a licensed amateur and a League member back in 1967 when I received my Novice ticket. As soon as I had my ticket I was on the air calling CQ and trying to get some QSOs under my belt. I must confess that in my haste to get on the air I had not taken time to learn the various "Q" signals and basic good operating habits. One day I received a QSL from a General I had worked, along with a reprint of "Your Novice Accent" by Keith Williams (W6DTY). In a note attached to the article the OM said he hoped it would give me some helpful hints on how to better enjoy cw. Brother, that article helped me improve my operating technique by ten-fold. I have re-read the article many times since.

Today I am a General and an avid cw buff, but as I tune the cw bands I find that many hams, young and old alike, could stand to improve their operating procedure. One day on 15 meters I heard a Novice call CQ twenty-one times before signing his call! He had a good signal and there was plenty of activity on the band, but he received no reply to his call. Wonder why? But the Novice is not alone. There are many sleazy operating techniques being aired daily on the higher class bands.

Maybe *QST* should reprint "Your Novice Accent" for the higher class OMs. After all, what's the use of having a strong, clear signal, if no one likes to listen to you send? — *Mark Johnson, WA0SZW, Lakewood, CO*

[EDITOR'S NOTE: Copies of "Your Novice Accent" are available from Hq upon request. Be sure to enclose an s.a.s.e.]

The Post Office Department promises faster mail service with the new Zip codes. Use yours when you write League Headquarters. Use ours, too. It's 06111.



# How's DX?

CONDUCTED BY ROD NEWKIRK,\* W9BRD

**H o w :**

At a time when there is reason for modest hope that commercial hf point-to-point pressures will subside in favor of more reliable space satellite circuits, thereby even raising the possibility of expansion in amateur spectrum space, short-wave broadcasters are swarming up a storm. Indeed, acceleration in proliferation of minicountries with maxiradios raises the specter of one eventually solid sprawl of automated ancient modulation fundamentals, harmonics and beats from 1 to 100 MHz and beyond. Excerpt from a current Newark News Radio Club *Bulletin* gives some idea how this ball is bouncing:

Radio Nederland-Madagascar negotiations were completed in 1967 and an official go-ahead was received a year later. Construction is now well under way on the transmitter and relay center buildings. In these soon will be housed twin digitally-controlled 300-kW Phillips transmitters which can be coupled for 600 kW. From thirteen antennas up to 330 feet high the facility will be capable of 18-hour-a-day parallel broadcasting. Eleven antennas were designed for transmission on any three adjacent SWBC bands. This relay is intended for countries in Africa, south Asia and the Indonesia-Australia area.

The relay center is located six miles northeast of Tananarive, the transmitters six miles farther north. The center will be equipped with receivers and unidirectional rhombics for reception of a point-to-point link from Holland for news and topical items. Other programs will be taped and flown in. *Nine European families have been posted at the facility along with 25 newly trained Malagasy personnel.* Antenna alignment should be completed for regular operation by April, 1972.

\* 7862-B West Lawrence Ave., Chicago, IL 60656.

Even an underactive imagination can appreciate how many precious kHz have already been clobbered by this remote-barrage radio colonialism. And don't fault the Dutch too much; our own VOA is strong in the field, interlaced, interwoven, and rarely undermodulated world wide. More ham bands? Surely we approve, for amateur two-way radio is undeniably king of global wireless cultural exchange. But our problem right now is how to tune 40 meters at night and still stay optimistic. What's yours?

† † †

### Everyham's Code for Everyyear

Rejoice that our whole of together,  
Though splinters would rend us a-flying,  
Stays captured in rapture of spirit,  
*Ham spirit aglow and undying.*

— From an old *QST*

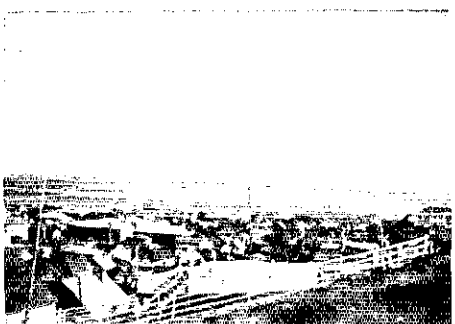
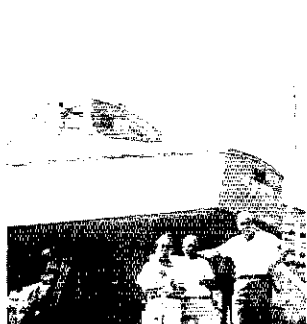
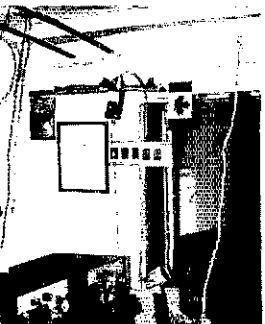
On a lighter note, chief guardians and purveyors of that old ham spirit, the "Elmers" mentioned in our March '71 opener and thereafter, remain a lively topic in the DX mailsack. Like

WAØIOX is my Elmer nomination, for Glen inspired me toward my ticket, helped me on theory, pitched in with rig repairs, and well represents the type of ham who keeps amateur radio strong. — *WNØCRQ.*

... Mine is WBØAFE and I hope to be as good a ham. — *WBØAZK.* ... My Elmer was the late W5BLQ. Jack taught me all I needed to know to get a license, then generously helped with equipment and antennas. Another super-Elmer down this way is WASYKD who started WASS YOU YOY ZCF, WN5ELV and many others along the ham highway. Though very active in club work, MARS, etc., Hank is never too busy to lend a helping hand. — *WN5CMX.*

... My trusty Elmer, W2CBY, recently passed away. He really would have appre-

FP8AP's motor launch *Attaboy*, pictured afloat in November, 1970, *QST*, has become a unique QTH of any Month. After 145 voyages in FP-VE-VO waters Gus retired and landlocked her up a mountainside overlooking St. Pierre where she makes a cozy hamshack. VE1s AIH and OM, shown here flanking FP8AP, signed FPØBG from these premises during recent visits.



ciated those lines about him in August's *QST*. — *WN2SXD*. . . . The late *K6GES* taught me code, basic theory, construction techniques, proper cw and RTTY usage, etc. I could write an entire book about such a wonderful Elmer. — *K6UGS*. . . . Would-be Elmers can start young. I'm not quite 22 but I've given several Novice and Technician exams already. — *WA4ZZU*. . . .

And on they go. If he's still around, did you remember to ship a season's greeting to *your* old ham radio mentor? In any case we'll do it for you: Happy New Year, Elmer, wherever you may be!

† † †

## What:

The ebbing year's DX activity closed with a rush from 160 all the way through 10, disclosing scant evidence of a sunspot shortage. Will this remain true in '72? Better wind up the DXers roundtable we started last month before taking up the business agenda for this meeting. In heavy QRM at the forum we manage to make out . . .

. . . Ex-9QSAF isn't yet sure of his next permanent address. — *WB5DOJ*. . . . I'm a two-year reader squeezing DX between school and work. — *WA2MDX*. . . . Checked on DX matters with NCDXC members at the Disneyland ARRL Convention. — *WA6WXO*. . . . Hope to get a ham club started at my high school. — *WB4RMQ*. . . . Worked a good batch of stuff with modest power and two phased verticals. — *W0EWF*. . . . Wonder if *anyone* still wants California QSLs. — *W6QPF*. . . . XE111J's XYL, WN1NTB, signs the OM's call in Novice hands from Vera Cruz. — *W2GHK*. . . . Some of those DXHPDS May limericks are *way* out. — *W8CL*. . . . I clip "How's" QTH lists for a file record. — *W4KO*. . . . Rig suffered recent coax maladies but KC6BT helped me reach the 120-country plateau. — *W5BZK*. . . . I'm a retired nurse, a "hamming nanny" who finds DX most interesting. — *WB2YKA*. . . . Operate strictly cw from Idaho after fleeing California and K6KUU about a year ago. — *W7HZL*. . . . W4OTY/mm, though en route Japan thousands of miles away, somehow managed to QSL me within two days of QSO. — *K6UGS*. . . . Everybody got Bermuda? Received only 41 QSL requests after 400 QSOs as VE1AL. . . . I find retirement and DX most enjoyable after years in Chicagoland as W9OSQ. — *W4CCB*. . . . Hope to be ZF1LM again come Christmas. — *W8LUI*. . . . SU11M holds the record for fastest DX QSL ever received here. — *WV9FBG*. . . . Just joined ARRL after years of peaking at "How's." — *WN5CMX*. . . . Thought I'd join your contributors after my first year of *QST*. — *WN3PMT*. . . . Here are a few QTH gleanings from 15 and 20. — *W9LNO*. . . . Anyone looking for old W2DY will find me on 15 and 20 sideband signing this new call. — *K4SD*. . . . XYL WA2BAV passed her Advanced and caught up with me. I'm considering a DXpedition in '72, suggested targets welcome. — *WB2AQC*. . . . Interesting 75- and 80-meter DX with 75 watts and dipole from my New Jersey college QTH. — *WA2KWB2*. . . . Judging from QSL receipts client OY9LV is becoming more active. — *W3HNK*. . . . Twenty's been good to the Pacific with occasional strong bursts from Europe. — *VE7BAF*. . . . Old 14 MHz topped out here in mid-July. — *W3JWN*. . . . It's been a tough year for me but DX is still in there. — *W8YGR*. . . . I'd like to see more listings of DX activity with GMT. — *E. Hamill*. . . . New 80-meter season started off well. — *W1SWX*. . . . ZD9BR suddenly made 20 cw quite worth while. — *W6AKM*. . . . After twelve years I finally caught up with Monaco. — *K8PYD*. . . . You'll be hearing more from me



FB8XX's radio team for '71 strikes an informal pose in their Kerguelen Islands wireless room. From the left meet operators Henri, Pierrot, Michel, and Jo. Henri, a veteran of communications in the stormy southern oceans, previously signed FB8XX in 1969, FB8WW on Crozet in '67. (Photo via F2MO)

when I get going from Tucson. — *WA2FOS/7*. . . . "How's" should have more Novice reports. — *WN2PWS*. . . . An HW-16 and 7-MHz dipole are fine for DX on 15. — *WN5EBC*. . . . Even with the sunspot peak past 15 is still exciting. — *WN9GIT*. . . . Ten opened well again with goodies roaring through from everywhere but Europe. — *WA3HGV*. . . . Received a direct QSL with IRC from a DX station wanting my card! — *W5IB*. . . . Liberian time, I'm told, is 45 minutes behind GMT. — *K2QHT*. . . . LA7QM is radioman aboard MS *Skyward* signing LKQH on ship bands. — *W3CY*. . . . Immensely enjoyed a visit to Israel. I can report amateur radio very much alive and well in the beautiful valley of Jezreel. — *WA2FDG*. . . . DU1LP, VS6BS, and myself plus XYLs had a mighty fine summer hamfest along the streets of Hong Kong. — *W5EYC*. . . . NIDXA is attempting to arrange better DX facilities and QSL service for AC5TY. — *K9KDI*. . . . Ex-HS4AFE (WA7PML) is stationed at March AFB in California. — *WA7QFW/7*. . . . Submarined back to the States from KH6HAM. — *W6LFB*. . . . Operating ZF11S was great fun after twenty years away from amateur radio. — *VE3AFY*. . . . Correspondence to Radio Peking brings back a colorful brochure concerning their English broadcasts, etc. — *W8IBX*. . . . Though not a serious DXer I enjoy reading about the sport. — *VE3CJB*. . . . Wonderful visit to France and Germany this summer. — *W4SZWC*. . . . With WAC and 27 countries confirmed I still need North Dakota for WAS. — *WN0BAV*. . . . ZS6ME is an avid "fox hunter" in monthly Transvaal 160-meter direction-finding games. — *W5QPX*. . . . Wish I could hear more of the rare stuff mentioned by the "How's" gang. — *WA8LUC*. . . . Sure agree with G3EKM's September QSLing comments. — *K6IBI*. . . . Back after DX from an absence of too many years. — *WA3RPL*. . . . Enjoy west coast DX angles in "How's." — *K6OPG*. . . . Need more activity from the rarer states on 160. — *W4DFR*.

... E19J, Gms 2WDF 3YCB 4AGG, Gws eYGH 4AEC, PY1DVG, VK3QI, VP2s SAM SBG, 8P6DR and many Gs were worked in late summer on 160. - *WIHGT*. . . . Two QSOs with KC6BK nine years apart. - *K5ZBY/4*. . . . DX on 40 cw perked up in early September. - *K3YVN*. . . . Kwajalein ARC runs free ham license classes in the Marshalls. Imagine the DX letdown when an amateur first licensed as a KX6 eventually becomes an ordinary W/K1 - *W2JHA*. . . . Hey, let's not let QSLing become a racket. - *W3LB*. . . . Catching South Dakota was as difficult as making DXCC. - *WB2ZHM*. . . . Glad to jump into your DX mailbag now and then. - *W2ADP*. . . . Worked about a hundred countries on 15 cw before nailing the last continent on that band. - *K4PR*. . . . After 67 countries on 40 cw since March I'm giving 80 a DX whirl. - *WA0VJF*. . . . Forty came through with W0FXM/KL7, my first Alaskan. - *WN0CTQ*. . . . Keep that Wouff Hong handy! - *W4VFP*. . . . Leisurely collecting 10-meter DX at my new Texas location. *WB5FIU*. . . . Retired to New Hampshire where I hope to run up the DX total. *W1CTW*. . . . EB on the Civil War telegraphers yarn. I was a B&O messenger in 1918, an AT&T op later. - *W7ZC*. . . . Found myself a fine XYL-to-be while signing "4X" in Israel. - *K9Y7J*. . . .

### Where:

**H**EREABOUTS - ARRL DX Contest activity next month from Grenada by W3s AOH TV, W4GIV, and myself, assisted by VP2GLE, can be QSLd via W3GJY. - *W3VW*. . . . We are losing civil airline mail delivery. Our mail will now be handled by company airplane between Florida and Andros Island. Please pass the word that this new QSL address will receive faster delivery: AUTE6 306, P.O. Box 16125, West Palm Beach, FL 33406. - *K4BZH/VP7*. . . . Never got logs from HRIKS; please delete me as his listed QSL manager. - *WA0WKW*. . . . Do not QSL 8P6CC via W4OPM. No logs received there for two years. - *K0SSN*. . . . Novice DXers should remember to keep self-addressed stamped envelopes on file with their ARRL QSL Bureau managers for a year or more after changing calls. - *WA0VJF*. . . . KV4FN's VP2VAD call was quickly switched to VP2VB. - *W3HNK*. . . . "QSLers of the Month" E16S, GC5AEF, HK0BKX, IS1LMN, JW1EE,



KA5JJ prefers radiotelegraph DX pursuits from his Iwakuni post. With other homebrew QRP units Marine Captain Jackson works Europeans on less than two watts. Jim has done a strong share of emergency work, MARS communications and regularly encourages many a would-be ham in amateur radio classes he organizes when and where feasible. Transfer to Tokyo may soon make him a KA2.

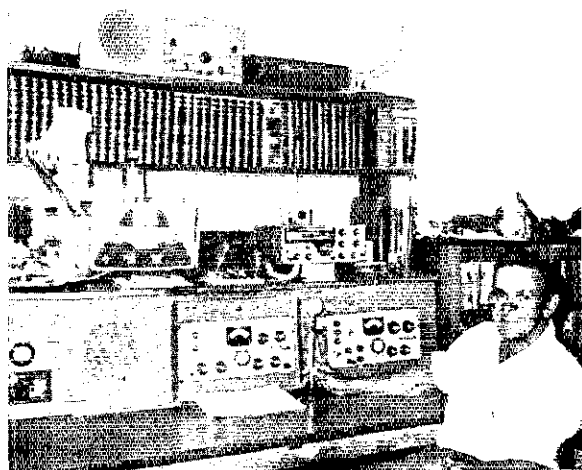
KC6BK, KR6KQ, KX6DC, M1B, MP4BJI, UD6DGA, VKs 3UVJ9 9XX, VU2HLU, WL7HH, ZS3KC, 8R1G, and 9Q5GE, plus QSL tenders Ws 2GKH 7VRO 8WB7 0PAH, K4TXJ, WAs 3HUP 4UOE 6AHF and DJ1OP, are each commended and recommended for swift postal response by "How's?" contributors W1SWX, Ks 3YVN 7JRE 8PYD 9KLR, WAs 2MPC 7MKC and WB9CJS. Any recent quickies in your log? . . . *Help!* W4MOX hunts hints on running down overdue pasteboards from DU1RO, HS1AM, VR3T, 9M2RB, VQ9TF; K9KLR likewise re XF4BA '67; WA3DMH ditto on CPs 4DJ 6FG, OY2I, VPs 1DW 2AR 2LF 7ARS 7EF, 9A1B and 9Q5CD. Any 'alp? . . . W2KF, WAs 2MPC 3DMH and KP4DKY announce their availability to serve as QSL aides to distant DX ops. . . . The XYL and I feel we should spend our remaining years traveling and wintering south. My foreign mint postage supply service, now grown into a nearly full-time occupation, is therefore being turned over to friend W2AZX, another avid DXer. - *W2SAW*.

**T**HEREABOUTS - JA3LUK says the JARL Bureau handles some 450,000 QSLs monthly. - *WCDXB*. . . . Afghanistan's QSL bureau, run by our Camel Drivers Radio Club at P.O. Box 279, Kabul, is in its third year. - *YAIRG*. . . . WA8CIA reports receipt of BV2A's QSL for a contact back in March of '68. - *LIDXA*. . . . Save that Pakistan postage; W7DGT has not been active outside Washington state. *W7EA*. . . . Overdue W/Ks, please QSL! - *UA0KQU*. . . . Anyone still needing a QSL for my 1970 3B7DA operation on St. Brandon should write my Vacoas address. I'll reply direct if s.a.e. and International Reply Coupons are supplied. - *3B8DA* via *WA9MAG*, *KP4DIW*, *W1AM*. . . . VE2DCY affirms that the real TL8GL, now active as OD5GX, shut down in July, 1969. - *LIDXA*. . . . I closed my 9G1CO station March 19, 1971, so contacts with such a call thereafter are invalid. - *G3WEQ*. . . . The 917 prefix was used by 9J2s in October, suffixes as usual. E.G., 917XZ equals 912XZ. - *LIDXA*. . . . G3YWP may be able to assist with QSLs for SZ4MO QSOs on 40, 80, and 160 meters in mid-November. Also, F9MS holds logs for operation by FR7ZU/e from November 5 through December 3, 1969; FR7ZU/g on September 16 through November 7, 1970; and FR7ZU/t from April 2 to May 16, 1971. - *DXNS*. . . . QSLs for GB2WGS from W/Ks can go via W9PEM or to my address, others via RSGB or G4AAQ. - *WB9EGG*. . . . Czechoslovakia's OM calls were to revert to the regular OK prefix by the first of January. QSL via the Prague CRC bureau. - *WCDXB*. . . . Interesting to see that DL0FM of Frankfurt issues QSLs patterned after the famous "keystone" cards of Frankford Radio Club, colors reversed. - *G3JKY*. . . . LX1BW reaffirms that cw activity under his call is spurious. Also, autumn Liechtenstein operation by HB9s ALO ALX and YC can be QSLd to their respective home QTHs. - *DXNS*. . . . A photo of LX1BW's station reveals his superb taste. He has my QSL on his wall. - *W2DKM*. . . . Those UA1KAE/7 QSLs in your file possible represent South Shetlands, according to National Geographic Society maps recently published. - *LIDXA*. . . . Reminder: CXs occasionally sign their CV prefix, suffixes the same. QSL CV8CZ to CX8CZ. - *DXNS*. . . . Now some alphabetized individual specifications found in recent mail but be aware that each suggestion is necessarily neither complete, accurate, nor "official." . . .

AP2KS, M. Khalid, P.O. Box 1270, Lahore, W. Pakistan  
 BV2A, J. Chen, P.O. Box 2007, Keelung, Taipei, Taiwan  
 CE3YO, S. Roth (WA3PMS), Santiago-State, Dept. of State, Washington, DC 20521  
 CM2RX, R. Fernandez, P.O. Box 5052, Havana, Cuba

FL8MM, P.O. Box 574, Djibouti, T.F.A.I.  
 HC2PT, Box 3404, Guayaquil, Ecuador  
 HO11E-HP11E-3F11E (via W2GHK)  
 HR1RTS, R. Shaw (WA70JW), U.S. Embassy,  
 Honduras, APO, New York, NY 09887  
 HS2AGJ, R. Curry (W5DG), Box 5763, APO, San  
 Francisco, CA 96330  
 HS3AET, M. Richardson, WBØFAX, 2908 West-  
 over Dr., Wichita, KS 67210  
 JH1CX, P.O. Box 84, CPO, Yokohama, Japan  
 KC4USI, B. Wood, WA7HOR, 13218 Ambaum  
 Blvd., No. 208, Seattle, WA 98146  
 KG4FD, C. Bootsma, Box 33, FPO, New York, NY  
 09593  
 KX6IQ, W. Brown, P.O. Box 693, APO, San  
 Francisco, CA 96355  
 MP4MBL, A. Matheson, G3ZYP, Paradise Wood  
 Cottage, Hartfield, Sussex, England  
 OK1AKO/DL (via K9BNF)  
 VP1SJ, S. Johnson, Cross Head Hotel, Belize, Br.  
 Honduras  
 VR4BM, P.O. Box 400, Honiara, Solomon Islands  
 VR5UX, W. Lambie, Box 36, Tonga Islands  
 W3TCV/4X (via WA3NOS)  
 WA2POX/TF (via WA2JZX)  
 WA6GLD/6Y (via WA6ANN)  
 WB4WQP/VE8, J. Kent, IIT Arctic Svc., Cape  
 Christian, c/o Hangar 9, International Airport,  
 Winnipeg, Canada  
 XU1AA, P.O. Box 484, Phnom-Penh, Khmer  
 Republic  
 XU1VS, Vong, P&T, Phnom-Penh, Khmer Repub-  
 lic  
 XX7s FR1K (to CR7s FR1K or via LREM)  
 YV7IC, P.O. Box 72, Porlamar, Isla de Margarita,  
 Venezuela  
 ZD9s GA GB (via ZS2RM)  
 ZL3PX/VR5 (to VR5FX)  
 5V7GE, G. Edmonds, P.O. Box 2, Bassari, Logo  
 9U5KU, P.O. Box 1198, Bujumbura, Burundi

CR4BK (via W3HNC)	T78AC (via DJ1LP)
DL4LG (to WB9EAK)	TYØABD (via DJ6QT)
EP1JY/am (to JY1)	TZ2AC (to DJ6QT)
ET3USC (to WA4AGT)	VKØMX (via VK5TY)
FG7XF (via W8HGH)	VKØPF (via VK3ATL)
FR7ZQ/g (to FR7ZQ)	VP2DAE (via K3RLY)
FYØGW (to DJ5SM)	VP2LI (via WA9UCF)
FYØKP (to DJ5AY)	VP2VB (via W3HNC)
G5AWE (to WB9EAK)	VP8JT (via ZS6BHK)
GB2WGS (see text)	W19BSA (via K9ECE)
GD3RZI (to G3WJN)	W06BSA (via W6ANN)
HBØAIC (to HB9AIC)	XY2AE (via DJ9KR)
HBØXHI (to DL4WJ)	XX6GA (via WA3HUP)
HBØXHS (to DK3SF)	YJ8XX (via ZL1AM0)
HBØXUA (to DK1UJ)	ZC4EJ (via G3ZGG)
HBØXVN (to DK3ST)	ZC4KJ (via ZC4LC)
HR1KS (see text)	ZF1ZZ (via K4CDZ)
HZ1GM (via G3LQP)	3AØGB (via VF3MR)
IBØCRW (to I1CRW)	JB6AD (via KP4DKY)
IF9cRW (to I1CRW)	3D6AF (via K6KH)
JY9EAC (to SM5EAC)	JE1MN (to HP1MN)
K3CBW/4X (to K3CBW)	4C1QB (to W5QBM)
K4AFB/5T (via K3RLY)	4NØDX (to YU1SJ)
KB6DB (via K3RLY)	5B4IS (to OZ7IS)
KG4EQ (to WA9SXQ)	5V8WS (to DJ6QT)
KY6PMR (via WA6GFF)	SWIAB (via JA2KLT)
MP4MBL (via RSGB)	5X5NK (via DJ3JV)
MP4MPA (via RSGB)	5Z5KA (via G3ZBA)
OMØRZ (to OK2RZ)	6D1AA (via W2GHK)
ON8YD (to I1CRW)	7Q7CY (via K4CDZ)
OY1R (via W2KF)	7Q7LA (via K4CDZ)
PY1DBE (via W3HNC)	9I7XZ (see text)
SP3DOI (via W2KF)	9I2JN (via W2RHK)
TEØA (to I12J)	9L1VW (via W9FHU)
TJ1BA (to 4X4RH)	9V1QJ (via WASUHR)



ZS3KC goes for DX contests in these Swakopmund surroundings. You'll probably hear plenty from Jack's R-100B and TA-33 in the ARRL International DX Competition upcoming next month.

Lots of helpers this trip: Ws 1CW 1SWX 1YL 5BZK, Ks JCUI 3RDT 3YVN 4SD 6SSN 7RIS 8PYD, WAs 1GGN 2KWB 2MPC 3HRV 6OKU 9SXQ, WBs 4QFH 9CIS 9EGG ØFAX, KH6GCY, Columbus Amateur Radio Association *CARAScope* (W8ZCQ), DX *News-Sheet* (G. Watts, 62 Bellmore Rd., Norwich, N.72 T., England), Far East Auxiliary Radio League (M) *News* (KA2LL), Florida DX Club *DX Report* (W4FRO), Japan DX Radio Club *Bulletin* (JASU), Long Island DX Association *DX Bulletin* (K2KGB), Newark News Radio Club *Bulletin* (I. Heien, 3822 Marshall Ct., Bellwood, IL 60104), Nigerian Amateur Radio Society *News* (8N2ABG), North Texas DX Association *Bulletin* (W5SZ), Northern California DX Club *Dyer* (Box 608, Menlo Park, CA 94025), Southern California DX Club *Bulletin* (W6EJJ), UBA's *On the Air* (ONS 4AH 5VA), VFRON's *DXpress* (PAØs FX LOU to VDV WWP), and West Coast *DX Bulletin* (WA6AUD). We can use more!

† † †

#### Whence:

ASIA — W/K/VF QSOs with Cambodia's XU1AA continue few and far between thanks to poor skip and limited operating hours. The multiop station's first two thousand contacts with 82 countries are said to have included only forty Statesiders. — *WCDAB*. . . . FX KR6HR now is on from San Diego. — *W3HNC*. . . . While visiting Israel I found 4X4s BL and VB running 1R-44s, club station 4X4QR using an SBE-34 and four 572Bs into a homebrew quad, 4X4BL's avid homebrewing includes TV receivers. Surrounding areas pour overpowering quantities of short-wave broadcast propaganda into the Middle East. *WA2FDG*. . . . VS6BS is active almost daily at 2300 GMT near 14,200 kHz looking especially for Caribbean contacts. *WB9EGG*. . . . Worked only 41 countries and nine states in my few weeks as HS4APG but found many new friends. — *WA7QFW*. . . . I operate 7- and 14-MHz cw in Thailand after signing DL4s FE RD, F7s BW UR and G5AEF since 1950. — *HS2AGJ* (W5DG). . . . TAs IIB IWA 2AF 2BK and 2FK are all reported in Germany, some signing DI calls. TATHY affirms that amateur radio remains severely frowned upon by Turkey authorities. — *W5QPY*. . . . The real 4S7FC is workable on 40's low cw edge although a pirate sometimes usurps his



SV0WXX, operated by SV0s WEE and WOO, fore and aft, and WSS radiated some 2000 DXCC credits from Crete in September on 40 through 15 meters. The lark was such a DX success the lads may try an early encore or variation. (Photo via W3HMK)

call there. -- W7JLU. . . . WA6ZZK and I carried on a 14,220-kHz QSO running less than two watts at each end. Over here near Tokyo where QRM is king a little courtesy in operating can go a long way. -- KA2AI. . . . Certificate hunters should send s.a.e. with IRCs to DJSCV, our awards manager, for info on CDRU's ARA and 10-CD diplomas. -- Y4IRG. . . . 4X4OC kindly allowed me use of his equipment in Israel last month. -- K3CBW/4X. . . . New or renewed memberships are claimed by KA2s AC (K6OOW), AH (WB2HDS), AI (K4KAI), DW (K5QJG), JJ (KH6IJ), RD (K4UT), SB (WA6RBI), and VL (W3CQP). Ws 6IEU 9KAS, K6YVV, WAs 6JSX and 8EDC are Stateside winners of recently issued KA awards. -- FEARL.

**AFRICA** -- 3PRDA is active daily on 14,040 kHz at 0300-0400 and 1200-1400 GMT or after with 75 watts and a 15-foot-high dipole. Alex has a consistent cw signal from Mauritius and needs only the Dakotas, Montana, Nevada, Utah, and Wyoming for WAS. -- W1AM, K7RLS, WA9MAG. . . . VQ9WES signed off for GI-land in November. -- WA3HGV. . . . TU2DD, foremost 7-MHz DXer among the Abidjan gang, plans to help increase TZ-land's QSO output. -- K2QHT. . . . 7Q7AA kindly loaned ZEICY much equipment for his 7Q7CY venture while I contributed some spare 572Bs and an SB-200. -- WA4JUK. . . . ET3ZU/70 (seven-ocean) may be popular from Kamarin Island early this month. Also we hear that TJ1AW suffered serious injury when the tower he was climbing collapsed on rain-soaked ground. -- WCDXB. . . . Ray of ZD9BM, 14,288 kHz at 0700GMT, renewed his Fristan da Cunha contract for another two-year hitch. ZD9s GA (ex-ZD9BR) and GB hold forth from Gough Isle. CT2AK mailed ten crystals to CR5AJ, one doubling to 14,200 kHz. -- DXNS. . . . An October inspection of 14,100-14,340 kHz in Nigeria showed 79 of those 240 kHz despoiled by nonamateur RTTY intruders. -- SN2ABG, NARS. . . . G4AQI goes to Mauritius with intentions of installing a 28-MHz beacon for world-wide propagation study. -- G3DME, QUAX.

**OCEANIA** -- VR5EX (ZL3PX), active on 20 cw, will extend his activity to other bands during a three-year Tonga tour. -- KH6GCY. . . . Sure was a thrill to see my Model 26 type out ZL2ALW's transmissions for my very first RTTY contact. K6OPG. . . . I was very pleasantly

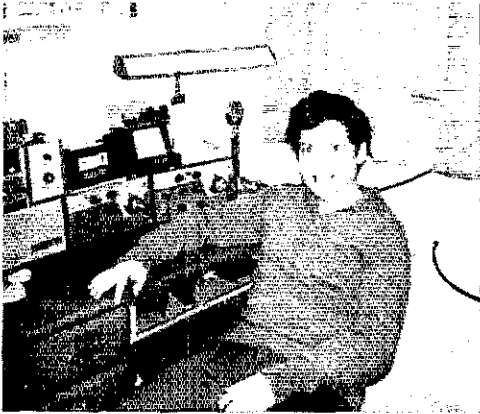
surprised to find my 160-meter cw QSO with W9UZZL logged in Australia by SWL Peter Drew, KST 239 on an indoor loop. W9UZZL was 449 down under, I was running 175 watts to a 220-foot "L." -- W4DFR. . . . NZART will celebrate its 50th anniversary in 1976 and ZLs are already planning for the event. -- ZLITB. . . . I tune the 160-meter band for W/K/VEs on weekends while transmitting with 150 watts between 1876 and 1880 kHz. Very little local noise bothers reception here. -- ZL3OX via W5SBX. . . . XYL KC6YL and I enjoyed 9000 QSOs from Yap before closing down for Texas, including DXCC, WAS, and other certifications. We look forward to resuming contacts with the many good friends we made over our 18-month Carolines stay. Watch for W3FDP/5 and WA7SFA/5. -- KC6WS. . . . VK3TL, formerly of Norfolk Isle, goes to Nauru for a couple of years with DX in mind. -- LIDXA. . . . VR1AA (G3HCL) works 160 through 6 meters and will QSY for 5B-DXCC seekers. Danny previously signed MD1D, ZC1CL, 3A2AE, 9M2LO, and 9M6CL. DXNS. . . . Apparently one station can be assigned both VR1 and KB6 calls on Canton Island. -- WCDXB.

**EUROPE** -- REF's 1971 French Contest results show U.S. telegraphers Ws 2NQ 8VSK 3DKT 0BMM 4EWR 9HE, K4LDR, W8s DSO F1 and WA1CYT our top ten scorers in that order, with VEs 2NV 3CQA 1AE and 2HN 1-2-3-4 for Canada. On phone W9TLU, K2WMG, and W8BDO won, placed and showed as the only Yank voice entrants. VE2s AG AFC, AQS and PK finished in that Canadian mike sequence. W/K cw entries outnumbered phone five to one in this one. -- W1YL. . . . Scandinavian Amateur Radio Teleprinter Group's 1971 World-Wide RTTY Contest ranked U.S.A. entrants W3KV, KH6AG, K6YUI, WAs 3KEG 4KEY 6WGL, Ks 3NS5 4VDM, Ws 6WIS and 4EGY in scoring sequence with VF7JBC top Canadian. W1 BFS, WA2YVK, Ws 5TZB 7RSJ and 0PHY paced other reporting call areas. Keyboard kings by continent are CR6CA, 1IKG, KH6AG, VU2KV, W9DD/HK3, and XE1WJ. -- SM4CMG. . . . OKs 2BHX 3QQ, G3KMA, DJ2CG, SP6TQ, OK2YF, SP5PEK, OH3YL, OK3DT, and DK3SN ran 1st through 10th among the 118 entries in TOPS CW Club's 1970 eighty-meter contest. VO1AW, Ws 1SWX and 8BDO did a 1-2-3 for North America. -- G3IRM. . . . Most enjoyable visit with PA0SPL in Amsterdam where Hans works 15 through 40 almost every evening with his Yaesu and trap vertical. Sent him a used TA-33 on my return home. -- K9YJJ. . . . Many W/Ks calling "CQ no Europe" missed a contact with Monaco. -- 3A0FN (WA4WME). . . . Until I obtain transmitting authorization aboard Navy's USS DuPont I'll tune 15 and 20 for W/Ks while cruising the Mediterranean. -- WB4JHJ. . . . OM Basil, G6OX, is going strong on 20 cw at 70. -- W4YOK. . . . WA2PQX/TF can be found on 14- and 21-MHz code and voice, mostly on 15. WA2JZY. . . . Rhein-Ruhr DX Association invites world-wide s.a.e.-plus-IRC inquiries to my address regarding its RRDKA award. We now have 118 members. -- DJ9NW.

**SOUTH AMERICA** -- WB0CUB/KC4 of Byrd Station says a rhombic is being erected down there with five miles of wire. Somebody may be using it on 40 shortly. -- W5IB. . . . I'll be operating aboard USCGC *Staten Island* and from Antarctica as KC4USI on 14,250-14,350 kHz until about April 1st. -- WA7HOR. . . . Send s.a.e. plus IRCs to me for information on RCV's "Maracay City" certification sponsored by our Maracay DX Club of Twenty members. -- YV4UA. . . . As USAF hamming on Easter winds down CE6CA/0 did his part to keep the island from becoming too rare. -- NTDXA.

**WEREABOUTS** -- All DXers are urged to attend the gala 23rd annual California DX Conference on the 22nd and 23rd of this month in





HB9CK, right, was a strapping teenager when one Guglielmo Marconi, only seven years older, electrified the world with wireless before the turn of this century. Ulisse soon became the Swiss army's first radio instructor, took up amateur radio on retirement 'way back in 1937, and now can be found at ninety almost any Sunday morning working buddies around 3735 kHz. Underscoring how our great game appeals to every age, young WA2HSU, left, earned an Extra ticket last year at fourteen. Alan finds enough time along with studies to climb well up the DX ladder. (Photos via HB9s FE, T, and WA3HUP)

Fresno, VK9NP, ZA5Z, 3B9DK, 3C0AN, and other DX prominents are schedules to appear. Rush registration to Southern California DX Club treasurer WB6UDC. — *W6EJJ*. . . . My brother WN0CTQ broke the DX ice on 15 with CX5AH and KV4EN. I've heard dozens of countries on 80 cw but few venture out of the Extra subband. Did catch OH0AA and ZD8CW, though, and 7-MHz is good for all continents on cw plus a logful of JAs. — *WA0VJP*. . . . After concluding 160-meter DXpeditioning on San Andres about January 7th I hope to operate from the Colombian mainland as an HK1 for a few days. — *W9UCW*. . . . Nearing the 50-country mark on 15 with just a dipole. CT2AZ, EL2NO, ZP1AX, 7Z3AC, and 9F3USA are among rarer items worked. — *WN4UKA*. . . . YL KG4FD is active here with an SB-101 and quad. I work 160 through 10 and will finish my stint with the Marines next month. — *KG4EQ*

(*WA9SXQ*). . . . Now past the 200-confirmed plateau on 80 cw. — *W1SWX*. . . . Ten meters is still good for plenty of DX but skip generally produces weaker signals this year with erratic QSB. — *K3YV*. . . . Just nailed my 100th country with no fellow VP7 heard. Ten came to life in September, 15 is out of its doldrums, 40's a QRM madhouse and 75 occasionally rewarding. DX is still great sport after forty years of hamming! — *K4BZH/VP7*. . . . Our group will hit the ARRL DX Test next month from Grenada with a 500-C and accessories. — *W3VW*. . . . W2DKM files a photo of his QSLs from ARRL DX Century Club members in 100 countries, the 65th "DXCC-squared" on record and No. 5 from Twoland. — *W9BRD*. . . . K4TMA, WB4s SEO WMG and I are planning a Navassa thing for April-May with tandem cw and phone radiations on 10 through 80 meters. — *W4GKF*. [52]

## The Eyes Have It

(Continued from page 68)

though not very much. Fred showed his true worth at this point. He pointed out that in transistors the concentration of impurities was fairly critical, and that a random potato of the type my wife usually buys might have just about any kind of impurities in it.

We really drove the local supermarket managers nuts for a few days, buying one potato out of each lot they had on hand. Sure enough, one Idaho potato (shipped from Colorado, I think) showed a power gain of 7.5 dB — as near as I could figure it, anyway. Well, to make a long story short (and I have to, 'cause we didn't take any notes), we kept cutting down the spacings, keeping the proportions the same like it said in Fred's book on semiconductors, and one night we finally had a little piece left that amplified pretty well at eighty meters. The signal generator drove it to about ten watts input power (or spudput power as Fred called it) and we hooked it to the antenna — natch.

## Success!!

Well, inside of three minutes we'd been checked into five nets and had a message to deliver to a guy on a farm seven miles out of town, so I guess it worked okay. (I also think that signal generator wasn't very stable, either.) We went QRT and slipped upstairs for a cold 807 and to discuss how we'd spend the royalties. When we went back down, our spudistor was gone and Herman, the cat, was sitting on the bench washing his face. The rf must have cooked the potato some; the room smelled kinda good, and old hungry Herman did his bit.

We've been trying now for three months to get another amplifier going. Our XYLS refuse to cook any more potatoes in any form, much less ones with little pieces cut out, and Fred and I are about thirty pounds overweight. Lettuce doesn't seem to amplify at all, so we're out of the experimenting business until I can get back into my blue suit. All the papers are filed though, and here's a chance for hams to pull together, especially skinny ones, and regain their reputations as leaders in the technological experimentation business. [53]

CONDUCTED BY BILL SMITH,\* KØCER

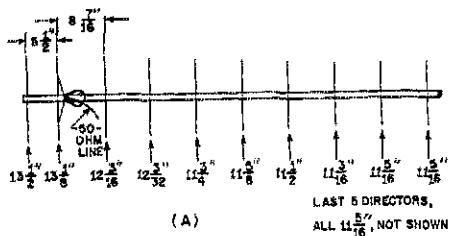
### 15-Element Yagi by WØEYE

FOR YEARS, collinear arrays of various kinds were thought to be the only reliable and easily reproduced arrays for 432 MHz. The extended-expanded version was especially popular, and a consistent winner of early antenna-measuring contests. Ineffective Yagis, both home built and store bought, convinced a good many uhf enthusiasts that Yagis would not perform well this high in frequency. Then, in the early 1960s, Ed Tilton, W1HDQ, Vhf Editor of *QST*, spent untold hours in cut-and-try work with all sorts of antennas for 432. The result was a large aluminum scrap-pile and an 11-element Yagi that worked the way Yagis should.

The "Tilton Yagi" has been widely used. As a single bay, in pairs, and in box configurations of four bays, it has done well in 432-MHz DX work, and demonstrated in numerous antenna parties that it is close to optimum, within the limitations of a 6-foot boom.

The 6-foot dimension was dictated only by practicality, with a lightweight wooden structure in

\* Send reports and correspondence to Bill Smith, KØCER, ARRL, 225 Main St., Newington, CT 06111.

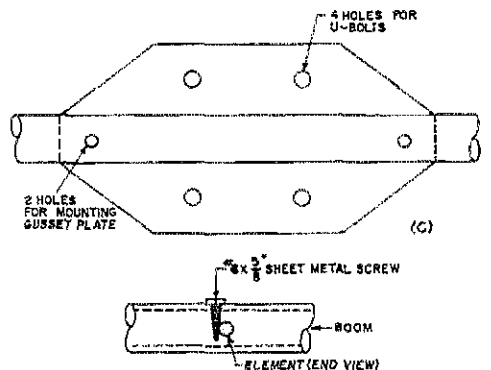
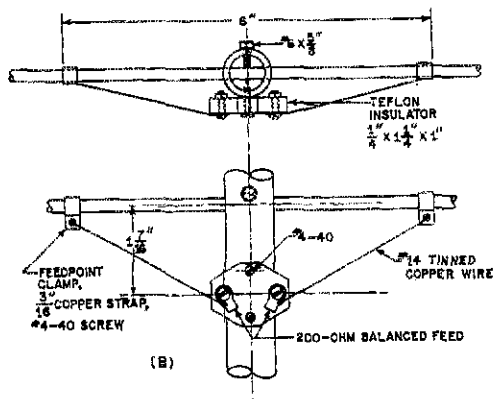


mind. There was never any doubt that a longer bay might be worthwhile in a good many applications. Described here is a 15-element Yagi built and tested thoroughly by Don Hilliard, WØEYE. It is a fine illustration of the statement often made in W1HDQ antenna talks and articles: "There are many ways to build an optimum Yagi." Don's antenna is on a boom 9 feet 9 inches long. Director spacing is uniform throughout. Elements are 3/16-inch tubing or rod, mounted through a 3/4-inch aluminum boom. The feed system is a delta, worked out for direct feed at 200 ohms, through 50-ohm coax and a 4:1 balun.

Measured under carefully controlled conditions, the WØEYE Yagi has shown in excess of 14 dB gain over a reference dipole and a somewhat sharper forward lobe than obtained with the 11-element job. It can be used in stacked pairs, and pairs of pairs, in the same manner as described in *QST* for April, 1966, and in *The Radio Amateur's VHF Manual*, 1968, and later editions. In this connection, at the Central States Vhf Conference this year, Sam Harris, KP4DJN/W1FZJ, suggested that box configurations of long Yagis may produce a forward lobe to sharp for optimum returns from meteors. Sam would like to see vertical stacks a single bay wide used in meteor work on 432.

Fig. 1 — Details of the 15-element WØEYE 15-element Yagi for 432 MHz. Director spacing is uniform throughout. Five forward directors, all the same length, are omitted from (A) for clarity.

Driven-element mounting and feed arrangement are shown in (B). Gusset-plate mounting for the boom is shown in (C). Note method of holding elements in place. Mounting plate dimensions are uncritical.



## Construction

The 116-inch boom of the WØEYE Yagi is 3/4-inch 6061-T6 tubing, 0.078-inch wall thickness. The reflector and forward director are each 1/2 inch in from the ends. The forward five directors, all 11 5/16 inches long, are not shown on the drawing. Director spacing is 8 7/16 inches, center to center, throughout. Other dimensions and element lengths are given in Fig. 1A.

The delta matching arrangement is shown at B. The delta arms are No. 14 fanned wire, soldered to wrap-around clips on the elements, 3 inches each side of center. The lower ends are soldered to lugs bolted to a Teflon block. The elements run through the boom, and are held in place by No. 6 sheet-metal screws, slightly off-set in the boom, so that they bear firmly against the elements, as shown in B and C. The boom is held to the vertical support with two U bolts and an aluminum gusset plate, as seen in the upper portion of Fig. 1C.

The pattern of the 15-element Yagi can be improved slightly and the gain raised by about 0.5 dB by the use of a 3-element reflector, details of which are given in Fig. 2. Additional reflector elements used in this way are not often seen in amateur antennas, but at 432 MHz their use becomes feasible. They may be a useful means of getting more gain, with less in the way of structural problems than would be involved in longer booms or additional bays.

Don presented the details of this antenna at the Central States Vhf Conference last August. Since that time quite a few of them have been erected, in single bays, pairs, and box configurations. All builders are reporting excellent results.

## WAS Boxes

Several months have elapsed since we last published the states-worked boxes. They appear this month, with a considerable number of

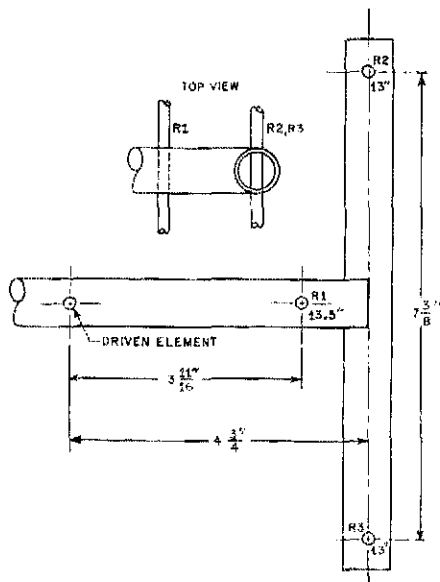


Fig. 2 — Gain of the 15-element Yagi can be increased about 0.5 dB by adding directors above and below the plane of the other elements. Note that the in-line reflector, R1, is spaced closer to the driven element when this is done.

## 50-MHz WAS

1	WØZJB	34	W6RHI	67	KØJJA
2	WØBIV	35	W2MEU	68	K6RNO
3	WØCIS	36	W1CLS	69	W9QWT
4	W5AJG	37	W6PUZ	70	W6EDU
5	W9ZHL	38	W7LL	71	K6VIM
6	W9OCA	39	WØDDX	72	K6GOX
7	W6OB	40	WØDO	73	WØFDM
8	WØINI	41	K9DXT	74	W9ICI
9	W1HDQ	42	W6BAZ	75	WØLLU
10	W5MJD	43	W6ABN	76	W7RT
11	W2IDZ	44	VE3AET	77	W7RDY
12	W1LLL	45	W9JFP	78	W6KIN
13	WØDZM	46	WØQIN	79	W6OKR
14	WØHVV	47	WØWWN	80	K6GMX
15	WØWKB	48	K9FTD	81	W7DYD
16	WØSMI	49	WØFKY	82	K6ZEF
17	WØOGW	50	W8LPD	83	K6HCP
18	W7ERA	51	WØZTW	84	K6YIL
19	W3OJU	52	W6GCG	85	K6GMV
20	W6TMI	53	W2RGV	86	K7BAG
21	K6EDX	54	W1DEI	87	W7ZOW
22	W5SPW	55	W1HOY	88	K7ZPS
23	WØORE	56	W6ANN	89	K6PFT
24	W9ALU	57	W1SUZ	90	K7HKW
25	W8CMS	58	W1AIP	91	W5WAX
26	WØMVG	59	W5IFH	92	WA7FPO
27	WØNNM	60	W6NLZ	93	W6HXK
28	W1VNI	61	W7MAE	94	W6NLT
29	WØOLY	62	W8ESZ	95	K7TCW
30	W7HEA	63	W2BYM	96	K6EJO
31	KØGOG	64	W7ACD	97	W6NLO
32	W7EFF	65	K6PYH	98	K7BBO
33	WØPFT	66	W4HOB	99	K6ZXS

No. 20, 22, 34, 60, 68, 70, 71, 72, 74, and all after 75 are for 50 states. Revised January, 1972.

changes. We note four new leaders in their respective call areas, on three bands. KØMQS leads nationally on 144 MHz by virtue of a November 4 moonbounce contact with K6MYC, his best distance being a similar contact the same day with VE7BQH. WA1MUG leads the first call area on 220 MHz with 15 states worked. K1PXE takes 420 honors with 18 states worked. In the fourth call area, K4QIE squeezed by W4EJ by 70 miles in distance worked on 420. Also appearing this month is the revised 50-MHz WAS box. K6ZXS's certificate was issued November 3 after he finally confirmed *Louisiana*. They're all tough until you have 'em!

It appears there is activity enough on the 1215-MHz band to warrant a 1215 box so we are now accepting listings. As usual, please list the station worked (one for each state) and the farthest mileage worked. We will publish the listings when a dozen or so are received.

Still unanswered is the question to how best list our Canadian friends for WAS purposes. It has been suggested by Ws and VEs alike that we add a column for provinces worked, but the problem here is mechanical in printing. The WAS award is for states worked and I am inclined to leave the boxes as they now are. I do, however, fully appreciate VE concern over not allowing credit for Canadian call areas worked. Their complaint, and I'm certain it is justified, is that some Ws refuse to schedule VEs because no state credit is involved. Distance worked does count, just as in other international communication such as moonbounce.

220- and 420-MHz STANDING

220 MHz

WA1MUG	15	5	450	W2DWJ	16	4	570
W1HDQ	13	5	450	K2CFH	14	7	
K1HX	12	4	600	W2ONS	14	6	525
W1AZK	10	3	375	K2OVS	14		600
K1BFA	10	3	225	K2YCO	12	6	675
				W3RUF	17	7	850
K2LBA	19	7	2650	K31UV	17	5	720
W2DWJ	15	5	740	W3UJC	9	4	400
W3CRS	14	5	600				
K2RTH	13	5	960	K4QIE	21	7	1065
K2DNR	13	5	600	W4EJ	21	7	995
W2SFO	13	5	325	K4LJQ	19	7	800
				W4HJZ	15	5	860
W3UIG	14	5	460	K4SUM	15	5	462
W3RUF	11	6	480	W4VHH	15	4	750
K31UV	11	4	340	K4GL	11	5	720
				K4NTD	9	2	835
K4IXC	5	3	1115	K4IXC	4	2	800
K4GL	4	2	485				
				W5RCI	19	6	880
W5RCI	10	5	910	W5ORH	13	4	700
W5AJG	3	2	1050	W5AIG	7	3	1010
W5LO	2	2	660	W5UKJ	6	2	590
				W5GVE	3	1	365

W6WSO	6	4	1142	W6DQJ	4	2	360
WB6NMT	4	5	2650	W6FZJ	2	2	310
W7CNK	6	3	923	K7ICW	4	2	225
W7TRG	5	3	959	W7JRG	2	2	420
K7ICW	4	2	250				

W8PT	11	6	660	K8DFO	23	7	675
				W8YIO	22	7	650
K9HMB	12	8	1070	K8RLG	21	7	700
				W8HVX	16	8	666
WØEYF	11	5	950	W8CVQ	13	7	625
WØQLP	3	2	923	W8MNT	13	7	600
				K8UCQ	10	6	800
VE2HW	5	2	225	W8ROF	10	6	425
VE3AIB	7	4	450	W88VIG	8	6	625
				K8BBN	7	6	425
				W8FWI	7	4	450

420 MHz

K1PXL	18	7	1210	W9WCD	20	7	825
K1HTV	17	5	610	W9VHV	17	7	780
W1AJR	16	5	680	W9JY	15	6	550
WA1MUG	15	5	740	W9AAG	15	5	800
K3EAVL	14	6	700	W9ANK	13	6	850
K1BFA	13	5	710	K9AAJ	12	5	425
K1HX	12	5	620	K9CNN	12	5	
WA1JTK	11	4	715				
W1HDQ	11	4	380	WØDRL	23	8	1205
W1QVF	10	5	400	WØLCN	13	4	700
				WØLER	12	4	709
K2ACQ	24	8	925	KØTLM	10	5	700
K2CBA	20	8	2670	WØYZS	8	4	650
K2UYH	20	6	840	WØLYE	7	2	702
W2CLL	20	6	790				
K2YDK	18	6	750	VE2HW	6	3	750
WA2HMB	18	6	720	VE3DKW	12	7	940
K2RIW	17	6	812	VE3AIB	9	5	600
WA2FGK	17	6	745	VE3ZC	7	5	510
K2AKO	17	6	740				
W2BLV	17	6	732	VE4MA	2	1	420

I would hope that no W would refuse a VE schedule because he doesn't receive WAS credit. Remember our VE friends are working toward WAS too, and their geographical locations make the award or a top ranking difficult. Consideration would go far toward solving this problem.

Anyone seeking a box listing may be listed so long as his totals equal or better the last listed station in his respective call area. Please submit a list of the stations worked, their locations, and the mileage to the farthest. Some current listings are not complete, missing call areas or mileage. If yours is one of these, please forward the missing information so I can complete your listing.

OVS and Operating News

50-MHz DX activity, judging from the lack of reports, appears to be at a standstill, except possibly for the winter E season yet to begin at this writing.

Hwang Chong-Soo, HM1EA, writes that he is running 70 watts ssb with a homebrew 829B transverter driven by a Hallicrafter SR-150. His ground plane antenna is atop a 5-story apartment building. Hwang, one of South Korea's newest 50-MHz operators, reports recent contacts with many JAs and Okinawa. He is looking for stateside contacts this winter, but the muf will not likely cooperate. Other Korean stations active on six are HM1BO and HL9WI.

Stateside, W5WAX, Oklahoma, says "nothing doing." WA6HXM reported five minor openings during September and October, but says W6FIG heard a KL7 briefly on October 28. WA6LYC reports "nil." K7ICW, Las Vegas, caught two October E openings to 5s but nothing else and K7GSE, Washington, worked Arizona October 7. WØPEP and WAØUPS, Iowa, worked Florida stations on October 9.

144 MHz treated DXers with a fine 3-day tropo opening beginning October 26. The first evening the 2-meter band was open from central Iowa into Texas, Oklahoma, Louisiana, and Mississippi. October 27 the opening stretched from Texas to Ohio as W8KAY was worked by W5SKD and WA5HMK, Houston, over 1100-mile paths. On the third night the Gulf Coast states from Texas to Florida got in on the action. K5PTK, Texas, worked five new states in the 9th and 10th call areas. He also worked east to W4WDH, Georgia. WAØCHK, Mo., worked three new states, adding K5AG1, Ia.; W3WDH, Ga., and W4LSQ, Alabama; to finish working all states east of the Mississippi and 38 worked total. John reports that W5SKD also worked K4GOF, Kentucky, at about 1100 miles.

VE3DSS, Toronto, says tropo was "pretty good" throughout October. Among his contacts was one with WA4ELH, Kentucky, for state number 27. He noted aurora about midnight October 25 but apparently everyone else was in bed.

These six operators are responsible for much activity in the New England area on 432 and 1296. Pictured (l. to r.) are W1GAN, K9AQP/1, W1QXX, K4GGI/1, VE2LI, and W1JOT.



Popular Central American 50-MHz DXers (l. to r.) T12MQ (LU8BF), T12JPL, and T12NA have provided many operators with Costa Rica.



The October Orionids meteor shower apparently was not a producer this year. Reports from the West Coast say little was heard although KØMQS worked W7JRG and VE2DFO on random, and WØ1FR worked VE2DFO and W5SXD. The path to VE2DFO from KØMQS and WØLER is easily workable — especially when good equipment and know-how is put into action. W9IDI is new in Wisconsin with a kilowatt and stacked 13-element Yagis. He will accept schedules. Another new station which will be in much demand is KØWLU, near Sioux Falls, S.D. Bill's kilowatt will soon be ready, but with 40 watts and stacked 11-element Yagis he worked 7 states in October. WA2UDT, N.J., is finding that first m.s. contact difficult in schedules with WØLER and WØMJS, Minneapolis. Stick with it, Bill!

Leonids and Geminids reports were not available at this writing.

Moonbounce is back in the news this month. November 4 was *the* day. KØMQS, Iowa, used his new array of eight 15-element Yagis to work K6MYC and VE7BQH. Dick said signals were the strongest he has heard on EME. VE7BQH reports seven more contacts with SM7BAE, Sweden, and a "bunch" with K6MYC. The contact with KØMQS gave Lionel state number 11 for a fine showing from VE7. Other EME schedules with F8DO and VK3ATN were unsuccessful. John, WØLER, is gathering material for an EME array to be assembled when Minnesota's snow cover leaves. The array will be eight 12-element Yagis.

220-MHz meteor scatter finally produced a contact between WB6NMT and W7JRG after 14 months of schedules. The contact, apparently the first between California and Montana on 220, required 1 hour 38 minutes to complete on a series of short bursts. WB6NMT is also running tropo/m.s. scatter schedules with W7CNK, Washington, and K7HSJ, Oregon. K7BBO, Tacoma, who should have his 220 kilowatt completed now, has been participating in the schedules operating cross-hand on 144. WB6NMT says 220 activity continues to grow in the Bay Area. Tuesday and Thursday are the "big" nights, but contacts are available any evening.

From across the country, K4GGI/1, Mass., has a similar observation, only Sunday, Tuesday, and Friday evenings are the most popular. Lewis says more than a dozen New England stations are regularly active.

Jim, WB8IDD, who publishes the *Mid-Michigan 220 News* is gathering information for a 220 directory similar to that compiled several years ago by ARRL. If you are on 220, Jim would like to know. Contact him at P.O. Box 145, Okemos, MI 48864.

The following notes were taken from Jim's newsletter and the one published by WA6GYD. A number of stations are active in Northern New

Jersey between 220.00 and 220.20 nightly at 9:15 and Sundays at 10 A.M. Among them are WA2JVO, W2BPU, WB2KSZ, WB2BCQ, K2OWR, WB2NTP, WB2LJW, WA2FFB, K2GHU, and WB2CST. WA2JVO runs a 5894 and 44-element array. W2CRS runs a 4X150A and 32-element array. Ike, W2EOS, says several stations expect to become active this winter in the Syracuse area. W9EVD, East St. Louis, is building a 4CX250B amplifier and K9UIM, Olney, Ill., is looking for contacts with his low-power a.m. W4MIB wants information on converting the Hallicrafters HA-2 transverter to 220. K8JNZ and W8CCK, Mich., are both working on equipment. In the Fresno area, WB6ZBX and W6NRO are active with 100-watt converted surplus rigs and K6PKO and WB6QZW are newly on 220. W6BGJ has completed a 5894 ssb rig and is planning an array of four 3-element quads.

K9AQP/1 has designed a 6360/5894 mixer/amplifier which drives a pair of 4CX250Bs. He will provide details to anyone wanting them. Write to Bob at Flavell Road, Groton, MA 01450.

Obviously 220 is getting more activity and I would guess that the recently announced Tempo 220 transceiver will add even more signals to the 220-MHz band.

420-MHz news is scarce this month. WA6HXW, Los Angeles area, has had several contacts into the San Francisco Bay Area, and has worked K7ICW, Las Vegas, over a 235-mile path. That contact was K7ICW's best DX to date on 432. Al is still at work on his kilowatt amplifier and has also been working on antennas. WA6EXV is running schedules with WA6HXW, W6FZJ, and K7ICW over difficult mountain paths with some success.

From Winnipeg, VE4MA continues his series of successful schedules with WØPHJ, Warren, Minn., and KØAWU, Grand Forks, N.D. Andy says VE4AS is now active on 432 running 25 watts and a WØEYE Yagi similar to that described herewith. VE4MA runs some 250 watts output into a 52-element Yagi array. VE4JX has a varactor tripler working and is putting up a new tower and antenna. VE4AP is also working on equipment. Andy says he, W7JRG at Billings, Mont., and WØENC, Rapid City, S.D., find the megawatt radars at Fortuna and Finley, N.D., useful propagation indicators. The Fortuna radar sweeps 432 to 433 MHz, the radar at Finley operates on 429 MHz.



Ray Naughton, VK3ATN, expects to be active once again on 1296 moonbounce this month. Ray's antenna farm includes this 16-foot dish shown during construction. The antenna is made of aluminum and weighs just 120 pounds.



Hwang Chong-Soo, HM1EA, is one of Korea's newest 6-meter men. His ground plane is fed by a 829B transverter. HM1EA's QTH is Seoul, capital of South Korea.

K9AQP/1 has a tip for those trying to put the Motorola T-44 on 432. Bob says the grid drive to the 2C39 tripler can be improved by tuning the hairpin that couples into the 2E26 plate coil. The circuit is apparently self-resonant with the input capacity of the 2C39. The input impedance of the tube is low, so the circuit is obviously low Q, but it is intended to operate on a higher frequency. Low grid drive has been cured in some units by adding a small amount of capacitance from the grid side of the hairpin to ground. A small air or glass-piston trimmer is suitable. Bob says he has improved grid drive by as much as 50 percent in some units.

1296-MHz activity doesn't seem to be lacking from Virginia through New England. K9AQP/1 sent us a list of 27 active stations in Va., Penna., Dela., N.J., N.Y., Mass., and Rhode Island. The 2C39 and 7289 are the most popular transmitting tubes running from 15 to 250 watts output. Three- to five-foot dishes are the most commonly used antennas. I'd be interested in receiving pictures and details on this equipment from you fellows who "know how."

WA6QYR says the San Bernardino Microwave Society has received confirmation on their reception of Apollo 15 signals as the spacecraft orbited the moon in late July. Society members participating in the tracking included K6HJJ, WA6QYR, W6DSL, K8MWA, WA6DPE, and WA6HWV.

K7BBO, Tacoma, has served notice that he and W7QID are after a new 10,000-MHz DX record. Equipment check-out has been done over a 75-mile path.

## Fifty Years of ARRL

A bound 152-page reprint of the gold-edged historical articles which appeared in the 1964 issues of QST is available from the ARRL for two dollars postpaid. Titled Fifty Years of ARRL, the book covers the highlights of ARRL and amateur radio history during the fifty years from 1914 to 1964, and will make a companion piece to the classic 200 Meters and Down, a reprint of which is also available from the ARRL for two dollars.

## 2-METER STANDING

KIABR	35	8	1478	W5HVF	37	10	1285
KIHTV	35	8	1310	W5WAX	35	10	1310
W1AZK	34	8	1412	W5AJG	33	9	1360
K1WH1	31	8	1300	W5UKO	33	9	1290
K1JUG	30	8	1370	K5PTK	29	9	1330
K1WBS	29	8	1300	W5LO	29	7	1325
W1VTU	29	8	1296				
K1BKK	28	7	1275	W6GDO	18	5	1326
K1PXF	26	7	1140	W6WSO	16	4	1390
W1JSM	25	7	1100	K6HAA	13	4	1380
W1HDQ	24	7	1040	K6JYO	13	4	1240
K1RJH	22	7	1450	K6HMS	11	4	1258
WA1FFO	20	7	1325				
K1MTJ	20	7	1225	W7JRG	27	6	1320
WA1MUG	19	5	-	K7NH	25	5	1290
W1MX	18	6	850	K7CW	18	4	1278
K1JIX	18	6	800	K7VTM	10	6	950
W2NLY	37	8	1300	W8PT	41	9	1260
W2CXY	37	8	1360	K8AXU	38	8	1275
W2QR1	37	8	1320	K2ZAT/8	36	9	1310
W2AZL	36	8	1380	W8IDU	36	8	1150
W2BLV	36	8	1150	W8YIO	36	8	1100
K2RTH	34	8	1215	W8IDT	36	8	1150
WA2EGK	33	8	1340	K8DEO	35	8	1200
W2CUX	33	8	1334	W8NOH	31	8	1165
WB2WLK	32	8	1080	W8TU	24	8	1000
WA2CJK	31	8	1160	K8ZES	22	8	675
W2CRS	30	8	1270				
K2CEH	27	8	1200	K9SGD	42	9	1300
K2DNR	25	7	1200	WA9D0T	41	9	1303
WB2SH	25	6	1000	W9AAG	41	9	1200
WA2LMB	23	8	1335	K9AAJ	41	9	1200
W2CNS	23	8	1150	E9UIE	41	9	1150
K2BWK	23	7	1350	W9YYF	40	9	1050
W2DWJ	23	6	860	W9BRN	36	9	1260
WB2YQU	22	6	850	W9PBP	34	8	820
WA2PMW	21	6	1000				
WB2FXR	21	6	915	K0MOS	45	10	1605
K2YCO	21	7	750	W0BFB	45	10	1380
				W0NKF	45	10	1369
W3RUE	36	8	1250	W0LER	44	9	1440
W3RWH	35	8	1335	W0DOY	41	9	1300
W3BHG	32	8	1260	W0LFE	40	9	1100
W3GKP	32	8	1108	WA0CHK	38	9	1120
W3BDP	29	8	1225	W0EYT	35	9	1380
K3CFY	27	7	950	W0ENC	35	9	1360
W3LNA	26	8	-	W0EMS	34	10	1320
K3CFA	25	8	1200	K0CER	33	9	1276
W3HB	23	8	1310	W0LCN	33	9	1100
W3TFA	21	8	1342	W0RLI	30	9	-
K3GBU	21	7	930	W0DRL	27	9	1295
W3ZD	20	7	850				
W31MZ	19	7	975	VE1AUC	7	2	500
				VE2DIQ	30	8	1420
K4GL	39	9	1270	VE2BZD	23	7	1309
W4HJQ	39	9	1150	VE2HW	15	6	800
W4WNH	38	9	1350	VE2ASO	37	8	1290
W4HHK	38	9	1280	VE3BQN	37	8	1250
K4LJQ	37	8	1125	VE3E2C	33	8	1283
K4FXC	36	8	1403	VE3AB	29	8	1340
W4VHH	36	8	1100	VE3DSS	27	8	1200
W4CKB	35	8	1440	VE3CWT	27	7	1072
K4QH	35	8	1225	VE3FVW	25	8	1100
W4FJ	34	8	1150	VE3EMS	24	8	1100
W4AWS	29	8	1350	VE3DSQ	23	8	-
				VE7BOH	11	3	4800
W5UGO	43	10	1398				
W5ORH	42	10	1507	VK3ATN	3		10417
W5RC1	42	9	1289	ZL1AZR	2		11055
K5WXZ	38	10	1450	SM7BAE	1		11055

The figures after each call refer to states, call areas, and mileage of best DX. Revised January, 1972.

Use your Zip code when writing ARRL.

# YL news and Views

CONDUCTED BY LOUISE RAMSEY MOREAU,\* WB6BBO

## Novice - Agony and Ecstasy

OUR NOVICE experience, like most apprenticeships, can be best remembered as both agony and ecstasy, for we seem to live in two extremes as we get started on the air. Afterwards, it is fun to remember and talk about when a few of us get together over the coffee cups or at club meetings. We laugh about the blunders we made and are eager to tell all the things we would have never admitted while we were Novices.

Novice is really the learner's permit in amateur radio, and we have much to learn besides the material that is necessary to upgrade into a higher class license. We learn first that the amateur fraternity are really very generous people; that they go out of their way to help us, answer our questions and, when we have received our call, to get set up and on the air. They advise us of code and theory classes, and we are often surprised to find that they have been listening to us, and telephone or drop in to tell us about a mistake that we are making in procedures, and how to correct it. And we learn too that when we attend our first YL club meeting we are welcomed as warmly as the gal with 25 or 30 years of experience on the air.

It is all so exciting in the beginning. We sweat out that 5 wpm and those questions just as painfully as if it were Extra Class, maybe even more because this is the first step on the road. The seeming eternity of waiting for the license has all the neighbors wondering why we look so eagerly for the postman every day. We mystify our friends by suddenly switching our conversation to topics they have never heard before, and using new expressions and words that sound exactly like alphabet soup. We startle them by referring to their

kitchen radio as a receiver, or gabble excitedly about "working" someone, or getting all "loaded." They are shocked to find us hanging out the third-floor window fishing for antenna leads with the crooked handle of an umbrella, or wandering around with a fluorescent light globe in the back yard.

The ecstasy begins when we go on the air for the first time and are able to send that CQ that we have practiced for so long on the code oscillator and proudly sign our call. Our mood goes right back to agony when we not only don't get an answer but we fill page after page in the log calling everyone that we hear with no answers. Then we discover that the rig does work and that the awful truth is that we had been tuning the receiver to an image and not the fundamental of our crystals.

The first contact is also both agony and ecstasy. A station does come back nearly blowing the tubes out of our receiver and bongo! - every vestige of code disappears and our hand is doing an oscillating shimmy on the key that would make a whirling dervish turn green with envy. We sign shakily, sink into the depths of humiliation, and are sure that we are and always will be a total failure.

The ecstasy builds from there on. We learn, slowly, the art of rag chewing and the pleasure of being able actually to talk to someone with more than just the two transmission signal and inventory contacts, and as we chat the speed builds. We discover DX on 15 meters and the sweet taste of meeting someone in another country. We meet the high tension and the excitement of contest operation in the Novice Round Up and discover the pride of certificate hunting when the blue RCC becomes our first one.

Novice is a misery of silly mistakes and blunders when everything is strange and new and unfamiliar, and it is the delightful discovery of higher grade amateurs who, remembering their own

\* YL Editor, QST. Please send all news notes to WB6BBO's home address: 1036 East Boston St., Altadena, CA 91001.

MINOW Net members at Walla Walla. Front row (l. to r.): K7MFS, WA7DXI, W7GX1, WA7KHB, WA7LOQ. Second row: W7WLX, WA7FRM, WA7BDD, K7PVG, W7LXQ, K7MRX, K7TWQ, WA7IRD, W7FDE, WB6FRE, K7UBC. (Photo courtesy WB6NWX)





1972 YLRL President, Mae Hipp, K7QGO (center), at the YL booth at the Sierra Hamfest with K7KCY, Barbara (left), and K7YVN, Faye (right).

experiences along that road, are there to help them by letting them know that no one is alone in amateur radio, that there is always someone to give a helping hand.

### 1971 Howdy Days Results

The winner, K5YIB, Barbie Houston; YLRL Member scores: K5YIB, 82; K4RHU, 75; WA7FLC, 50; W4WHR/1, 42; WA2GPT, 40; WA0MVO, 39; WA8KMT, 33; VE4ST, 31; K6KCI, 29; WA8VXE, 27; YV5CKR, 25; WB2JCE, 24; G8LY, 16; K8ITE, 14; Non-member: VE1AMB, 25.

K7QGO was the Contest Custodian. Congratulations to the winner K5YIB, and the non-member winner who automatically receives the prize in that category. The participation of G8YL and YV5CKR added the DX flavor to this YLRL activity of getting acquainted with other gals and made it into a contest at the same time.

### YLRL Permanent Activities

In the 33 years since YLRL was organized, this world-wide organization has established two permanent projects for the benefit of women amateur radio operators.

The "Adoptee" program makes it possible for DX YLs to become members of the club without the involved red tape of foreign exchange that is necessary for the payment of dues from countries outside the United States. YLRL members, or affiliated clubs in this country, "adopt" or sponsor DX women as members. The sponsor must, of course, be a member of YLRL and the club must be affiliated with the organization.

"Tape Topics" is the activity of taping YL Harmonics and other YL news, such as material from this column, for distribution to blind YLs. This service is available to any sightless YL amateur radio operator in this country.

The women in charge of these two services are: Adoptee Program, Verda Siebenthaler, K7UBC, YLRL International Membership Chairman.

Tape Topics: Eastern Librarian, Dot Baumgardner, WA8IJW; and Western Librarian, Raj Cauthers, K7NZO.

### ARRL Headquarters Lady "Hams"

Ramona, Lil, Jean, and Ellen are the gals at ARRL Headquarters who hold amateur radio licenses. Ramona, WN1OGW, of the Communications Department, is the person who digs into the supplies when we request them and sees to it that they get to us. She is the daughter of Perry Williams, W1UED.

Lilianna Vitols spends her working hours in the Technical Department as secretary, and her off hours on the air as WN1OYD.

W1CKK is Jean DeMaw of the Circulation Department. A long-time ham, she is the wife of Doug DeMaw, Technical Editor of QST.

Ellen White, Deputy Communications Manager, worked her way through four calls before she received that distinctive W1YL.

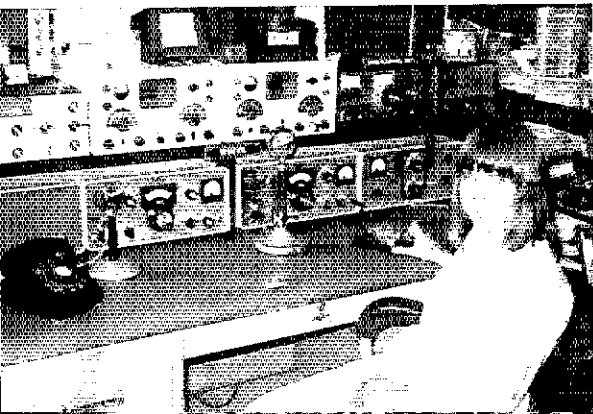
### YLRC of LA 25th Anniversary

The largest club of licensed YLs, and the second oldest in the United States, YLRC of Los Angeles, celebrated a Silver Anniversary in October, 1971.

Organized by W6TDL, Clara Dishong, the aims of the club are to stimulate interest, promote the progress of women in amateur radio, and cooperate with YLRL. The first year, members assisted in revising and rewriting the YLRL constitution, recommended a new format and publication of YL Harmonics, and brought the YLRL Scrapbook up to date following the war years.

By the second year the membership had become so wide spread that it was found convenient to hold meetings at a more central location. They later joined the Los Angeles Council of Radio Clubs and the Disaster Corps organized by the Chamber of Commerce. Their handling of the program for women at the ARRL Southwestern Division Convention in 1948 was so well done that the club has automatically been chosen to do the job at all succeeding Division Conventions.

And 1948 also saw the first annual "Leap Year" contest suggested by W6NAZ for YLRL



Kathleen Sara Carroll, WN1PGG, is a Novice at the age of 10 and is now studying for her Technician Class license. She is the daughter of W1UYL. (W1UYL photo)





members and OM operators. This has grown into the annual YL-OM contest. In 1948 the present YLRL "Adoptee" Program began with the YLRC-LA decision to send *Harmonics* to YLs in foreign countries with G2YL and OK1MI as the first DX YLs to be so sponsored.

It was the Los Angeles club which, in 1949, formally requested then *QST* Editor Budlong to include YL affairs in the publication.

They have assisted 400 orphaned children in Japan, handled traffic during forest fires, provided 24-hour operation for the ninth plenary session of CCIR at KoUSA, and one of the members, W6NZP, Evelyn Scott, was the first YL to operate from Antarctica.

This closely knit club that literally "took a dare" to sponsor the first YLRL International Convention in 1955, will again be the "crew" this year when the world-wide membership of YLRL "Joins the YL Crew in '72" at the sixth of these quadrennial events on May 26-28, in Long Beach, California.

#### Clara Dishong, W6TDL


She was licensed in 1940, and was barely getting her feet wet in radio when World War 2 stopped all operating for a few years. After amateur privileges were restored she was very busy on 10 meters handling traffic for servicemen in the Pacific, mainly in Guam, Okinawa, and Aleutian Alaska. Because of the hundreds of messages she handled between service men in Guam and their homes, Clara was awarded honorary membership in the Guam Radio League, a distinction that was given to only twelve civilians. Clara was the only YL to be so honored.

The communications angle of amateur radio has always been her main interest - influenced, no doubt, by her earlier experience with Western Union, as well as Sunkist, Los Angeles, as a simplex and teletype operator.

In 1946, as YLRL 6th DC, Clara decided that the easiest way to get news of the girls in her district was to organize a club. So, since she wanted to be sure that no one was overlooked, she sent a letter to every feminine-sounding name in the Sixth Call Area. As a result of her effort the YLRC of Los Angeles was organized.

She is active on 80 meters and the Working Girls' Nets

#### Feedback

On page 102, July *QST*, YL-OM Contest results, 111AGA is incorrectly listed as 11AGA, under the OM Phone Scores. 

## Silent Keys

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

- W1ADW, Joseph F. Feeley, Danbury, CT  
 W1BE, Louis Schweitzer, Norwalk, CT  
 K1CMS, Eustis B. Grimes, Swampscott, MA  
 W1EFL, Herman C. Ellis, Jr., Everett, MA  
 K1GSO, Edwin P. Leonard, III, Duxbury, MA  
 WA1KFP, Roy A. Rayner, Buzzards Bay, MA  
 WN1NDP, Edward N. Mulcahy, Randolph, MA  
 WA1OJA, Max E. Luose, Woodmont, CT  
 W1RJB, Earl L. Bartlett, Nantucket, MA  
 K1UKP, Harold A. "Bud" Strout, Brighton, MA  
 W2BGH, Louis Martin, Port Jefferson, NY  
 WA2CLD, Carl W. Dalton, Maple Shade, NJ  
 W2NOQ, Wallace Manning, Watertown, NY  
 WB2QPP, Mary L. Webb, Yonkers, NY  
 W2LXA, Paul R. Donopria, Selden, NY  
 W3KKW, David W. Steckler, Lancaster, PA  
 W3NYT, Harry J. Segerest, Hatfield, PA  
 W4ALM, Arthur L. Binford, Memphis, TN  
 W4ECM, Ballard S. Edgar, DeBunak Springs, FL  
 K4JIS, Ernest A. Summerville, Sr., Norfolk, VA  
 WB4JLR, Paul H. Smith, Pinellas Park, FL  
 W4QD, Lewis F. Gifford, Pensacola, FL  
 W4PAK, Frederick D. Hackworth, Chesapeake, VA  
 W4TBY, Thomas S. Kenna, Neptune Beach, FL  
 W4WTL, John P. Argo, Memphis, TN  
 K4ZSS, Bertha I. Millaway, Burlington, NC  
 K5AAS, Thomas D. Warden, Lubbock, TX  
 W5AQK, E. Holland Henderson, Concan, TX  
 W5CN, Msgr. James F. Burnes, Dallas, TX  
 K5GTZ, Dewey R. Sutt, Sitsbee, TX  
 W5JSQ, Raymond L. Ransome, Houston, TX  
 WA5NOA, Robert J. Boucher, Waco, TX  
 W6ABU, Edward P. Strople, San Diego, CA  
 WA6QCS, Martha H. Meehan, Santee, CA  
 WB6CR1, Don C. Shurtz, Fair Oaks, CA  
 WA6DLK, Michael P. Topoll, Santa Clara, CA  
 WA6FXN, John Q. Adams, San Diego, CA  
 WA6LRE, Donald W. Zimmerman, Morro Bay, CA  
 W6VY, Millard C. Wyse, Burbank, CA  
 K6YA, Hugh E. McKee, Los Altos, CA  
 W7EBG, Frank E. Shopen, Phoenix, AZ  
 WA7OFY, Billy J. Crye, Las Vegas, NV  
 W7VCY, Roger M. Zinkan, Rawlins, WY  
 EX-8CKI, George C. Hale, Birmingham, MI  
 W8DLP, Howard R. Harbeson, Nottawa, MI  
 K8DUT, Harold A. Reams, Elyria, OH  
 W8BNC, Charles L. Wood, Grafton, WV  
 WA8LUO, Edward L. Malenfant, St. Clair Shores, MI  
 W8SOF, John J. Bartlett, Owosso, MI  
 W8ZQW, Walter W. Miller, Allegan, MI  
 WN9BBR, Gerald W. Waldrop, Ft. Wayne, IN  
 WA9GTY, Rolland C. Hollinger, Fort Wayne, IN  
 K9RUU, Richard L. Fountain, Rockford, IL  
 K9SDA, Ellis J. Kemp, Sr., Alton, IL  
 W9UUU, William L. Gaskins, Terre Haute, IN  
 K9WMA, Harvey, W. P. James, Rockford, IL  
 W0KSP/EX-W6DCH, Byron M. Boyce, Omaha, NE  
 W0KFM, James W. Lowman, Fairfax, IA  
 VE1HR, G. Roy Ford, New Glasgow, NS  
 VE1XG, H. M. "Moe" Smith, Sackville, NB  
 VE3FA, Elmer E. Mock, Galt, ON  
 VE6AOK, Albert G. E. Kelly, Edmonton, AB  
 VE6HC, Thomas E. McNabb, Forestburg, AB  
 VE6VW, Earl H. Nessel, St. Albert, AB  
 VE7AC, Reginald K. Town, Winfield, BC  
 VE7ALW, M. A. Wilson, Vancouver, BC  
 VE7NH, L. E. Cuff, Victoria, BC  
 G2NH, Ernie A. Dedman, New Malden, Surrey, England  
 G2NN, Frederick Crocker, Twickenham, Middlesex, England  
 G2ZG, W. J. Badman, Weston-Super-Mare, Somerset, England

#### Feedback

Apologies to Colonel Frank J. Shannon, Sr., K4GT, incorrectly listed in the Silent Keys column in December *QST*, but, happily, very much alive.

# Operating News

GEORGE HART, WINJM  
*Communications Manager*  
ELLEN WHITE, W1YL  
*Deputy Communications Mgr.*  
ROBERT L. WHITE, W1CW; DXCC  
GERALD PINARD, *Training Aids*  
ALBERT M. NOONE, W1KQM; *Contests*

**Class Instruction.** In almost every mail, and often over the telephone, we receive requests from someone asking where they can get instruction toward acquiring an amateur license or an advanced grade of same. Headquarters for years has kept a card file of clubs who conduct regular courses in code and/or theory, and this card file has assisted many an inquirer in his quest. But all too often, upon receipt of an inquiry, it was found that "the cupboard was bare." Yet we suspect that there are many clubs and individuals who give instruction or are willing to do so that we don't know about.

This subject comes from the plains of Kansas, where the Wichita Amateur Radio Club has done some exploratory work along amateur radio instructional lines and has made a formal proposal to the Midwest Division director for the creation of a "corps of instructors" as part of the ARRL field organization. The matter is now in the hands of the headquarters for appraisal and preliminary exploration.

We think the idea has possibilities. As many of you know, headquarters already makes available a brochure specifically for the benefit of anyone who wishes to conduct classes or set up a program of instruction toward the acquisition of an amateur license or a higher grade of same. It is called "Licensing Classes" and was written by Bill Welsh, W6DDB, who has made something of a name for himself in the educational field. This brochure is available for the asking from headquarters. (We would appreciate a 10 x 13 s.a.s.e. \$1 postage if

you're in a hurry, or 28 cents if you can wait for third class delivery.)

Your League has been active in the field of class instruction since the post-WWII reactivation, it was then that the Training Aids section was formed as a branch of the Communications Department and stocked with surplus military films, film strips and code training equipment. George Grammer wrote his *Course in Radio Fundamentals* - now being revised, by the way, Paley or Edison awards were won by W9BSP, W2JIO, and W6DDB, all in the field of education. The subject has not been neglected - not by a long shot.

But this doesn't mean nothing further can be done. The idea of an ARRL Instructor's Corps has definite possibilities if it is widely supported. Does your club do anything along these lines? If so, how about writing and telling us about it, if you haven't already done so. Some time this month (January), the ARRL Communications Department will be bulletining all affiliated clubs and enclosing the annual questionnaire form. This year, it will contain some questions regarding your training program, personnel and facilities. We hope you'll execute this part of the form extra carefully, and if you do not now conduct such a program, give some thought to the possibility of doing so.

How about yourself personally? Are you interested in setting up a training program, with yourself as instructor, either by yourself or in conjunction with another local amateur or two? Maybe it's worth thinking about, eh? If you should

From left to right elected section officials as photographed recently by Communications Mgr. W1NJM: WA4GLS, SCM Tennessee; W5LR, SCM Northern Texas; W0DM, SCM North Dakota; W1ALP, SCM Eastern Massachusetts.



# DX CENTURY CLUB AWARDS

Radiotelephone listings follow the general-type "New Member" and "Endorsement" listings.

October 1-31, 1971

## New Members

JA1WPX	203	PY4KB	142	FA2IA	119	UKSMAG	110	HA6KNB	106	K5TYT	101
K4UVH	184	VE3RIV	141	W8LNL	119	VE3GUS	110	HK0BKX	106	UK5IA1	101
JH1ELG	166	I2CZO	134	K9NBH	118	VF4ZM	110	JA8CDT	106	UW0AJ	101
W6OK	160	SM4DHF	133	K8SMC	116	K4ZDK/5	109	UK8IAA	106	UKSKAA	100
JA2EDG	152	WA2YJN	128	DK3SN	114	4X4YM	107	VR2FO	105	WA1EOT	100
YV5CUU	145	W9YDX	127	JA2AN	113	FR8AO	106	JA2AHR	104	WB2IWH	100
WA4KJR	144	SM5CPC	123	JA1CMC	111	K2FDQ	106	UA9GE	104	WB4IYB	100
K9BWO	143	5Z4LS	120					K4SGI	102	W5MDP	100

FA6AI	210	YV5CUU	142	W9YDX	122	PY4KR	117	3BRUZ	109	WIKSN	102
K2DNL	177	IA7ZF	133	XL1CI	121	FSHN	112	DL1CI	108	WB2JSJ	102
HCMA	166	W6OK	131	W5LUF	120	K8SMC	111	K8EMK	106	KP4DIW	100
9G1GT	166	PY2ATV	128	EL2CH	118	DK3MA	109	E33NN	105	WB2RIK/VE1	100
HK4BPD	148	GM3VEY	124	JH1FG	117	HP1ONT	109	W4RFV	104		100
OE3KRA	144	W4RTE	123			K5ZDK/5	109	WA9ZET	103	WA0NYU	100

## Endorsements

In the endorsement listings shown, totals from 120 through the 249 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.

WSQK	335	W8DCH	300	W4ORJ	270	SM6CVX	220	WA3JZR	180	WB4MA1	140
W5JWM	330	JA AG	300	W6CDE	270	VG1HU	220	W4YKH	180	W5IB	140
F3YR	325	JA7AD	300	W9KOD	270	W2DJ	220	W8MJE	180	W5PAQ	140
K6RN	320	OH2BC	300	K2SHU	260	W4AST	220	W9FPZ	180	WA55UF	140
F9RM	315	OH2RR	300	WA3RSQ	260	WA4YVO	220	J1LAV	160	WA6TAX	140
OH5OQ	315	JA1OC A	290	W4DUO	260	WB4GPI	220	K4PEK	160	F5HN	120
OZ3Y	315	JA8ZQ	290	PY5A1L	250	W6HQN	220	KP4DIW	160	G3RWF	120
W1MM	315	K1OZR	290	W4UQ	250	W0HJ	220	OZ1AJ	160	K3TVE	120
W2QK	315	K4RTA	290	W8CFG	250	JA3BTR	200	SM6ARH	160	K4TQJ	120
W6CUF	315	OH5VY	290	JA1BHM	240	K3SEW	200	W2H D	160	K6UTW/5	120
W8JO	315	W9TKR	290	JA0AZE	240	K5GLZ	200	WB2RJI	160	K6BLU	120
W9ROM	315	K1KNQ	280	K0DYM	240	W3BBO	220	WA3HRV	160	K6PO	120
W1FTX	310	K4FEK	280	VF2YY	240	W5QBM	200	W4NG	160	WA1JWQ	120
W2MUM	310	OH2BAD	280	W1LHT	240	W7PI Z	200	W4OZF	160	W3NQC	120
YV5HZ	310	YD1AG	280	W1QUS	240	WA9WXL	200	IARXC	140	WA3NNA	120
W9DH	305	K1CEF	270	W4BKP	240	ZP5KA	200	K6IR	140	W5BKZ	120
W0SMV	305	K5LIW	270	W4JD	240	K4LD	180	K8JN	140	W6PNO	120
ZL1AJU	305	VE3IR	270	K51FG	220	K9ZPJ	180	VF3HHZ	140	W5UNF/6	120
WB2YOH	300	WB2PCM	270	K8C MO	220	OL5LX	180	W3LC	140	WB6UNS	120
										WA9MAC	120

EA2HX	315	K4RTA	290	OH2BR	270	W2IOZ	220	K4UVH	180	E9BWO	140
F9RM	315	SM0A1N	290	W6CDE	270	W4AST	220	KC6WS	180	KR6I Y	140
W2QK	310	W6GRV	290	W3COR	270	WB4GPI	220	VF3JR	180	WB2WQJ	140
W9TKD	305	W8JO	290	W9DHF	270	W8YEK	220	W9I AX	180	WA6TAX	140
YV4JO	305	JA1OC A	280	K2SHU	260	NE1J	220	ZP5KA	180	C117W	120
EA7GF	300	K8GQG	280	YF7NH	260	H8TABU	200	HK4TA	160	K3TVE	120
G3UML	300	OH5VY	280	W2ESC	260	K4FEK	200	K9I UX	160	K4BNC	120
I2IAG	300	YD1AG	280	W2PDB	260	K25FN	200	OZ1AJ	160	K0DRN	120
IF9GAI	300	DL6NX	270	W3LJ	260	WA1KYW	200	VI2DJR	160	VE2AYL	120
K1LHT	300	EA7IR	270	W7FKM	260	W2RAD	200	WB2I ZU	160	WA9LPM	120
KH6BB	300	K1KNQ	270	WA7GJK	260	W4FOD	200	W3YHR	160	W6CTG	120
W2FXA	300	K1OZR	270	W8CFG	250	W5QBM	200	WA3JZR	160	W7BRU	120
W6PTS	300	OH2BAD	270	W4BKP	240	JA9BMG	180	WA0RRJ	160	W8MFF	120
IS1DJ	290			K8C MO	220			K6IR	140		

## DXCC Notes

Previous advice and information concerning Rockall had indicated that the island could be considered as a separate country, under the criteria used for country-status considerations (Feb. 1969 QST, page 88). Advice just received now indicates that Rockall would be considered as part of Scotland, for DXCC purposes.

## WIAW FALL-WINTER SCHEDULE (Oct. 31, 1971-April 30, 1972)

The Maxin Memorial Station welcomes visitors. Operating-visiting hours are Monday through Friday 1 P.M.-1 A.M. EST, Saturday 7 P.M.-1:00 A.M. EST and Sunday 3 P.M.-11:00 P.M. EST. 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 on Nov. 25, Dec. 24-25, Dec. 31, 1971; Jan. 1, Feb. 21, Mar. 31, 1972. Please note that all times-days are in GMT. Specific operating frequencies are approximate and indicate general operating periods.

GMT	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
0000								
0030	←	CODE PRACTICE DAILY <sup>1</sup> 10-13-15 wpm						
0100		←	CW BULLETIN <sup>2</sup>					
0120-0130 <sup>4</sup>			3.7 Novice <sup>3</sup>	14.020	7.020	7.15 Novice <sup>3</sup>	3.520	
0130-0200			3.7 Novice <sup>3</sup>	14.100	7.050	7.15 Novice <sup>3</sup>	3.555	
0200	←			PHONE BULLETIN <sup>2</sup>				
0205-0230 <sup>4</sup>			3.820	50.120	145.588	1.820	21.270	
0230	←	CODE PRACTICE DAILY <sup>1</sup> (35-15 wpm TThSat, 5-25 wpm MWF5n)						
0330-0400 <sup>1</sup>			3.555		1.805		3.555	
0400	RTTY Bulletin <sup>3</sup>			RTTY BULLETIN <sup>3</sup>				
0430	Phone Bulletin <sup>2</sup>			PHONE BULLETIN <sup>2</sup>				
0435-0500 <sup>4</sup>			7.220	3.820	7.220	3.820	7.220	
0500	CW Bulletin <sup>1</sup>			CW BULLETIN <sup>1</sup>				
0520-0530 <sup>4</sup>			3.7 Novice <sup>3</sup>	7.020	3.945	7.15 Novice <sup>3</sup>	3.520	
0530-0500			3.7 Novice <sup>3</sup>	7.050	3.945	7.15 Novice <sup>3</sup>	3.555	
1400			CODE PRACTICE <sup>1</sup> (5-25 wpm MWF, 35-15 TTh)					
1800-1900		21.28 CW <sup>2</sup>	21.28 8SB <sup>3</sup>	21.28 CW <sup>2</sup>	21.28 8SB <sup>3</sup>	21.28 CW <sup>2</sup>		
1900-2000		14.250	14.050	14.250	14.050	14.250		
2000-2100		7.080	7.255	14.095 RTTY <sup>3</sup>	7.255	7.080		
2100-2130		21.28 8SB <sup>3</sup>	21.28 CW <sup>2</sup>	21.28 8SB <sup>3</sup>	21.28 CW <sup>2</sup>	21.28 8SB <sup>3</sup>		
2130			CW Bulletin <sup>1</sup>		CW Bulletin <sup>1</sup>			
2200-2230		7.150 Novice <sup>3</sup>	21.125 Novice <sup>3</sup>	7.150 Novice <sup>3</sup>	21.125 Novice <sup>3</sup>	7.150 Novice <sup>3</sup>		
2230			RTTY Bulletin <sup>3</sup>		RTTY Bulletin <sup>3</sup>			
2300			CPN <sup>4</sup>	7.095 RTTY <sup>3</sup>	14.095 RTTY <sup>3</sup>	CPN <sup>4</sup>		
2345			CSN <sup>4</sup>		CSN <sup>4</sup>			

<sup>1</sup> CW Bulletins (18 wpm) and code practice on 1,805 3.52 7.02 14.02 21.02 28.02 50.02 and 145.588 MHz.  
<sup>2</sup> Phone Bulletins on 1.82 3.82 7.22 14.22 21.27 28.52 50.12 and 145.588 MHz.  
<sup>3</sup> RTTY Bulletins sent at 850-Hertz shift, repeated with 170-Hertz shift; frequencies 3.625 7.095 14.095 21.095 and 28.095 MHz.  
<sup>4</sup> Starting time approximate. Operating period follows conclusion of bulletin or code practice.  
<sup>5</sup> WIAW will tune the indicated bands for novice calls, returning the call on the frequency on which called.  
<sup>6</sup> Participation in section traffic nets.  
<sup>7</sup> Operation will be on one of the following frequencies: 21.02, 21.08, 28.02 MHz.  
<sup>8</sup> Operation will be on one of the following frequencies: 21.270, 21.410, 28.520 MHz.  
 Maintenance Staff: W1s Q1S WPR YNC.

### WIAW CODE PRACTICE

WIAW transmits code practice according to the following schedule. Approximate frequencies are 1,805 3.52 7.02 14.02 21.02 28.02 50.02 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 EST dy	0030 dy
	4:30 PM PST	
5-7 <sup>1</sup> / <sub>2</sub> -10-	9:30 PM EST 5nTThS	0230 MWFSn
13-20-25	6:30 PM PST	
5-7 <sup>1</sup> / <sub>2</sub> -10-	9:00 AM EST MWF	1400 MWF
13-20-25	6:00 AM PST	
35-30-25	9:30 PM EST MWF	0230 TThS
20-15	6:30 PM PST	
35-30-25	9:00 AM EST TTh	1400 TTh
20-15	6:00 AM PST	

The 0230 GMT practice is omitted four times a year on designated nights when Frequency Measuring tests are sent in this period. To permit improving your list by sending in step with WIAW (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 0230 GMT practice on the following dates.

Jan. 14:	It Seems to Us
Jan. 18:	Correspondence
Jan. 26:	League Lines
Feb. 3:	ARPS
The subject of practice text for the following sessions is <i>Understanding Amateur Radio</i> , First Edition.	
Feb. 7:	Plate Modulators, p. 239
Feb. 9:	Modulator Power Supply, p. 243

decide to go into something like this, let us help you to get the project off the ground at the same time you help us by registering your availability. Even if your activity must be limited to proctoring novice and tech examinations, this is of interest and we want to have it on record. We want to have an extensive card file for reference purposes, keep it up to date, and perhaps even print an occasional list of members of the ARRL Instructor's Corps.

**More on Exclamation Point.** That little item in November QST about the exclamation point attracted quite a bit of attention. Most of the comment was negative in character, which is not too unusual. We think a little more discussion is in order before this matter is resolved or laid to rest, as the case may be.

Most of those who commented were concerned about the similarity of SO to the first part of the

international distress call, SOS. If someone expressing an exclamation point wanted to do so more emphatically, he may use two exclamation points (SO SO), and he may run them together so that it could conceivably sound like an SOS to someone casually tuning around, whereupon the Coast Guard could be notified and all Hades would break loose. Or, an exclamation point followed by a word beginning in S might produce the same effect if sent stoppily.

Well, this seems to us reaching out a long way for a difficulty, and it's surprising how many people responded along this line, apparently independently of each other. Of course the Communications Act provides severe penalties for false or fraudulent signals of distress, but it hardly seems likely that an amateur station which accidentally emits, just once, a signal that sounds like SOS, not followed by a distress message of any kind, as provided for and required in international regulations, could be considered in this category. If so, there are probably many other combinations that could be capable of being loused up by inept operators (especially those practicing on keyers) to produce the same effect. It's hard to believe that such an accidental effect could be all that electrifying, any more than someone on phone saying that "it's a beautiful MAY DAY."

Still, to advocate usage of a combination with such a fearful potential may be considered inadvisable, so we'll not advocate it. What else is available?

Well, W3QY suggests consideration of  $\overline{DX}$ , which lends itself nicely to elongated dashes for emphasis. (Wouldn't someone think you are calling DX?) He also mentions a previous suggestion of WA3LAK for AG, the opposite of BT. K4GTS suggests  $\overline{EX}$  (formerly used to indicate an imminent fraction, but now in disuse),  $\overline{OD}$  or even  $\overline{OI}$ , dragging out the final dits for emphasis instead of the dahs, because the latter cannot be done with keyers. W9HC says "why not adopt, rather than invent?" and suggests we use the American Morse exclamation point ( $\overline{MN}$ ).

Any of these suggestions "grab" you? Any of them turn you off? Are we spending too much QST space on a minuscule detail? — WJNJM.

## OCTOBER CD PARTIES

### High-Claimed Scores

An apparent flaw in our system resulted in a slight mix-up of the TOP FIVE July "Open" CD Party CW scores. Our sincerest apology to both W6HX (WB6OLD, opr.) whose 351,360 should have placed him third, and to WA9ITB at 334,440 which should have resulted in a tie for 5th place with W8FAW.

If your October CD Party score in the January CD Bulletin differs somewhat from the High-Claimed Scores listed below, it is for one of two reasons. First, a number of the Top CW entries, through no fault of their own, QSO'd a station that did not have a current appointment and this resulted in the loss of a multiplier. Second, duplicate QSOs were subtracted from all logs where found.

The following are high-claimed scores; they read, from left to right: appointee, total score, number of QSOs, number of sections and number of hours of operation. Final adjusted scores will appear in the January CD Bulletin. — W4JKQZ.

	CW		
W2FZK	292,250-828-70-19	WRSBHN	103,320-624-63-15
WA6DKJ	281,050-796-70-20	W8LO	102,610-331-62-
V17HDJ	276,000-793-69-19	WSRUB	102,300-326-62-8
W3IN	253,980-341-68-19	WSRF	101,760-311-64-10
W1FBY	253,920-730-69-18	WB4KVE	101,400-338-61-6
K4PUZ	251,920-745-67-20	W11JN	100,750-305-65-11
W8UM (W8YVR, opr.)	238,300-691-70-20	W4KFC	100,480-307-64-5
K8ORK (WA0WZ, opr.)	228,735-657-69-20	E6DZL	100,425-302-65-12
WA1ABW/2	225,390-676-66-16	W9YB (WB2RKK, opr.)	100,345-32161- 7
WA2IOO/1	208,890-628-66-19	W2NZ (WA2s FTK FBI)	175,500-535-65-18
W8YVR/1	207,030-615-67-17	W8LT (3 oprs.)	161,510-521-62-
K6AZI	204,340-597-68-18		Phone
W88AKW	201,620-589-68-20	WA6DKJ	144,385-424-67-14
K8DDA	182,240-539-67-19	W2SZ (WA2FBI, opr.)	(17,480-351-66-20
W4JQ	181,235-534-67-16	WSQOZ	90,210-284-62-12
WA9NUS/9	172,700-518-66-13	K5TSR	89,320-304-58-13
WA0AAD	162,560-501-64-17	WA2IOO	84,960-283-59-12
K5TSR	157,785-467-67- 9	WA2MEQ/7	75,690-261-58-13
WA0VFN	144,150-465-62-15	WSRUB (K6QPH, opr.)	71,775-257-55- 9
W84OGN	142,025-431-65-18	W8QOJ	68,115-335-57-14
W1DAI	141,375-428-65-13	W84ONP	60,200-208-56-13
E4EU	140,400-425-65-11	W810G/5	57,035-181-61- 9
W8TDR	139,520-431-64-12	W84QFH	53,625-195-55-15
W3GRM	136,345-401-67-19	W9YB (WB2RKK, opr.)	48,430-172-54- 5
W6NKR	132,800-408-64-14	WA0AAD	46,690-154-58-11
W1JAX	132,275-400-65- 8	W4QZF	44,160-187-46- 7
W89AWY	130,975-403-65-12	W8RF	43,855-172-49- 6
W8YVEG/5	128,030-407-62-14	W4SZKJ	41,520-166-48- 9
W84ONP	121,225-366-65-18	W43PLP	41,160-164-49-14
WA9AUM	120,250-364-65- 8	E4HXS	38,304-157-48- 9
K2KIR	118,625-358-65- 6	K4PI7	37,490-156-46- 4
W9PJ1	117,000-355-65-12	K4F3U	37,485-146-49- 4
WA2MEQ/7	116,865-371-63-14	W4ZICU	36,900-161-45-10
W7GHT	115,700-350-63-13	W4IPI	36,750-156-49-12
W7WMY	115,500-350-66-14	W8BNXD	36,360-145-49- 8
WA7ISP	114,975-360-63- 7	W46COP	34,780-144-47- 9
W84RJA	107,260-342-62-15	K1GAX	32,000-121-50- 9
W6NJU (WB6ZVC, opr.)	106,920-338-62- 8	K1TFX	31,605-126-49-11
WSQOZ	104,310-335-61- 9	W6CIB	29,040-118-48-11
W8YVEG/7	103,635-322-63- 9	W6NYG	25,670-106-46- 9
		W6NJU (*WB6ZVC)	60,500-216-55- 9

## NOVEMBER 13 FMT RESULTS

The November 13 ARRL Frequency Measuring Test brought in a total of 125 entries representing 1535 individual measurements. Entries received after the announced date of November 24 are not listed (that's the day WIAW started carrying the results of the test). The unique measured frequencies for the early run at 3535.256 7062.380 and 14080.689 kHz. The late run checked out at 3538.985 7044.191 and 14056.631 kHz. Interested in an appointment as ARRL Official Observer? If so, check with your SCM (see page 6). Plan now to participate in the February 13 FMT, full rules appear in the Operating Events section this issue.

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 accord as of equal merit all those reports computing 4100ths parts per million (or highest accuracy). A participant must submit a minimum of 2 measurements to qualify for this listing.

### HONOR ROLL

E1GZH W1P1J W3BFF K3LPP W4AAD K3WIK K4BE K4EOU E4HDX W4KQO W4NTO W5AO W5UW W5LOU W6CBX W4GX W8GAAL K6KA K6KO K6MZN W6RO W8RSU W7FDJ W47MUU W8BDJ W8MDL W8NWU W8UPW W9BMY WA9U0N W8QTX W8M K8VQM Ireland.

In the following tabulation, error percentage can be determined by moving the parts-per-million decimal point (the figure shown in parentheses) 4 places to the left. Class 100s must demonstrate an average accuracy of better than 71.4 parts per million. Class II00s must show at least 357.2 ppm.

(5) W8FTX K9WMP, (6) K6FTV, (7) K90XA K9WGN, (8) W3LYK W6ME K9CSC, (9) W4TQA/2 W47DUY, (10) W6EB,

(1.1) W5KYD, (1.2) W8MSC, W8MTI, (1.5) VF3ASO, (1.9) W8SCAV, (2.0) K9KIP, (2.3) W1DDO, K1VVS, W9AAH, (2.8) K2RCO, (3.1) W8SIN, (3.3) W6CDF, (3.5) K6HV, (3.6) W3YQ, W4AST, W5MO, (4.1) W4YVQ, (4.3) K6FC, (4.6) V16MJ, (5.1) K4NE, K4RTA, (5.9) W4WBK, (5.9) W9HPG, (6.3) K5LJZ, (6.9) W45RQ, (7.2) W1AYG, W5PDG, (8.1) K6IR, (8.4) W8REQ, (8.7) VE5DP, (8.8) W6MOW, (8.9) K9GEL, (9.4) W47SD, (9.7) W60DQ, (9.9) W4HU, (12.1) W6AUC, (12.2) W6CBF, (12.7) W7HIS, (13.6) W3IN, (13.9) W62CCF, (14.9) K1KMY, (15.9) W6LJ, (16.8) K6BKS, (17.8) K9QEO, (19.7) W6GSL/D/S, (20.1) K4TXJ, (20.3) K4CMI, (21.4) K3STU, (22.9) W82MOI, (23.8) W8FZZ, (24.6) W6FCX/7, (26.6) W3JGN, (27.1) K0AYO, (27.5) W84PAG, (28.9) W6MUI, (29.4) W3ADE, (30.3) W84PYU, (31.2) W3AJSZ, (32.0) W1QV, (34.5) W3TK, (46.4) Peterson, (48.2) W6PHY, (49.4) W82MFZ, (50.1) W8MCR, (52.4) W3IAD, (80.4) W7LHK, (81.7) VE7TT, (82.2) W821PG, (84.5) K5EJL, (90.6) W47OBH, (96.4) W4ZWZ, (132.6) K6GG, (185.1) K8TKK, (242.5) W8SSUE, (254.7) W8SUNA/4, (288.4) W82AOL, (337.6) W4UCL, (486.4) W7CHI, (799.0) K7JNK.

### CAC and the Novice Roundup

After extensive study, the ARRL Contest Advisory Committee has come up with a slate of basic changes for the 1972 Novice Roundup.

From the number of comments received during the past few years, the length of the NR period was

in need of pruning. This was accomplished. In lieu of the traditional pattern of a two-week period (encompassing 3 weekends), the upcoming event will take place from February 5-13 (a one-week period encompassing 2 full weekends). Although the initial proposals from the CAC included retention of the 40-hour operating allowance, in view of the overall shortened test period the Hq. Awards Committee has suggested a 30-hour period.

The information exchange has been shifted from a consecutive serial number, plus ARRL section, to RST plus section. The multiplier, previously for sections worked, now includes a separate multiplier for each DX country worked in addition to sections. A minimum time-off period has been adopted. All of these modifications are covered in full in the NR rules, this issue.

A hearty vote of thanks to the 1971 CAC (W3GRF chairman, W1AX, K2KIR, W3WJD, W4UO, W6DQX, W6PH, KH6IJ, VE2NV) for their continuing efforts to improve the ARRL contest program.

- W1YL

## Operating Events

### JANUARY

6 **W6OWP Qualifying Run** (W6ZRI, alternate) at 0500 GMT on 3590/7129 kHz, 10-35 wpm. This is 2100 PST the night of Jan. 5. Underline correct minute of highest speed copied, certify copy made without aid and send to ARRL for grading.

8-9 **VHF SS**, p. 64 Dec, *Hollywood ARC Operation's Day*, p. 91 Dec.

12 **W1AW Qualifying Run**, 10-35 wpm, at 0230 GMT on 1.805 3.52 7.02 14.02 21.02 28.02 50.02 and 145.588 MHz. This is 2130 EST the night of Jan. 11. Underline one minute of top speed copied, state no aids used (typewriters OK). Sign and mail to ARRL with your full name, call of (any) and complete mailing address.

15-17 **CD Party** cw. This is a quarterly event for all League appointees and officials, notified separately by bulletin. Check with your SCM (page 6) to see if you can qualify for an appointment. **SBWAS Contest**, sponsored by the National Teenage Radio Society, from 0500Z Jan. 15 to 0500Z Jan. 17, 80-10 meters, phone and cw. Work a station only once regardless of band/mode. Exchange QSO no., RST (I) and state (or W/Ks), just no. and report for VE/DX. Log date/time, stations, exchanges, bands, mode, multipliers. Two points per QSO on 10 meters, 1 point for QSOs on other bands, 80-15. Final score = no. of QSO points times the number of states per band (max. total 250). Suggested frequencies: 3550 3910 7050 7285 14050 14280 21050 21360 28050 28600. Novice 3740 7160 21115. Appropriate awards. Logs by Feb. 15 to: T. J. Marke, W19BJR, 529 Cleveland Ave., Little Chute, Wisconsin 54140.

### FEBRUARY

2 **W6OWP Qualifying Run**.

5-6 **DX Competition** phone, p. 65, Dec.

10 **W1AW Qualifying Run**.

11-13 **OCWA QSO Party**, starts 1400Z Feb. 11 and ends 2400Z Feb. 13; sponsored by the Dallas Chapter. Only members eligible for the OCWA certificate and plaque. QJWA member QSOs count one point. Repeats on other bands/modes do not count. Nor do non-member QSOs. Multiple points by sum of states/VE provinces, maritime mobiles and countries (other than W1VE) for final score. Your log should read as follows: numbers exchanged, date/time, call worked, QTH, frequency, RST D, handle and OCWA no. Approximate frequencies: cw, 3580 14080 21080 28080; phone, 3980 7280 14280 14345 21380 21445 28580; rtty, 3595-3600 7095-7100 14080-14100 21070-21075 28070-28075. Mail logs by March 11. Send to: L. L. Helthecker, W3EL, 1409 Cooper Drive, Irving, Texas 75060.

12 **W4ZNR "Operation's Day"**, fourth annual event by the Colanoe Central H. S. RC of Albany, N.Y.; begins 1300Z and ends 0100Z Feb. 13. The club will man two phone and two cw desks at the same time. Check the following frequencies: cw, 3713 7175 21150; phone, 4920 7275 14280 21376. Special QSLs via the school radio club trustee Herb Insley, W2KZN, 100 Hackett Ave., Albany, N.Y. 12206.

13 **Frequency Measuring Test**, open to all, starts with a callup at 0230 and 0530 GMT Feb. 13. (Remember, this is the evening before, local time!) The periods for measurement start at 0237 (80 meters), 0245 (40 meters) and 0253 (20 meters); for the late run, 0537 0545 and 0553, respectively. Each measuring period lasts 5 minutes. Submit your average for each 5-minute period which will be compared with the umpire's average during the same period. The umpire is a professional frequency measuring laboratory. Tell how many readings you took to form your averages. Approximate frequencies for the early run are 3537 7030 and 14088 kHz. Late run frequencies are 3540 7078 and 14101 kHz. Your report must be RECEIVED by Feb. 24 to qualify for the QST report of the competition. W1AW will start transmitting the official readings Feb. 25. The next FMT is scheduled for May with full rules in the April issue. **Tennessee QSO Party**, sponsored by the Tent Council of ARCS, starts 0200Z Feb. 13 and ends 2400Z same day. No power or time limits. The same station may be worked on different bands/modes; all modes combined into one entry. Exchange RST (I) and county for Tenn. stations, or state/province/country. Score one point per QSO. Mult. is no. of different Tenn. counties worked (for out-of-state stations). Tenn. stations use the no. of state/province/countries AND Tenn. counties. Suggested frequencies: 3580 3980 7070 7270 14070 14290 21050 21375 28100 28600. Any station disrupting a working Tenn. traffic net for the purpose of contest contacts will be automatically disqualified for any award. Each station working 10 stations will be eligible for a certificate. Plaques will be awarded high Tenn and high out-of-state score (minimum of 25 different Tenn. stations worked to be eligible). Logs must show date/time in GMT, stations, bands, modes, locations and final score computations. They must be received no later than 30 days after the end of the contest. Send, with an a.s.c.c., to Dave Goggio, W4OGG, 1419 Favell Dr., Memphis, Tennessee 38116. All Tenn. ARCS will be operating portable and mobile stations in counties with little or no amateur activity.

19-20 **DX Competition** w, p. 65 Dec.

26-27 **YL/QM Contest** phone, p. 88 Dec. **French Contest** phone, p. 91 Dec. **Vermont QSO Party** (rules next issue).

### MARCH

2 **W6OWP Qualifying Run**.

4-5 **DX Competition** phone.

10 **W1AW Qualifying Run**.

11-12 **YL/QM Contest**, cw.

11-13 **Islykoo Park VHF AR Soc. Worldwide vhf Activity**.

14-16 **Old Old Timers QSO Party**.

18-19 **DX Competition** phone, p. 65 Dec.

25-27 **BARTG Spring RTTY Contest**.

26-27 **Rocky Mt. QSO Party**.

27 **W1AW Morning Qualifying Run**.

QST

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 — PAM: WA3GSM. RM: W3EB. On behalf of all Delaware amateurs, a note of appreciation to retiring SCM K3NYG for his untiring efforts and excellent accomplishments during the past 5 years. New appointments: WA3GSM as PAM and WA3GAY as OPS. W3PM provided most of the sale items at the Kent Co. ARC Auction where WN3PKH was the special prize winner. The Delaware ARC elected WA3HFL, pres.; K3YHR, vice-pres.; WA3AYD, secy.-treas. The club also sponsored "Operation Holiday" a message service held at Castle Mall in Dec. The First State ARC Oct. transmitter hunt winners were K3JXR and WA3PCB but the annual trophy went to K3NCL with his sister Cheryl as co-pilot. K3GUW is active on 2-meter RTTY and says that we should have a 2-meter fm repeater in the Wilmington area by now. Traffic: WA3OJU 95, WA3GAY 57, W3EBE 37, W3DKX 23, WA3DUM 12, WA3FRY 6, WA3GSM 4.

**EASTERN PENNSYLVANIA** — SCM, George S. Van Dyke, Jr., W3HK — SEC: W3FBF. RMs: W3EML, W3MPX, K3MVO, WA3AFI, K3PIE, W3CDB. PAMs: K3BHU, WA3PLP. OO reports were received from W3BHF, K3RDT. OVS reports from W3CL, W3ZRR, WA3KFT. OBS reports from W3CBH, WA3AFI. PSHR: W3MPX, WA3OGM, K3QIO. BPL: W3CUL, W3VR, K3NSN.

Net	Freq.	Operates	QNI	QTC	RM/PAM
EPA	3610	6:45 P Dy	408	361	W3MPX
EASN	3716	6:30 P Dy	228	63	WA3OGM
PPN	3960	5:30 P M-F	620	511	K3BHU
EPAEP&1N	3917	6:00 P Dy	232	53	WA3PLP
PTTN	3610	6:00 P Dy	163	136	WA3AFI

W3CUL reports doing a month's work in two weeks! W3VR commutes to Fla. to cut the grass! W3EML recovering from a double birthday celebration, his and YL's. W3MPX needs help on the late session of the EPA net. WA3ATQ postponing move to Poconos until Spring. WA3POA reports his bean bent and dropped 40-lb. W3BUR reports RI Hill ARC placed first in 5 transmitter class in FD. Wrens left so W3EU finishing antenna work before winter sets in. W3GMK would like more activity on R1FY. K3VAX now 2-meter fm mobile. The Penn ARC has twenty Novices and six just made General, nice going. Speaking of Novices, how many of you lads take the time to check in on the novice band and give one of them a contact or some help? If you are an early bird there is a cw net at 1152 on 3733 kHz! A local paper noted that 40 years ago WA3AQN an ORS of ARRL contacted 1100 stations. He is still at it! W3MTU runs a SPACE net every Tue. on 145.2 MHz. There is a nice certificate for those who check in. Object is to pass information on space activities and to boost activity on vhf. We still need liaison stations from the phone nets to the cw nets. WA3AGD/4 now mobile and looking for his old traffic friends in EPA. New officers dept.: York ARC — K3NVI, pres.; K3BWB, vice-pres.; W3AMA, secy.; W3EXZ, asst. secy.; W3EUD, trans.; K3NVI, trustee. Penn Wireless Assn. — K3JQH, pres.; WA3MNO, vice-pres.; W3ZID, corr. secy.; K3WGG, rec. secy.; K3VRP, treas. Traffic: (Oct.) W3CUL 3364, W3VR 949, K3NSN 568, W3EML 396, W3MPX 388, WA3OGM 367, K3QIO 158, K3MVO 121, WA3LAK 101, WA3QOZ 71, WA3ATQ 65, WA3LWR 60, WA3AFI 52, W3CDB 52, W3HKN 42, WA3LVC 32, W3VAP 32, K3BHU 29, K3PIE 28, WA3JRY 20, W3CL 18, W3BNR 17, W3OY 17, W3CBH 15, K3HKW 10, W3ADF 8, W3OMI 8, K3KTH 7, WA3POA 5, W3ZRR 5, WA3PGT 4, W3VA 4, W3BUR 3, WA3CIU 3, WA3BJO 2, W3AIZ 1, WA3CKA 1, W3EU 1, K3FOB 1, W3GMK 1, W3EIK 1, K3VAX 1. (Sept.) K3PIE 52.

**MARYLAND-DISTRICT OF COLUMBIA** — SCM, Karl R. Medrow, W3FA — WA3HV made 35 PSHR points for Sept. and your SCM mislaid them. K3ORW becomes an ORS and OPS.

Renewals: W3FZV and WA3MJF as ORSs; WA3EOP as OVS. The Oct. BPL man is W3TN. The Potomac Area VHF Society is slowly growing. Big doings at Gaithersburg Hamfest, 400 registered at the ARRL booth with a good turn out of appointees. K3BA, W3EOW, W3ABC, WA3OWA, W3QU and WA3IWT each took a trick at the table. W3FZV plugs for C D scores. The secret weapon of W3GRM is a 15-meter beam plus a new final. WA3EOP has been net hopping to keep Hagerstown on the phone map. W3BHF finds 10 meters alive to Africa. W3CIX and WA3KEG stirred up things on RTTY in the WAF test. WA2AFL reports the Middle Atlantic Region Net (MARN) meets at 5 P.M. EST daily on 3,715 MHz for slow speed training. The Baltimore Amateur Radio Club promoted ham radio at the Baltimore City Fair this year. W3RUN reports BARC has training classes for novices, and club activity is on the increase with 2-meter fm. WN3RME and WN3QIA have started the Atlantic Seaboard Novice Net (ASNN) on 3,725 MHz 2030Z MWF right here in MDC. ASSN reports 9 sessions, 16 QNI and traffic of 4. MDCTN had 18 sessions QNI avg. 15.2 and 44 messages with MFPN holding 21 sessions a QNI avg. of 19.9 with 39 messages. MDD 30 sessions, QNI 331 and 137 messages. W3OKN keeps MDC represented up northeast way. W3QU, WA3MSW and K3LFD provide steady liaison to 3RN. K3RIUQ has 5 to go for WAS on 160 meters. K3G7K has the Thur. hot spot on MDD. K3QUC keeps schedules with number one son at W1MX. W3FCS and W3ZFT both sport new towers and multibanders. Traffic: (Oct.) W3TN 279, W3OKN 120, W3OJU 113, W3EZT 76, W3FA 75, W3FCS 63, K3LFD 51, K3GZK 46, K3BA 45, WA3MSW 36, W3FZV 30, WA3HV 27, K3RIUQ 25, W3FOP 15, W3EOW 9, W3GRM 5, K3QDC 4, WA3EOP 3, WA3GXN 2. (Sept.) W3ZFT 96, WA3IVF 24.

**SOUTHERN NEW JERSEY** — SCM, Charles E. Travers, W2YPZ SEC: W2LWV. PAMs: W2FJL, W2YPZ, W2ZHMU, RM: W2J1.

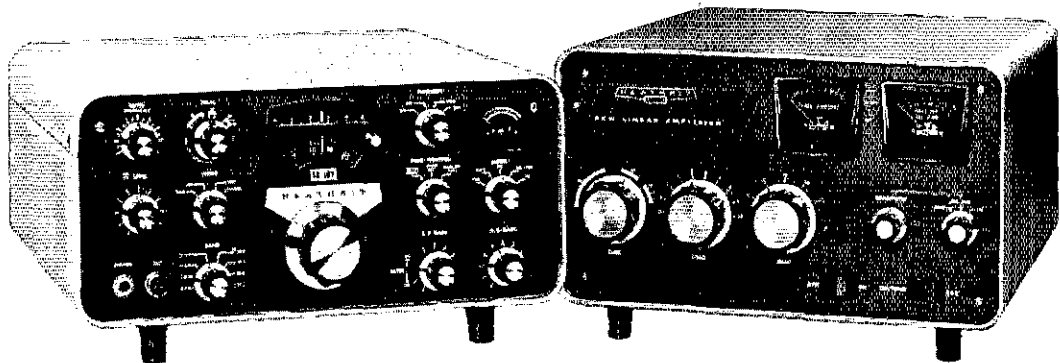
Net	Freq.	Time (PM)	Sess.	QNI	T/c	Mgr.
NIPON	3925	Su 6				W2FJL
EUTTN	7290	M-F 8	25	219	25	W2ZHMU
NJN	3695	Dy 7 & 10	62	624	446	WA2BAN
MARN	3715		21	95		WA2AFL
MCVHE	145.9	F 8	4	10		W2YPZ

Activity is definitely on the increase. W2CDZ and WA2FGS have returned from Las Vegas where they attended the RACES Convention. A new 50-ft. tower has been installed at the QTH of Rose Ellen and Bill. Within recent weeks, two new nets have come into being. The East Coast Teen Age Traffic Net (phone) with W2ZHMU of Trenton as Net Mgr.; frequency 7290 kHz Mon. through Fri. at 5 P.M. local time. Initial activity is strong. WA2AFL, Woodcliff Lake, is Net Mgr. of the Middle Atlantic Region Net (MARN) on 3,715 MHz at 2100 GMT, which was started in Sept. WA2TNS an active member of the Mercer Co. VHF Net will be on 2 fm with a Drake by the time this is in print. He also is active in the Mercer Co. ARRL as well as the City of Trenton RACES. OO W2ORS reports one station operating off frequency. He was, however very cooperative and immediately corrected his error. K2ARY reports transmitting 12 bulletins in the last three months. All members interested in the Jan. SIF should be well organized and prepared to carry on the emergency test. Consult your SCM, SEC, FC or Net Mgr. to properly align for the exercise. Join some group. SNJ has 110 ARRL members and two nets. Traffic: W2FJL 92, W2ZHMU 64, WA2FGS 62, W2ORS 47, W2J1 41, W2QO 32, WA2KAP 20, WA2KIP 15, W2IU 13, W2SFX 7, WA2KWB 6, WA2BLV 3.

**WESTERN NEW YORK** — SCM, Richard M. Pitrenee, K2KTK Asst. SCM: Rudy M. Ehrhardt, W2PVL. SEC: W2RUF. Section nets appear in Apr. Station Activities. The NYSN Novice Training Net has sessions every night at 1700 EST on 3730 kHz. Weekly session with QNC on Sat. at 1000 EST, same frequency. Contact W2RUF for details. W2PAW has formed the first Amateur Radio Club. W2BZZZ, in Herkimer. Contact him for details. W2MTA reports NYS handled 460 messages with 722 check-ins for Oct. W2OF reports The All Service Net handled 57 messages with 60 check-ins during 5 sessions, while the Mike barned Net had 26 sessions, 344 check-ins and traffic was 232. WA2MPC has a new SB-102. K2UCF a new SB-220. WA2DHS is a new Navy Martian. WA2UJ, ex-W1MRW has his dipoles up and is ORV on 80 through 20. W2RQF reports the NYPON cw is doing much better this season. W2WS moved from the ranch in Calo to a home in

(Continued on page 114)

# General, Advanced or Extra—the Heathkit “Maxi-Rig” is your ticket to the world.



The incomparable Heathkit SB-102 Transceiver. SSB/CW, 80-10 meter coverage. Still only 380.00\*

The Heathkit SB-220 Linear Amplifier. 2,000 watts P.E.P., SSB input, 1 kW CW. Just 349.95\*

Here's exceptional stability and dial linearity — made possible by an all solid-state linear master oscillator with 1 kHz calibration. The SB-102 stabilizes itself in a fast 10-minutes, drifts less than 100 Hz per hour after initial warm-up. The new receiver section delivers an S + N/N ratio of less than 0.35 uV for 10 dB — with front-panel selection of built-in 2.1 kHz SSB crystal filter or optional 400 Hz crystal filter. And there's a dial resettable to 200 Hz; 180 W PEP SSB input, 170 W CW input; switch selection of upper or lower sideband and CW; built-in sidetone for monitoring; built-in 100 kHz crystal calibrator; triple action level control to reduce clipping and distortion; built-in VOX, and complete metering.

The SB-102 is the value leader because you build it yourself to save on initial investment and service. Simple circuit board/wiring harness construction gets it all together. Order your round-trip ticket to the world now — the famous Heathkit SB-102 SSB/CW Transceiver.

- Kit SB-102, 24 lbs. . . . . 380.00\*
- Kit SB-800, 8 ohm matching speaker with mounting space for AC supply, 7 lbs. . . . 19.95\*
- SBA-301-2, 400 Hz CW crystal filter, 1 lb. 21.95\*
- Kit HP-23A, AC supply, 19 lbs. . . . . 51.95\*
- Kit HP-13A, DC supply, 7 lbs. . . . . 69.95\*
- SBA-100-1, mobile mount, 6 lbs. . . . . 14.95\*

The Heathkit SB-220 is the linear amplifier that the competition tries to measure up to. Two conservatively rated Eimac 3-500Z's in a grounded grid circuit offer up to 2000 W PEP SSB input, or a full 1 kW on both CW and RTTY. The broad-band pretuned pi-input delivers maximum efficiency with low distortion over 80-10 meters. Only 100 watts of driving power is needed to produce full-rated input.

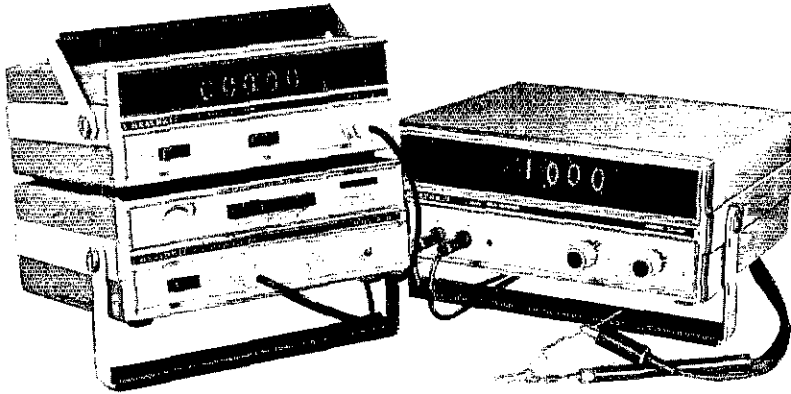
SB-220 features include a built-in solid-state 120/240 V power supply; circuit breaker protection; zener diode regulating operating bias to reduce idling current for cooler running and extended tube life; a large quiet fan; ALC to the driving unit to prevent over-driving; front panel switch selected monitoring of grid current; relative power and high voltage. The SB-220 offers a clean, compact design with the liberal use of internal shielding for extra strength and component isolation. Its green table-top cabinet complements all your SB-series gear.

And tune-up is fast and easy. Just set the band switch, push the CW-Tune/SSB rocker switch to CW-Tune, adjust the Tune and Load controls for maximum relative power. Push the rocker switch to SSB and you're ready with a full 2-gallons. The Heathkit SB-220 brings your rig up to the performance limits — order yours now!

- Kit SB-220, 69 lbs. . . . . 349.95\*



# Home Brewer or Pro...Heath has low cost digital gear you can count on.



The Heathkit IB-101 Frequency Counter with IB-102 Scaler gives you 175 MHz capability for just 299.90

The new Heathkit IM-102 Digital Multimeter, 3 1/2 digits, built-in calibration to 0.2%, lab calibration to 0.1%. Just 229.95

The Heathkit IB-101 delivers instant, reliable counting from 1 Hz to over 15 MHz with 5-digit cold-cathode readout tubes and a computer-type integrated circuitry that eliminates blinking, provides a rock-stable divider chain that never needs adjustment. Hz/kHz switch and overrange indicator give 8-digit capability. Set the range switch to kHz and readout to the nearest kHz. Push the switch to Hz position and read down to the last Hz. Overage and Hz/kHz indicators give correct range and error-free measurement. Has dual gate, diode-protected MOSFET input circuit for proper triggering over a wide range of input levels without adjustment or input attenuators. Input Z is 1 megohm shunted by less than 20 pF to minimize loading. Low drift, temperature compensated 1 MHz crystal oscillator provides highly stable time base. Assembles in approximately 6 hours.

The Heathkit IB-102 extends your range to 175 MHz. Divides input frequencies from 2 MHz to 175 MHz with the scaled output fed to any compatible counter with a 1 megohm input. Switch selection of 10:1 or 100:1 scaling ratios — resolution down to 10 Hz with a counter having 1 second time base. For use with frequencies within the range of the counter being used, a 1:1 switch position provides straight-through counting without scaling. Exclusive Heath input circuit triggers at extremely low signal levels, increasing versatility greatly. Test switch gives a quick, easy method of checking input level.

Kit IB-101, 7 lbs. .... 199.95\*  
 Kit IB-102, 7 lbs. .... 99.95\*

The new Heathkit IM-102 measures AC and DC voltage, current and resistance, with automatic switching for DC polarity. Five overlapping ranges show voltage from 100  $\mu$ V-1000 V on DC; five ranges cover 100  $\mu$ V - 500 V on AC; 10 ranges measure 100 nA-2 A, AC or DC; six resistance ranges cover 0.1 ohm-20 megohms. Input impedance is 1000 megohms on 2 V range, 10 megohms on higher ranges, with overload protection on all. Decimal point is automatically placed with range selection. Panel light indicates overrange. A Heath-designed calibrator is furnished assembled with every IM-102. A unique transfer method, described in the manual, provides accurate AC voltage calibration. Assembles in approximately 10 hours.

Kit IM-102, 9 bs. .... 229.95\*  
 Kit ID-1041, high voltage probe, 1 lb. .... 6.95\*

HEATHKIT

**Schlumberger**

HEATH COMPANY, Dept. 9-1  
 Benton Harbor, Michigan 49022

Enclosed is \$ \_\_\_\_\_, plus shipping.

Please send model(s) \_\_\_\_\_

Please send FREE Heathkit Catalog.

Name \_\_\_\_\_

Address \_\_\_\_\_

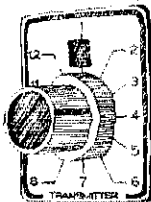
City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Prices & specifications subject to change without notice.  
 \*Mail order prices; F.O.B. factory. AM-258R

# Are 144 channel possible in an FM 2

## Yes! In the new Swan FM 1210-A.

\*Swan adds another dimension to 2 meter FM operation. Now with Swan's new independent switching for transmit and receive tuning (shown at right), combined with capacity for 12 receive and 12 transmit crystals, the FM 1210-A provides the capability for 144 channel combinations. With this wide selection of channels, crowded frequencies and unwanted QRM are virtually eliminated.



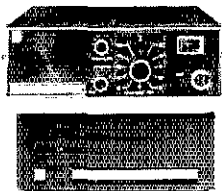
Selectivity has been greatly improved with the addition of our 16.9 mc crystal lattice filter that provides substantially greater rejection of adjacent channel interference. Extensive testing has shown that the new Swan 1210-A has selectivity equal to any 2 meter transceiver on the market, at any price.

The power of the FM 1210-A is rated at 10 watts output which, with the proper antenna, provides you with reliable communications. The output transistor is protected against damage from an improper load by an automatic protection circuit.

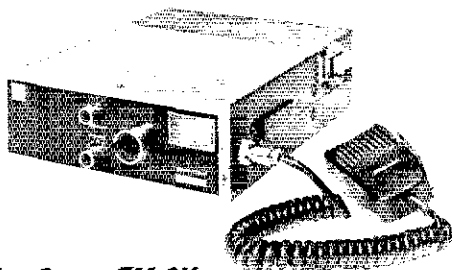
Each crystal has its own trimmer capacitor for exact frequency adjustment. In addition, the FM-1210-A is the ONLY 2 meter transceiver to provide a crystal oven for superior stability on those cold mornings.

Receiver audio to internal speaker is rated at 2 watts, almost twice that of most other 2 meter units, for loud clear reception of the station you are working. Provision has been made for the addition of an external speaker, and there is external keying for an amplifier.

Another exclusive and practical feature is the heavy-duty pedestal type AC power supply that is included in the purchase price. This new feature provides for compact base station efficiency and performance.



**\$329**



### The Swan FM-2X

10 Watts, 12 Channels... Your best value! Features automatic protection of the output transistor, and individual trimmers on each transmit and receive crystal. Its compact size makes it easy to install under the dash of your automobile, or use it with its attachable AC power supply in your ham shack. Everything you need is included at one low price: microphone, built-in speaker, AC and DC operation, and our quick disconnect mobile mounting bracket.

**\$259**

### FM-2X SPECIFICATIONS

#### General

- Frequency coverage 144-148 mc.
- Number of channels: 12.
- Crystals installed for 3 channels as follows: Channel 1: transmit and receive 146.94 mc; Channel 2: transmit 146.34, receive 146.94 mc; Channel 3: transmit 146.34, receive 146.76 mc.
- Modulation: frequency modulation (phase type).
- Transmitter control: push to talk on microphone.
- Power source: AC 117 volts 50-60 cycles, DC 13.5 volts  $\pm 10\%$ .
- Dimensions:  $8\frac{1}{4}'' \times 7'' \times 3''$ .
- Weight: 8 $\frac{1}{4}$  lbs.
- Furnished with unit: dynamic microphone, antenna connector plug, spare fuses and lamps, AC power supply, DC power cord with fuse holder.

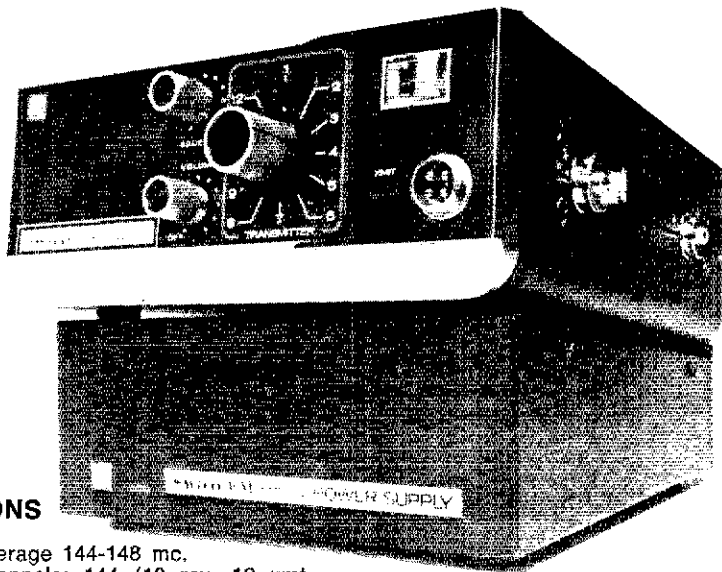
#### Transmitter

- Fully solid state.
- RF power output 10 watts nominal.
- Frequency deviation adjustable to  $\pm 15$  kc; factory adjusted to approximately 5 kc.
- Frequency stability:  $\pm .001\%$ .
- Spurious radiation:  $-60$  db below carrier.
- Frequency multiplication: 12 times.

#### Receiver

- Circuitry: crystal controlled double conversion super-heterodyne.
- Input impedance: 50 to 75 ohms.
- Intermediate frequencies: 10.7 mc and 455 kc.
- Sensitivity: 0.5 uv for 20 db quieting, 0.5 uv for 12 db SINAD.
- Intermodulation: more than 50 db down.
- Audio output: 1 watt to internal speaker.

# combinations\* meter transceiver?



## FM 1210-A SPECIFICATIONS

- Frequency coverage 144-148 mc.
- Number of channels: 144 (12 rcv, 12 xmt, independent switching).
- 8 crystals are included as follows: TRANSMIT: 146.22, 146.34, 146.76, 146.94. RECEIVE: 146.28, 146.88, 146.76, 146.94.
- Modulation: frequency modulation (phase type).
- Transmitter control: push to talk on microphone.
- Power source: AC 117 volts 50-60 cycles, DC 13.5 volts  $\pm 10\%$ .
- Dimensions: 8 $\frac{1}{4}$ " x 7" x 3".
- Weight: 8 $\frac{1}{4}$  lbs.
- Furnished with unit: dynamic microphone, antenna connector plug, spare fuses and lamps, AC power supply, DC power cord, and mobile mounting bracket.

### Transmitter

- Fully solid state, no tubes.
- RF output power: 10 watts nominal.
- Frequency deviation: phase type, factory adjusted to 5 kHz.
- Frequency stability:  $\pm 0.01\%$ ,  $-30^\circ$  to  $+50^\circ\text{C}$ , oven controlled.

As little as \$10 per mo. on Swan's new Revolving Credit Service

\$26 down, \$10 mo. on unpaid balance. Annual percentage rate 18%.



**SWAN FACTORY**  
305 Airport Road  
Oceanside, CA 92054  
Phone: (714) 757-7525

**EASTERN OFFICE**  
P.O. Box 2288  
Ocean, N.J. 07712  
Phone: (201) 531-4114

- Spurious & harmonic radiation:  $-60$  db minimum.
- Frequency multiplication: 12.

### Receiver

- Type: superheterodyne, dual conversion 16.9 MHz and 455 kHz IF.
- Input impedance: 50 to 75 ohms.
- Sensitivity: 0.5  $\mu\text{v}$  for 20 db quieting, 0.25 mv for 12 db SINAD.
- Intermodulation: greater than 55 db.
- Audio output: 2 watts at less than 10% distortion.
- Image response:  $-55$  db.
- Squelch threshold: less than 0.3 mv.
- Adjacent channel rejection:  $-55$  db.

### 100% SATISFACTION GUARANTEED

If you are not 100% satisfied with the Swan 1210-A 2 meter FM Transceiver, return it to the factory and the full purchase price will be refunded to you by return mail.

Gentlemen:

Please send me the following:

- Your 1972 Swan Catalog.
- Model 1210-A 2 meter FM Transceiver.
- Model FM-2X 2 meter FM Transceiver.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

State \_\_\_\_\_ Zip \_\_\_\_\_

# YOU ASKED FOR IT!

**HERE IT IS!** . . . one complete U.S. Callbook and one complete DX Callbook per year and no change in price. In addition you can keep your CALL-BOOKS up-to-date through a subscription to the new Service Edition Series published each March 1, June 1 and September 1 — each one covering new licenses and all activity during the preceding quarter. Annual subscription to complete Winter CALL-BOOKS plus 3 Service Editions only \$14.95 postpaid for the U.S. and \$11.45 postpaid for the DX.

Over 285,000 QTHs in the U.S. edition **\$8.95**

Over 180,000 QTHs in the DX edition **\$6.95**

These valuable EXTRA features included in both editions!

- QSL Managers Around the World!
- Census of Radio Amateurs throughout the world!
- Radio Amateurs' License Class!
- World Prefix Map!
- International Radio
- Amateur Prefixes
- Prefixes by Countries!
- Zips on all QTHs!
- A.R.R.L. Phonetic Alphabet!
- Where To Buy!
- Great Circle Bearings!
- International Postal Information!
- Plus much more!

See your favorite dealer or order direct (add 25¢ for mailing in U.S., Possessions & Canada. Elsewhere add 50¢).

**50 YEARS OF SERVICE TO RADIO AMATEURS**

**GET YOUR NEW ISSUE NOW!**

**WRITE FOR FREE BROCHURE!** RADIO AMATEUR **callbook** INC  
 Dept. A. 925 Sherwood Drive  
 Lake Bluff, Ill. 60044

Fayetteville and relayed help for K2CUM out of gas on the Thruway K2DWF and K2FG invited 1830 kHz activity Mon. nights at 2400Z. WA2GRP has a new QTH in Marilla. W2IM has migrated permanently to St. Petersburg, Fla. W2BW found the source of his interference to be a bad fan thermostat. Sorry to report the passing of WN2QAH in a plane crash. W2PAN and XYI QSYed to the sunny south and is now K4RX in Fla. New officers for the 100% ARRL Rome Radio Club are WA2GBI, pres.; WA2MOW, vice; WA2FLT, secy.; WA2FLX, treas.; K2IXN, board chmn. and WB4HKE/2, pro. chmn. BPLers in Oct. are WA2ICU and W2OE. Congrats fellas. The winter season has all the 5BDXC aspirants frothing — many WNY types heard on the low end of 80 and 40 especially. K2LWR, Buffalo, probably has the best antenna setup for 80 in the section. Traffic with \* indicating PSHR: (Oct.) WA2IC\* 219, W2OE\* 384, W2FR\* 251, W2RLF\* 221, WA2FLD\* 220, W2HFB 97, W2BU\* 89, K2CC 76, W2MTA\* 71, W2FZK 70, K4JRX 63, W2ROF 64, W2MSM 51, WB2VND 45, K2JTK\* 44, K2OIV 41, WN2AOG 36, WA2JBF 34, K2QFV 34, WN2PIU 24, WA2H11 21, K2DNN 20, K2UJR 19, W2PNW 16, K2BWK 15, W2EAF 15, WA2LUF 14, K2IMI 12, WB2SMD/2 12, W2DHD 11, WA2NPO\* 9, WR2OAP 9, WN2RBB 5, WA2CJY 3, WB2FPG 3, W2PVI 3, WA2GLA 1. (Sept.) WN2RBB 5.

**WESTERN PENNSYLVANIA** SCM, Robert E. Gawryla, W3NEM SEC: W3KPL, PAM: K3ZNP, RM: W3LOS, W3KUN, WA3IPU. The WPA CW Net meets daily 3585 kHz at 7:00 P.M. K5SN meets Mon. through Fri. 3585 kHz at 6:30 P.M. All times local. The Nittany ARC reports that ex-D41UG now is WA3KWD. Hardly passed the General, Advanced and Extra Class license exam all on the same day and also is the first non-citizen licensed by the FCC under the new Goldwater Bill. He is a member of the NARC. WPA also had the first licensed ham under the new bill. The Radio Assn. of Erie, RAE, had their famous "Rat Patrol," local ARRL group on 10 meters, out in full force during the Halloween week end. Mobile units gave the local law enforcement a big helping hand. Steel City ARC reports new officers for the coming year: W3SDV, pres.; K3IVF, vice-pres.; K3VNL, rec. secy.; WA3DKY, corr. secy. The Two Rivers ARC also announce the following members as their new slate of officers: WA3HIC, pres.; WA3GCS, vice-pres.; WA3MWM, secy.; WA3NLE, treas. The Erie ARC elected K3VYO, pres.; K3HZL, vice-pres.; W3TZW, secy.; WA3JHC, treas.; W3OJM, dir.; W3OVM, act. mgr. Check your license. If you are due for renewal upgrade at the same time. In any event, don't forget to renew. K5SN reports the following traffic activity for Oct.: 15 sessions, 51 stations QNI, 28 messages. The WPA gang had the following activity: 31 sessions, 349 stations QNI and 207 messages handled. Traffic: WA3PI 168, W3NEM 165, K3ZNP 154, W3VA 152, WA3NAZ 151, W3LOS 95, W3KUN 77, W3MJ 35, WA3MDY 34, K3HHD 26, K3HCT 23, WA3FO 20, K3SMB 14, K3HZL 5, W3IDO 5, K3SJS 5.

**CENTRAL DIVISION**

**ILLINOIS** — SCM, Edmond A. Metzger, W9PRN — SEC: W9RYU, PAM: WA9XCP and WA9PD (vtd), RM: WA9ZUL, Cook County, I.C.: W9HPG.

Net	Freq.	Time (21) Days	Ffe.
IFN	3940	1400	3
IN	3690	2:00(4:00) Dy	141
NCPN	3915	1:00(1:00) M-S	87
III PON	3915	14:30(22:45) M-F	462
III PON	145.5	0200 MWT	3
III PON	50.28	0200 M	18

Net mgr. W9HRY reports the ninth region net passed a traffic count of 412 messages. New officers of the Lake View Radio Club are WA9DBU, W9QCG and W9GKM. W9RGI is the Memorial Club Station at the Red Cross building in Rockford and active on cw, am, fm, ssb and RTTY from 80 to 2 meters. K9RAS is now K4GFW in Fort Lauderdale. WB9AWY is an Extra Class licensee. W9KRU presented "The Inside Story of Crystal for Your Rig" at the Oct meeting of the York Radio Club (Elmhurst). WB9FH, Mark Zwicker, Peter Barr and Dale Pendleton are the new officers of the Glenbrook Amateur Radio Club. K9CAS which operates from the Glenbrook High School. WN9EEN, WN9DYJ, WN9DZL, WN9ICT, WN9DYK, WN9GLS, WN9GMP, WN9GDN, WN9GTX, WN9GXU, WN9GYK, WN9HPC, WN9HFB, WN9IRD and WN9IEF received their Novice tickets through the code and theory class of the Chicago Amateur Radio Club. Newly elected officers of the Six Meter Club of Chicago are K9ZUL, WA9RI, K9ZVW, WA9NTA, WA9IWW and WA9WBW. From reports received for this column it is evident that many radio clubs in the Ill. section are sponsoring radio theory and code classes. Contact your local club for further information. Our sympathy to the family and friends of K9UL, K9WWA and WN9WZA who recently joined the ranks of Silent

# GIANT GIANT KILLER PACK

Swan introduces a complete 2-element beam antenna package direct from our factory, at tremendous savings! Now, **ONLY SWAN HAS IT ALL!** Pack includes:

Swan TB-2 Beam Antenna . . . . .	\$79.00 list.
40' Rohn-Spaulding EP-5 Tower . . . . .	\$89.00 list.
AR-22 Rotor . . . . .	\$59.95 list.
100' Rotor Cable . . . . .	\$ 6.00 list.
100' RG-8/U Cable . . . . .	\$16.00 list.
Total list cost <del>\$250.00</del>	

**SWAN'S GIANT  
KILLER PRICE FOR ALL**

**\$180**

*Use Swan's new Revolving Credit Service.*

While the price is a bargain, the two-element beam antenna package is the finest you could own at any price! The Swan TB-2 antenna traps are wound on pre-grooved Lexon coil forms, and precision tuned at the factory for consistent superior performance. These are the same traps that we use on all Swan triband antennas. And only Swan offers precision cast aluminum boom to mast and other element fittings. The driven elements are supported by lightweight precision machined aluminum casting, so that they won't work loose under heaviest storm conditions. All fittings are of the same heavy-duty construction as our multi-element beam antennas. The Rohn-Spaulding EP-5 40' tower is made of the same highest quality materials that have made Rohn-Spaulding towers the largest in the nation. The tower can be ground mounted with base plate and adjustable house bracket as furnished.

Now you have the convenience of having a complete antenna and tower assembly from one source, at a 30% savings, and you can charge it all to your Swan credit account.

**MONEY BACK GUARANTEE**

Since this low price is possible only by direct factory purchase, you can order your Swan Giant Killer Pack by mailing in the coupon at right. If you are not completely satisfied, return the antenna to Swan and we will refund the full purchase price to you by return mail.



Gentlemen:  
Please send me your Giant Killer Pack.

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Ship C.O.D.       Check enclosed.

Charge my BankAmericard # \_\_\_\_\_

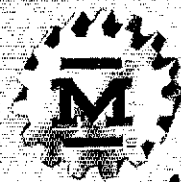
Charge my Master Charge # \_\_\_\_\_

Master Charge Interbank # \_\_\_\_\_

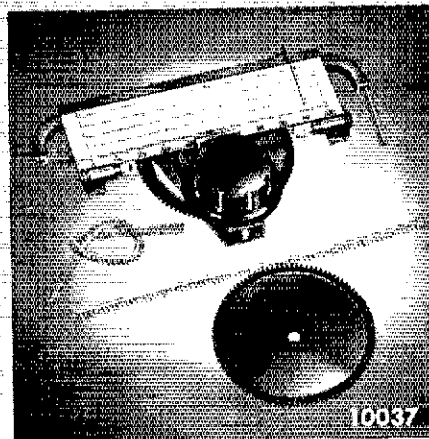
Delivery will be made by fastest surface shipment.  
Shipping charges C.O.D.

**SWAN FACTORY / 305 Airport Road, Oceanside, CA 92054, (714) 757-7525**  
**EASTERN OFFICE / P.O. Box 2288, Ocean, N.J. 07712, (201) 531-4114**

# Designed for



# Application



## NO-STRING DIAL

No strings; no pulleys; no back lash; no flimsy assembly. The No. 10037 is a sturdy mechanically engineered "Designed for Application" dial assembly which completely eliminates the annoyances of string-driven pointers, eliminates all indicator stutter or wobble and provides positive pointer travel and resetability. The pointer is driven positively by a flexible but non-elastic molded gear driven rack which cannot slip, break or fall off a pulley. The geared flexible rack rides in a multi-slot extruded aluminum channel. This girder-like extruded piece provides mechanical rigidity to the assembly. Furnished complete with panel trim bezel and flexible coupling for output shaft.

## JAMES MILLEN MFG. CO., INC.

MAIN OFFICE AND FACTORY  
MALDEN  
MASSACHUSETTS



Keys. WA9ZWY would like to contact anyone interested in slow-scan TV. WB9AJB has returned from his tour of active duty with the U.S. Air Force. Traffic: (Oct.) K9AVQ 203, W9NXG 182, WA9ZUE 165, WB9FHI 111, W9FLF 88, WB9AWY 79, W9FHI 64, WA9NZI 39, W9IXV 38, WA9RTB 38, WA9LDC 28, W9RGU 28, W9PRN 10, W9LEX 8, W9LDU 6, (Sept.) WB9FHI 44, (Aug.) WB9FHI 112.

INDIANA - SCM, William C. Johnson, W9BUO - SEC, W9FC. RMs: WB9ANT, W9FC, W9HRY, WA9ZKX. PAMs: K9CRS, WA9OHX, (chf) W9PMT.

Net	Freq.	Time(Z)/Days	T/c.	Mgr.
ItcN	3910	1330 Dy 2130 M-S 2300 Dy	357	WA9OHX
QIN	3656	0000 Dy 0300 Dy	133	WB9ANT
PON	3910	1245 Su 1830 S-S	28	WA9UMH
PON VHF	50.7	0200 T-T	454	K9APH
Hoosier VHF	50.2	0100 Dy	28	W9PMT

It is with deep regret I report W9EJW of Indianapolis as a Silent Key. WA9QMY reports the Adams County CD 6-meter net was activated for Halloween patrol exercise. W9E1 spent 14 hours on CW CD Party with 223 QSOs. WA9ABI now has a Heath scope. W9NTP reports the Ind. Amateur TV and UHF Club held their fall meeting Oct. 9 at the Naval Avionics Club house. K.O. Learner of Kokomo showed pictures and gave a talk on the Tiros and Nimbus picture from our weather Satellite. There also was a talk about the frequency to be used by amateur TV stations and WA9HPK gave a demonstration on Amateur TV. Ninth Region Net (9RN) freq. 3640 kHz, time 0045Z-0230Z Dy. W9UEM is home from the hospital. K9CEG is back for the winter. WA9FSZ presented a NASA film on the first moon landing at the Red Cross ARC meeting Oct. 18. To all amateurs who have the Hoosier Courtesy Award please turn in some one name and call to the IRCC; not many awards are being given out. For the Certificate hunter it is the Hoosier 500 award. WB9ANT, QIN Net mgr. has a new method for QIN Honor Roll, 30 check-ins or more. QIN Honor Roll: WB9ANT 55, W9RLS 54, WB9EAY 53, W9E1 49, W9QLW 39. Amateur radio exists because of the service it renders. Traffic: (Oct.) WA9WJA 247, WA9OILX 158, WB9ANT 120, WB9EAY 108, WA9VZM 100, W9HRY 88, W9QLW 79, WA9ZKX 51, W9FHI 48, W9BUO 46, K9CBY 46, W9PMT 32, K9YBM 31, K9APH 28, WA9CHY 28, K9RPZ 26, WA9CIZ 25, W9E1 17, W9DZC 15, K9JOY 15, W9LW1 15, WA9NYU 12, K9DIY 11, W9KWB 11, K9ILK 10, K9RWQ 10, W9YYX 9, W9HWR 8, WA9ZFS 3, WA9AUM 2, W9BDP 2, W9NZZ 2, (Sept.) W9RLS 65.

WISCONSIN - SCM, S.M. Pokorny, W9NRP Asst. SCM: Joseph A. Taylor, W9OMT. SEC: W9NGT. PAMs: WB9CKE, K9EHI, WA9OAY, WA9PKM, WA9QKP. RMs: WB9BJK, K9KSA.

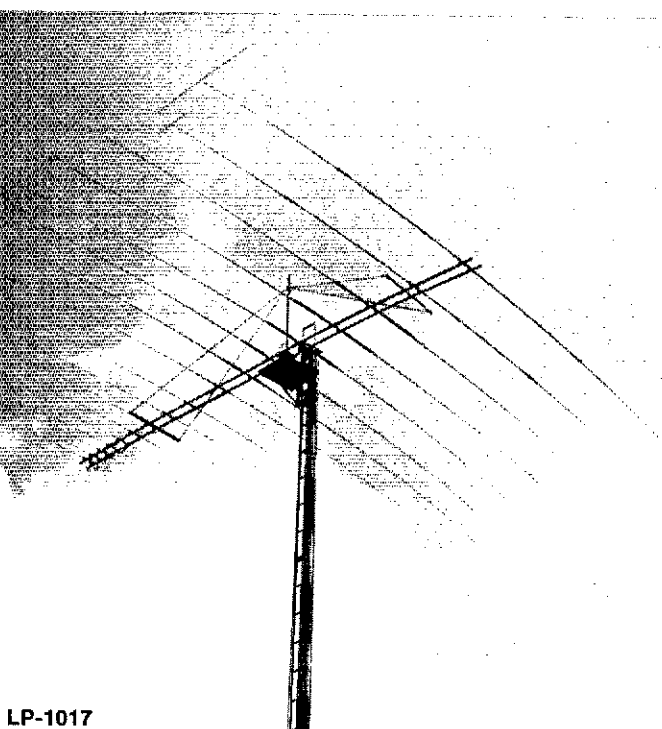
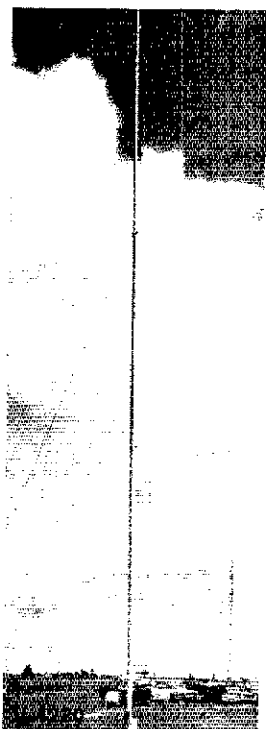
Net	Freq.	Time(Z)/Days	QNT	QTC	Mgr.
WIN	3662	0115 Dy	232	126	WB9BJR
WSSN	3662	0200 TTS			K9KSA
SW2RN	146350	0230 Dy	161	5	WA9PKM
SWARN	50400	0300 M-S			WB9CKE
BWN	3985	1245 M-S	421	271	WA9OAY
WI-RACES	3993.5	1400 Su		62	W9NRP-ANC
WI-OCWA	3987	1500 Su		41	W9NRP
BE-N	3985	1800 Dy	759	77	WA9QKP
WI-PON	3925	1801 M-F	478	55	W9EMC
WSBN	3985	2300 Dy	1337	116	K9FHI

K9OPF now K4GKD at Arlington, Va. W9SZR in S. Vietnam and will be operating contests from HS5ABD and XU1AA. K9FWF/4 at Orlando, (Disney World) Fla. New Novice at King, W9NIIH. New EC for Outagamie Co. K7RSQ/9. Renewed ECs are K9FHI, W9LAC, WA9SAB, K9UTO and W9ZBD. New OBS for W9BN K7RSQ/9, WIN W9DND. Renewed OBS W9NRP for 2 and 6. New OPS: WB9CMD, WB9DAN and K7RSQ/9. Renewals: W9NRP as OPS; W9CXY and W9R1P as GRCS; W9PJT as OO. New OVSS: WB9CIL and K9OXY. By the time you read this column, Wisc. will have elected a new SCM. I sincerely thank all for your participation and cooperation and hope you will all cooperate with the new SCM. 73 and see you on the air. Traffic: K9CPM 266, W9CKY 238, W9DND 221, WA9YSD 142, WB9BJR 139, W9ESJ 125, K9FHI 57, WB9DXK 55, WB9ABF 47, WB9FHI 43, K7RSQ/9 42, WA9OAY 38, W9KRO 33, W9NRP 32, K9JPS 29, W9IHW 27, WB9BRF 25, WA9BZW 22, K9KSA 18, W9OMT 10, K9UTO 10, W9ZBD 10, WA9YWI 9, WB9CMD 8, WA9PKM 6

## DAKOTA DIVISION

MINNESOTA - SCM, John H. Halstead, KØMVF - SEC: KØLAV. RMs: WØZHN, WAØYAH. PAMs: KØFLT, WAØHRM,

# Hy-gain Commercial duty HF antenna systems don't compromise HF efficiency



LP-1017

New from Hy-Gain... replacements for the old, inefficient whip and tuner combinations. Now get maximum performance from two new high efficiency antenna systems that operate *without* tuners or other external matching devices. Specifically designed for commercial duty HF communications circuits. Connect your transmitter, receiver or transceiver...and communicate with nearly 90% efficiency.

*Check Hy-Gain features...and low prices.*

**Model V-4220** Vertical Omnidirectional  
4 through 30 MHz (or 2 through 30 MHz)

- Tunes any frequency 4 through 30 MHz (or 2 through 30 MHz)
- No tuner required—50 ohm input
- VSWR 1.5 to 1 maximum
- True  $\frac{1}{4}$  wave monopole radiation patterns at all frequencies
- Available in fixed station and shipboard models
- Installs with 2 men in a matter of hours

**Price for 4/30 MHz version \$1,100 U.S.**

**Model LP-1017** Log Periodic 6.2/30 MHz

- Only 36' x 40', 320 lbs.
- Covers 6.2 through 30 MHz continuous
- Operates in all high seas HF frequencies 6.2 and above
- VSWR max 2.5 to 1, (2.0 to 1 over 90% bandwidth)
- The smallest, lightest LP ever built
- Fixed azimuth or rotatable
- Available as complete system with tower and rotator, or mount on your existing support structure

**Price \$1,100 U.S.**

*Write for complete details on these and other communications antenna systems available from 2 through 1000 MHz.*

**HY-GAIN ELECTRONICS CORPORATION**

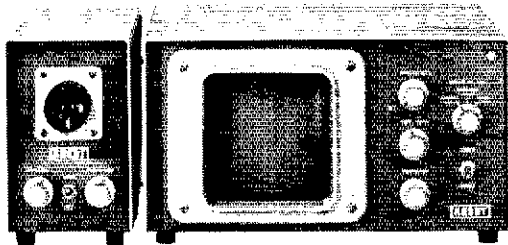
Phone 402/434-9151 Lincoln, Nebraska 68505, USA Telex 48-6424  
(International agents and distributors write Export Dept.)

# AMATEUR ELECTRONIC SUPPLY

- has -



*In Stock for  
Immediate Delivery*



- ROBOT MODEL 70 MONITOR. . \$495
- ROBOT MODEL 80 CAMERA. . \$465
- 25mm, f.1.9 lens . . . . . \$ 30
- 25mm, f.1.4 lens . . . . . \$ 40
- 25mm, f.1.4 Macro lens . . . . . \$ 60

## AMATEUR ELECTRONIC SUPPLY

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

CLEVELAND Area Hams may wish to visit our Branch store located at 17929 Euclid Avenue, Cleveland, Ohio, Ph. 486-7330, Pete Smith, Mgr. ALL Mail Orders and Inquiries should be sent to our Milwaukee store.

**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  Send Robot literature

W0HI. The TEN mgr. reports that Minn. tied with Missouri with 61 check-ins in Oct. W0ZHN led the Minn. contingent of TEN representatives with 34 check-ins. Others were WB0CGI with 21, WA0IAW 17, K0ZXE 11, K0ORK 6, WA0JPR 4, WA0RRA 3, WA0WEZ 3, W0ISJ 1 and WA0VYV 1. W0ZHN has organized a second session of MSN meeting at 0400 GMT on 3685 kHz. This session should expedite delivery of messages received from TEN. Activity has been good on the first nights of the second sessions. K0ORK is out of the hospital and back on MSN. WB0ATR is active on MJN as NCS and also on 15 meters with a home brew two-element Yagi. WA0RRA has resigned as Asst. SGM. We accept her resignation with reluctance. Thanks, Eddy, for a fine job. Happy New Year and a belated Merry Christmas. Traffic: (Oct.) K0CSE 257, W0ZHN 243, WA0IAW 143, WA0YVT 130, W0WIA 74, WA0FBZ 73, WA0YWA 68, WB0BRG 65, W0BUC 64, K0ZXE 63, WB0DYZ 61, WA0TEC 48, K0ORK 37, K0MVF 36, WB0CGI 35, K0FLT 30, WA0YAH 30, WA0HRM 28, WB0DZA 26, WA0VYV 25, K0PZ 21, WA0JPR 19, K0ICG 17, WA0UWT 13, WA0VYB 11, WA0YER 11, WA0VUP 10, W0WAS 10, W0BUIO 9, W0ISJ 9, W0KNR 9, WB0ATR 8, WA0GGL 8, K0ZBI 8, WB0CNB 7, WA0VHX 5, K0SXQ 4, WB0CFE 3, W0UMX 2. (Sept.) W0ISJ 3.

NORTH DAKOTA - SGM, Harold L. Sheets, W0DM - SEC: WA0AYL, OBS: WB0AIR, PAM: W0CAQ, RM: WA0RSR, OO: W0BF. The ARRL SET will be on Jan. 29 and 30, 1972. WA0AYL ND SEC has started to ready for this event by appointing nine new county ECs with more to come. WB0BFJ, pres. of the Valley Tr. H.S. RC, took a trip to Mexico. WA0AAD had over 500 OOs in the last CD party. His XYL, in self defense, is learning the code for a license. W0MEA reports that his son, a teacher in West Fargo, received his license and call WB0FFW while his daughter, a student at Concordia, not to be outdone received her Novice with the call W0W0. Congrats and welcome. W0LXO can be worked on 28 MHz and 21 MHz from his winter home in Fla. WB0ANH/M has been putting out a good signal from his mobile as he drives back and forth to the western part of the state. WB0FHJ is attending school at NDSU and is keeping W0HSC on the air. WB0BHJ has been doing some fone patch work into Grand Forks. WASWDB/Ø had a very busy Oct. - he got married and then had to get with the logs of the ND QSO Party held in Sept. Work is progressing on the repeater station in the Grand Forks area. In the Sept. report of TEN, Mgr. WA0ELO had 42 minutes and WA0KSR had 30 minutes of participation. Our thanks to W0DXC for acting as NCS for the NDCW net during the illness of WA0RSK.

Net	kHz	CST/Days	Sess.	QNI	QTC	Mgr.
Goose River	1990	0900 Su	5	88	3	W0CDO
NDCW	3640	2100 M-F	11	36	3	W0DXC
NDPCN	3996.5	0900 Su	15	450	62	WA0SJB
		1830 SS				
NDRACES	3996.5	1730 M-F	21	777	64	WB0ATJ
		1830 M-F				

Traffic: WA0SUF 85, WA0LLO 33, WA0SJB 24, WB0AUM 19, W0DM 15, W0CDO 6, WA0JPT 5, W0DXC 3, W0MXF 2, K0KSA 2.

SOUTH DAKOTA - SGM, Ed Gray, WA0CEX - WA0FUZ has resigned as SEC and wishes to express his thanks to those who helped him with his duties in that post. WA0OVR has been appointed as the new SEC. Don EC for Meade Co. has done a lot of work there with organizing emergency planning. In addition to the normal SEC work of the section Don wants to encourage the use of 2 meters in emergency work in the state. The Brookings repeater is now using 2100 Hz tone and the Sioux Falls repeater is using 1800 Hz tone. The Rapid City repeater has been experiencing some problems losing the site for their antennas but should be back on shortly. Net reports: Morning Net, 564, QTC 39; NJQ 803, QTC 7; Early Evening 569, QTC 8; Late Net 842, QTC 30; CW SDN 137, QTC 30. Traffic: W0HOT 84, W0CAS 29.

### DELTA DIVISION

ARKANSAS - SGM, Jimmie N. Lowrey, WASVWH - SEC: W5RXU, RM: WASTLS, PAM: WASOMO, WASYMW has received SBWAS award number 72. The Arkansas DX Assn. held its annual banquet in Little Rock with guest speakers WASRFU, pres. of INDXA, presenting slides of the OH2BIIZA Expedition and W5KYD giving a humorous talk on propagation. WASOMQ was elected Net Mgr. of the Razorback Net; he also has a new SR-102 on the air. Welcome to new amateurs W5FMJ, W5FMK, W5FOG, W5FQG, W5FNU, W5FOW, W5FQP, W5FOA, W5FJJ, W5RMX has a new Itempo 1. WASATP has a new Regency HR-2MS 2-meter mobile. WASWMC, WASAER and W5BTTY have new Drake TR-22s.

Net	GMT/Day	Freq.	Mgr.
Razorback	0030 Dy	3995	WASOMQ
DX Info	0045 T	3995	W5QYH

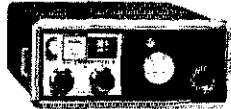


# AMATEUR ELECTRONIC SUPPLY

*is the Best Place to purchase your new*  
**DRAKE** *gear for the following reasons*

- Performance
- Versatility
- Resale Value

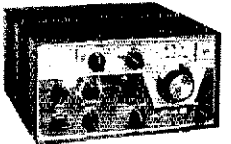
ML-2F "Marker Luxury" 2m FM	\$329.95
TR-22 Portable 2m FM Transceiver	199.95
AA-22 Rec/Xmtr Amplifier - 12vdc	149.95
MMK-22 Mobile Mount	6.95
Extra crystals for ML-2F, TR-22 - each	5.00
DRS-1 Digitally Synthesized Receiver	2195.00
2C Receiver	255.00
2AC Calibrator for 2C	18.75
2CS Speaker for 2C	23.00
2CQ Speaker/Q-multiplier for 2C	39.95
2NB Noise Blanker for 2C	26.95
R-4B Receiver	475.00
MS-4 Speaker for TR-4/6, R-4B	32.00
TR-4 Transceiver 80-10 Meters	599.95
34PNB Noise Blanker (plug-in)	100.00
RV-4 Remote VFO for TR-4	110.00
FP-1 Crystal Control adaptor	46.95
TR-6 Transceiver - with noise blanker	650.00
RV-6 Remote VFO for TR-6	110.00
AM Plug-in Filter for TR-6	35.00
CW Plug-in Filter for TR-6	35.00
LSB Plug-in Filter for TR-6	35.00
AC-4 AC supply for TR-4/6, T-4XB	99.95
DC-4 12vdc Supply for TR-4/6	125.00
MMK-3 Mobile Mounting kit for TR-4/6	6.95
MC-4 Mobile Console for TR-3/4/6	69.00
2NT CW Transmitter	144.00
T-4XB SSB Transmitter	495.00
L-4B Linear Amplifier	825.00
MN-4 Antenna Match Network	99.00
MN-2000 Antenna Match Network	195.00
W-4 RF Wattmeter (2-30Mc)	61.95
WV-4 RF Wattmeter (20-200Mc)	73.50
C-4 Station Control Console	299.95
TC-6 6m Transmitting Converter	250.00
TC-2 2m Transmitting Converter	300.00
SC-2 Receiving Converter for 2m	76.00
SC-6 Receiving Converter for 6m	71.00
CP5-1 Power Supply for SC-2, SC-6	19.75
SCC-1 VHF Crystal Calibrator	26.95
CC-1 Converter Console	26.95
TV-300HP High-Pass Filter	4.95
TV-1000LP Low-Pass Filter	18.75
LN-4 Line Filter 120v 5 amp	8.00
729SRD Microphone with plug	17.00
SPR-4 Programmable Receiver	495.00
SNB Noise Blanker	65.00
DC-PC DC Power Cord	5.00
TA-4 Transceiver Adaptor	15.00
SCC-4 Crystal Calibrator	20.00
RY-4 Teletype Adaptor	10.00
<b>CRYSTAL KITS FOR SPR-4</b>	
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
Tropical Broadcast - 3 crystals	13.50



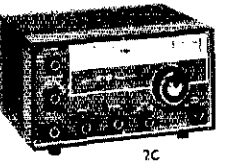
TR-22



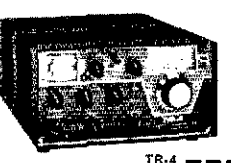
ML-2F



R-4B



2C



TR-4

- 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.
- LOW LOW 1% Monthly Service Charge (ONLY 12% per annum) on GECC Revolving Charge Plan. Only 10% Down Plus LOW Monthly Payments - For Example: \$10 a month finances up to \$300, \$20 up to \$610. Write for complete information and credit application.

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, lineacs, accessories, etc.).

2NT Transmitter	\$10 Bonus	TR-4 Transceiver	\$50 Bonus
2C Receiver	\$20 Bonus	TR-6 Transceiver	\$60 Bonus
SPR-4 Receiver	\$40 Bonus	L-4B Linear	\$80 Bonus
R-4B Receiver	\$40 Bonus	ML-2 2M FM Xcvr	\$30 Bonus
T-4XB Transmitter	\$40 Bonus	TR-22 2M FM Xcvr	\$10 Bonus

**SIX EZ-WAYS TO PURCHASE**

1. CASH
2. C.O.D. (20% DEPOSIT)
3. MASTER CHARGE
4. BANK AMERICARD
5. AMERICAN EXPRESS
6. GECC REVOLVING CHARGE



*Order Today*  
 Direct from this Ad



Ray Greiner, K9KHW  
 Mgr. Mail Order Sales

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: \_\_\_\_\_

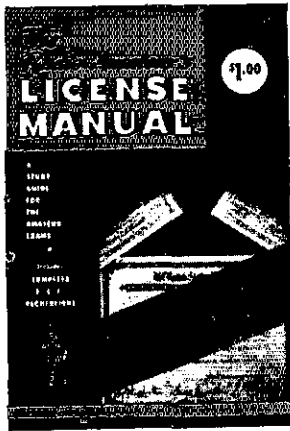
Address: \_\_\_\_\_

City & State: \_\_\_\_\_

Send used gear list  Send Drake literature

**AMATEUR ELECTRONIC SUPPLY**  
 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  
 CLEVELAND Area Hams may wish to visit our Branch store located at: 17929 Euclid Ave., Cleveland, Ohio, Ph. 486-7330, Pete Smith, Mgr.  
 ALL Mail Orders and Inquiries should be sent to our Milwaukee store.



66th EDITION

Regulations change from time to time, and every amateur should be aware of the latest changes. The best source for the latest information is the current *LICENSE MANUAL*.

Complete FCC Regulations —in addition to sample questions for Novice, Technician, General, Advanced and the Extra Class examinations.

**\$1.00**

POSTPAID

*The* AMERICAN RADIO  
RELAY LEAGUE INC.  
NEWINGTON, CONN. 06111

OZK	0100 Dy	1790	WA5TLS
CAREN	0200 Th	146,34/94	W50DF
Ark Phone	1200 M-S	3937	W5YVW
Frost Office	2130 M-F	3925	W50BD
Ozark	2330 Dy	3995	WA5ZKL

Repeaters: W5DI-Little Rock 146.34/94; W5YUJ-Fort Smith 146.34/94. Traffic: W5ZKE 91, W5TLS 40, W5SOQ 14, W5EYVW 6.

LOUISIANA — SCM, J. Allen Swanson, Jr., W5PM — SEC: W5OB, RM: W5QVE, PAM: W5NYY, VHF: PAM: W5DXA. My apologies, fellows for no column last month. The Lafayette RC reminds us the 7th Annual La. QSO Party will be held the week end of Jan. 15, 1972 starting at 1800 GMT. Logs to K5ARH. W5WXD and W5CIC/S earned their Section Net certificates. Anyone looking for skeds into NOLA check into the AREU Net Wed. 2000 at 50.4. WB2UE/G/S who won the N.Y. QSO Party for La. passed his Extra Class exam. W5ZZA who recently passed his Advanced says his son W5TYI has passed his Extra and his father has just received his Tech with the call W5ZZNI. W5WPO has been active on 6 and reports that 2-meter activity in Lafayette is picking up. RM, W5NYY reports the newly-formed LTN is growing by leaps and bounds (0100 on 3915). W5EA would like to locate an sbx exciter for a Globe Champion. W5QVN is the proud owner of a new Yaesu 400. The Twin City hams helped the Monroe police with a "Goblin Patrol" — 7 mobiles on 6-meter fm. W5OUD is the latest addition to the 2-meter activity in the WARC. This gang can be found on 146.8. W5PWX enjoyed a holiday to the mountains. W5OB still chasing DX is excited over working VU7US. The Ozene ARC of Slidell have acquired a parcel of land for their own club quarters. K5CME, W5BOE are new members of the I-ARC. Yours truly now has 333 confirmed for DX. Traffic: W5VOE 172, WB2UE/G/S 116, W5NYY 31, W5WBZ 30, W5QVN 16, W5EA 6.

MISSISSIPPI — SCM, Walker J. Coffey, W5NCB — SEC: W5JWD, RM: W5TMC, W5YZW, PAM: W5JHS, W5KEL, K5MDX. Appointments: W5JTB, K5YTA, K5KTL as OPS; W5PDG as OVS; K5LWS as QO; W5JTB as EC for Prentiss County. W5BW, K5BLN and W5CGT were in the hospital. Welcome to new hams WN5s FDI, FDL, FJW, FGA, FGC, FGX, FEB, FEC, FEI, FIC, FIN, FMI, and FPA. K5KTL observed his 90th birthday in Oct. He checks into the MSBN regularly and handles traffic. The Delta QSO Party had 247 stations on the air. W5RUB did his usual good job of handling the paper work. Gulf Coast ARC plan to run theory (W5PDG) and code (W5SSUL) classes. W5SSUL has endorsement for 140 countries. W5WQT is working on his DXCC. Has 80 confirmed. Congrats to W5SBM as new RNS Net Mgr. W5BKM and W5STW have their Advanced Class tickets.

Net	Freq.	GMT/Days	QNI	QTC	Mgr.
MTN	3665	0045 Dy	144	96	W5Y73W
MNN	3743	0000 MW*	42	14	W5TMC
GCSBN	3925	0030 Dy	-	-	W5JHS
CGCHN	3945	0100 Dy	1522	60	K5MOJ
MSBN	3990	0015 Dy	1168	130	W5STW
CGCHN*			1593	64	K5MOJ

\*Aug. Correction. Traffic: W5SBM 345, W5YZW 168, W5LDT 115, W5NCB 61, W5DFK 49, W5WZ 42, W5AHE 27, W5TMC 21, K8YUW/5 13, W5RUB 10, W5BKM 9, K5YTA 9, W5SKYB 8.

TENNESSEE — SCM, O.D. Keaton, WA4GLS — SEC: WB4ANX, PAM: W4PFP, WA4EWW, K4MOI, RM: WB4DAI.

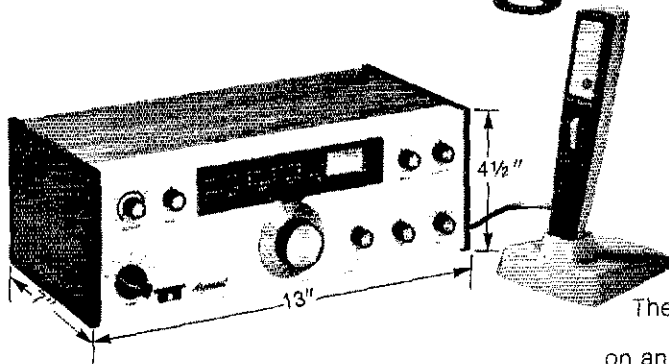
Net	Freq.	Time(D)/Days	Ses	QNI	QTC	Mgr.
IN	3635	0100 Dy	31			WB4DAI
E.PPN	3980	1140 M-F	21	493	17	WA4LWW
PPN	3980	1245 M-F	31	1604	71	W4PFP
		1400 S-Su				
TSSBN	3980	0030 T-Su	25	1610	111	K4MOI
MTCMN	28.8	0200 T&F	8	83	0	WA4GLS
FTTMN	28.7	0200 M&F				WA4QCX
LJVFH	50.4	0000 TTh&S	10	58		WB4IOB
EJVFH	445.2	0000 W&F	4	25		WB4IOB
CCN	3980	0100 Th	4	37		WB4MPI
KVHFN	50.7	0100 T	4	27		WB4MPI
IHARCN	7268	0030 W&F	8	99	6	WB4QNK

Everyone get ready for the SFT on Jan. 29 and 30 and let's make this the most successful SFT in history. Traffic: WB4HD 161, WB4DAI 144, W4ZJY 121, K4CNY 114, W4QGG 81, W4RUW 43, W4WBK 41, WB4HSS 20, WB4MPI 18, W4UWM 18, K4AIC 17, WB4ANX 15, W4PFP 11, W4SYE 11, WB4MYZ 9, K4SJV 8, WB4FVM 7, WB4BZC 6, WB4LHV 6, W4VJ 4, K4LOO 3, K4UMW 1.

**GREAT LAKES DIVISION**

KENTUCKY — SCM, Ted H. Huddle, W4CID — SEC: K4YZU. Endorsements: WA4VZZ as ORS; WA4AGH as OPS; W4BEJ as PAM; KRN; K4AVX as EC; K4UNW as OO.

# introducing the Argonaut.



The Argonaut is for every ham.  
A transceiver that operates  
on an AC pack or lantern battery.  
Covers Amateur bands 80-10, SSB and CW.

A little bored with high power? Substitute skill for brute force and thrill to the challenge of conquering distance with a few but potent watts.

Operate the Argonaut anywhere. Slip it into a suitcase when traveling (it occupies less than 1/5 cubic foot). Enjoy it in a motel, campgrounds, on the beach or patio, or carry it as a backpack when hiking.

Sailing? Tie down the mainsheet and enjoy a QSO. Flying? Keep in contact with the world. Motoring in a car, camper or trailer? Go mobile without tedious installation.

The Argonaut is more than just fun. It is always ready for the serious business of providing emergency communication when commercial power fails. It augments one of the great public services of Amateur Radio.

The Argonaut is for every ham.

The Argonaut is for you.

<b>Argonaut Price</b>	<b>\$288.00</b>
<b>AC Power Supply</b>	<b>\$ 24.95</b>
<b>Microphone, EV PTT</b>	<b>\$ 17.00</b>

## SPECIFICATIONS

**GENERAL:** Frequency range in MHz: 3.5-4.0, 7.0-7.5, 14.0-14.5, 21.0-21.5, 28.0-30.0. 9 MHz crystal filter. 2.5 kHz bandwidth 1.7 shape factor at 6/50 dB. Automatic side-band selection, reversible. Completely solid state. All circuits permeability tuned. Tuning rate approximately 25 kHz per revolution. Size: HWD 4 1/2" x 13" x 7". Weight approximately 5 lbs.

**RECEIVER:** Sensitivity less than 1/2 uv for 10 dB S + N/N. Backlash less than 50 Hz. S-meter. AGC fast attack, slow delay. CW side tone. Incremental tuning. Separate af and rf gain controls. Frequency response 300-3000 Hz. Distortion less than 2%. Built-in speaker. Drift less than 100 Hz. Dial accuracy  $\pm 5$  kHz (slightly more in 28 MHz).

**TRANSMITTER:** Power input: 5 watts PEP SSB, 5 watts CW. Output circuit: broad band 50-75 ohm impedance. Actuation: Press-to-talk. Full break-in for CW. Built-in SWR bridge. Integral TVI filter. Drift less than 100 Hz.

TEN-TEC dealers will have Argonauts in stock soon. If there is no dealer in your area, order direct and include \$2.00 for shipping. Tennessee residents, add 3 1/2% sales tax).

Dept. G2

**TEN-TEC, INC.**  
SEVIERVILLE, TENNESSEE 37862

**FOUR POLE  
VHF/UHF  
OMNIDIRECTIONAL  
GAIN ANTENNAS  
FOR AMATEUR FM  
REPEATER OR  
COMMERCIAL SERVICE**

40' DIAMETER 2.45 GHz \$42.50  
50' DIAMETER 2.45 GHz \$38.50

IN STOCK AT YOUR  
LOCAL DEALER



621 HAYWARD STREET  
MANCHESTER, N. H. 03103

Net	Freq.	Time(Z)/Days	QNI	QTC
KRN	3960	1130 Dy	390	7
MKPN	3960	1330 Dy	612	7
KYN	3600	0100 Dy	344	51
KSN	3600	0300 Dy	344	31
KLN	3960	0600 Dy	1237	144
ENTN	3725	0200 Dy	252	86
KREN	3628.5	2:45 Dy	8	0
EPON	3945	1800 S	100	3
CUATN	50.4	0200 Dy	85	15

The Kentucky Teletype Net needs you! KRTN QNI and QTC are way down. W4BAZ reports that KYN has more cities than ever QNI. WN4WKL has been working DX (ZS3G3) since receiving his ticket in Sept. The Lexington Hamfest was cold but successful. WA4JQS and K4MAN walked off with first and second prize. Somerset will have a 2-meter repeater sometime around the first of the year. WA4JQS has a new Swan 250C. Don't forget the SLE 1 Jan. 29, 30. The SEC planning meeting will be held in Louisville Jan. 16 at the US42 Holiday Inn. Traffic: W4BAZ 167, WB4PVC 139, K4PW 118, WA4DYI 89, K4MAN 69, W4CID 68, K4UNW 66, WB4PSJ 65, WA4VZZ 65, WN4UGU 61, WA4JQS 58, WB4KPI 53, WB4LGH 47, W4OYI 44, WA4AGH 31, K4JRT 31, WA4MXD 26, W4OXM 23, K4TXJ 21, WB4TF 17, WB4AUN 16, W4NBZ 16, WB4AVV 12, WB4PQY 12, K4HOI 12, WA4HLW 7, K4LOL 6, WA4FAI 5, K4AVX 4, WB4GCV 4, WA4MLX 3, WN4PW 3, WN4WCM 3, W4BFA 2, WN4WKL 1, WA4WWA 1. Total: reports 35, traffic 1365.

MICHIGAN - SCM, Ivory J. Olinghouse, W8ZBT - Asst. SCM. B. Peter Treub, W8KBZ. SEC: W8MPD. RMs: W8JYA, W8WVL, W8RIN, W8DUL, K8KMQ. PAMs: W8STAN, K8MIK, K8PVC. VHF PAMs: K8AEM, W8WVV.

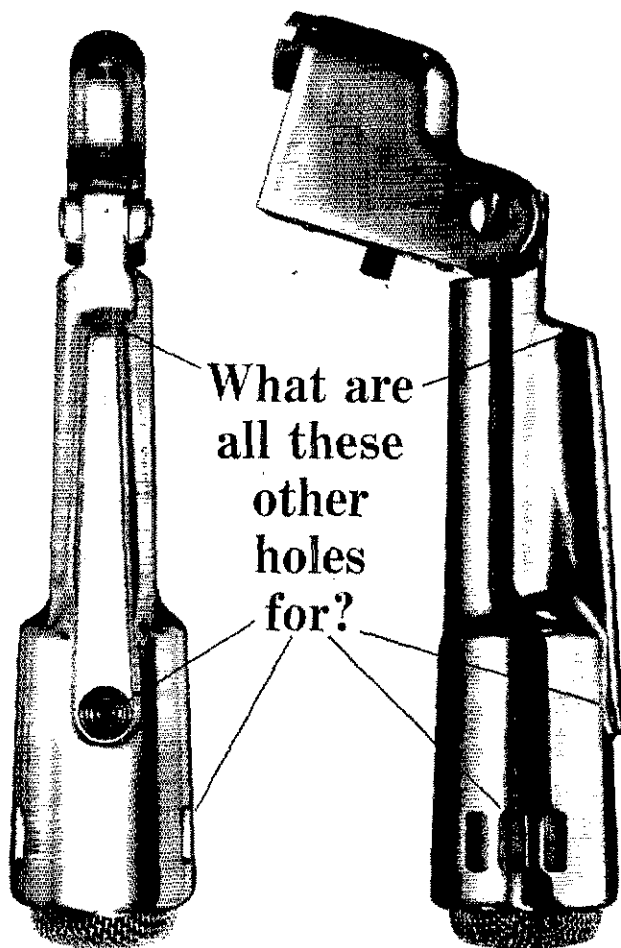
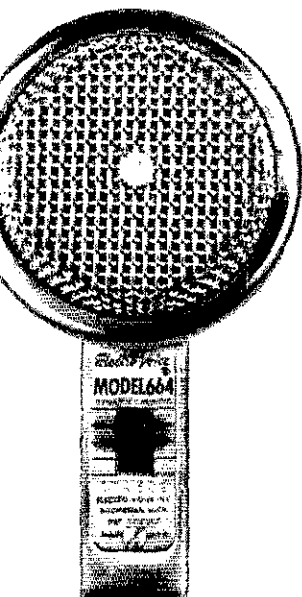
Net	Freq.	Time/Days	QNI	QTC	Secs.	Mgr.
GMN	3663	2300 Dy	1100	387	93	W8JYA
WSSB	3935	0000 Dy	725	132	30	K8PVC
BRIMEN	3930	2230 S-F	840	82	25	W8STAN
UPLN	3920	2230 Dy	396	49	31	E8MJE
GLEFN	3932	0230 Dy	634	106	30	W8RHF
POH	3955	1600 Dy	773	277	31	K8LNE
PDN/CW	3645	2400 M-S	194	23	26	V1 DPC
MLOM	50.7	0000 M-S	232	20	21	W8LRC

SEMARa elected the following officers for 1972: W8BRH, pres.; W8BBW, vice-pres.; W8GV, secy.; W88NYK, treas.; W88BAU, Sgt.-at-arms; K8DX and W8IHX, dir. The Marquette and Menominee ARC officers for 1972 are: K8CQW, pres.; K8ICQ, vice-pres.; W89DR, secy.-treas. The M and M Net meets Sun. at 1:30 on 3907 MHz with K9PP as NCS. The ARPSC Conference held a Trenton was a big success with more than 50 amateurs present to the forums. Next conference will be held in West Va. Hazel Park ARC now has 211 members and mailed 196 bulletins for Nov. Their license classes had 58 novices and 49 hams in the General and Advanced classes. The club sponsors cw practice on 146.16 MHz Mon. through Sat. 7:00 to 8:00 P.M. at speeds 8, 10, 12 and 14 wpr. Operators are W8MHQ, W8BJYX and W8SVEN. The Muskego Area ARC are now planning for the Division Convention Mar. 17-18, 1972. They want it to be bigger and better than 1971. BAR has started plans for the annual Blossomland hamfest and auction to be held in Mar. SKARS held it's yearly Spook Patrol the evenings of Oct. 29 and 30. Seven mobiles participated each night. W88NP has a new eleven-element Cush Craft beam and a new Advance Class ticket. W88FO is a new Advanced Class licensee at Hillsdale. W88BPY is using a new Swan 500. W88LEZ is getting a new HW-101. K8JNZ and W8CKK are preparing for operation on 22. W88TV is back on the air on 160. W88P is now located in the Lansing area. W88BU8 has moved to Palo Alto, Calif. from Lansing. W88BJJ is busy on the Intercontinental Traffic Net. 2 patches in Oct. W88WVV also ran 8 patches. Traffic: Oct. W88WZL 354, W88PIM 214, W88LXY 166, K8KMQ 157, W81140, W88ELU 134, K8LNE 116, W88DUL 87, W88SUC 7, W88ZBT 75, W88RAXI 62, K8DYI 56, K8PVC 55, W88VY 5, W88RTN 53, K8MIK 50, W88MO 47, W88LU 46, W88BPY 4, W88NMI 41, W88BJJ 39, W88NOH 38, W88ENW 36, W88LEZ 3, W88ZDL 33, W88RBI 30, W88QNZ 27, K8JED 26, W88FXR 2, W88RHE 24, K8WRJ 22, W88DCN 18, K8COU 17, W88OJI 1, W88PO 17, W88ACW 15, K8PI 15, K8TAK 15, W88BI 1, W88FZL 13, W88IIPZ 13, K8MXC 12, W88FX 11, W88VKM 1, W88BYB 9, K8CPW 9, K8IHA 8, W88US 8, K8AEM 7, W88DK 7, K8ACO 5, W88AGQ 5, W88VY 4, W88WVV 4, W88ANK, W88FFZ 2, W88FZ 2, W88UC 2, W88RYX 1. (Sept.) K8KMQ 22, W88VY 61, K8PEO 10, W88ACW 7.

OHIO - SCM, Richard A. Egbert, W8EFD - SEC: W8OU, RM: W8IMI. PAM: K8UBK. VHF PAM: W8ABDU.

Net	QNI	QTC	Secs.	Freq.	Time(Z)	Mgr.
OSSBN	2771	870	63	3972.5	1530/2345	K8UI

If the  
**Electro-Voice**  
**Model 664**  
 picks up  
 sound here...



What are  
 all these  
 other  
 holes  
 for?

The holes in the top, sides and rear of the Electro-Voice Model 664 make it one of the finest dynamic cardioid microphones you buy. These holes reduce sound up at the sides, and practically eliminate sound arriving from the rear. Only an Electro-Voice Variable-D microphone has them.

Behind the slots on each side is an acoustic "window" that leads directly to the back of the 664's "alloy" diaphragm. The route is short, small, and designed to let highs get through. The path is so angled that when highs from the back of the 664 arrive, they are so loud they are almost 20 db. Those arriving from the front aren't. Why two "windows"? So sound rejection is uniform and consistent regardless of microphone placement.

The hole on top is for the mid-range. It works the same, but with a longer path and added filters to

near the rear is another hole for the lows, with an even longer path and more filtering that delays only the bass sounds, again providing almost 20 db of cancellation of sounds arriving from the rear. This "three-way" system of ports insures that the cancellation of sound from the back is just as uniform as the pickup of sound from the front—without any loss of sensitivity. The result is uniform cardioid effectiveness at every frequency for outstanding noise and feedback control.

Most other cardioid-type microphones have a single cancellation port for all frequencies. At best, this is a compromise, and indeed, many of these "single-hole" cardioids are actually omnidirectional at one frequency or another!

In addition to high sensitivity to shock and wind noises, single-port cardioid microphones also suffer from proximity effect. As you get ultra-close, bass response rises,

this varying bass response—except use a Variable-D microphone with multi-port design\* that eliminates this problem completely.

Because it works better, the E-V 664 Dynamic Cardioid is one of the most popular directional microphones for demanding communications applications. To learn more about Variable-D microphones, write for our free booklet, "The Directional Microphone Story." Then see and try the E-V 664 at your nearby Electro-Voice microphone headquarters. Just \$95.00 in satin chrome or non-reflecting gray.

\*Pat. No. 3,115,207

**ELECTRO-VOICE, INC.**, Dept. 122Q  
 631 Cecil St., Buchanan, Mich. 49107



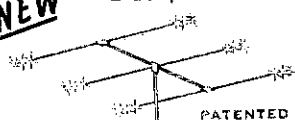
• LEADERS IN COMPACT ANTENNAS •  
**MAXIMUM EFFICIENCY/MINIMUM SIZE**  
**FOR APARTMENTS • SUBURBAN HOMES**

Marine and Portable Operation  
 Packaged for APO and FPO Shipping

ALL MODELS COMPLETELY WEATHERPROOFED

**NEW**

**B-24 + RK-3 COMBINATION**

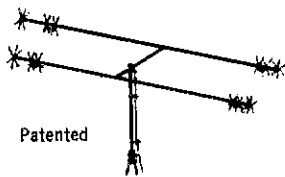


**3 ELEMENTS**  
**10-15-20 METERS**

Bands	10-15-20 Meters
Power Rating	1400 Watts P. E. P.
Total Boom Length	11'
Turning Radius	7'-10"
Total Weight	23 lbs.
Single Feed Line	52 ohm
SWR at Resonance	1.5 to 1.0 max.

**B-24 + RK-3 Combination Net \$94.95**  
**RK-3 Reflector Kit (only) Net \$36.95**

The features of the popular B-24 plus the new RK-3 reflector kit make a unique 3 element combination. Choose the combination or add the RK-3 to your present B-24 and enjoy the improved gain and front to back.



**6-10-15-20 METERS**

The time proven B-24 4-Band antenna combines maximum efficiency and compact design to provide an excellent antenna where space is a factor. New end loading for maximum radiation efficiency. No center loading.

Bands	6-10-15-20 Meters
Power Rating	1400 Watts P.E.P.
El. Length	11'
Turn. Radius	7'
Total Weight	13 lbs.
Single Feed Line	52 ohm
SWR at Resonance	1.5 to 1.0 max.

**Model B-24**  
**Net \$62.95**

**MULTIBAND COAXIAL ANTENNA**  
**for 6-10-15-20 METERS**

Needs no ground plane radials. Full electrical 1/2 wave on each band. Excellent quality construction. Mount with inexpensive TV hardware. Patented.

Power Rating	1400 Watts P.E.P.
Total Weight	6 lbs.
Height	11'
Single Feed Line	52 ohm
SWR at Resonance	1.5 to 1.0 max.

**Model C4 Net \$36.95**

Send for Free Brochure  
 If there is no stocking distributor near you order direct from factory. We pay shipping to your QTH if in Continental U. S. A.

**Mini-Products, Inc.**

1001 W. 18th Street • Erie, Pennsylvania 16502

BN	636	363	61	3580	0900/0300	WRMI
06MtrN	510	61	63	50.61	0000	WARADU
CSN	183	68	31	3580	2325	WBWAK
HN RTTY	223	56	31	3605	2300	WASYUB

BPLs for Oct. went to W8QCU and K8ONA. Certificates for regular participation in Buckeye Net went to WB10K, K8MLO, WA8ZTV, WA8UP, W8ENI, K8DHI and WB8FLZ. WB8CWD is a new OPS and WB8DQU takes over EC duties for Wayne and Holmes Counties. Lancaster and Fairfield Co. ARC elected WA8STH, pres.; WA8JHJ, vice-pres.; WA8VCV, secy.; WA8SSJ, treas. Buckeye Net Bulletin says that K8DMZ back-packed across Idaho with sleeping bag, gun and camera, but no rig. The Fall meeting of the Ohio Council of Amateur Radio Clubs was attended by 35 representing 20 organizations. The next (Spring) meeting will be held Mar. 11. Contact W80UU for details. K8ONA was presented with the Veterans Award for 1971 by the Cuyahoga Co. Joint Veterans' Commission for her traffic-handling efforts on behalf of our servicemen. The Aviation RC's new officers are W8FMG, pres.; WA8JH, vice-pres.; W8TNK, secy.; WA8LUR, treas. K8UUA is now KL7HFJ. The W8 QSL Bureau reminds all who would like to receive cards sent via the Bureau to have an SASE on file. The address is 280 East Broad St., Columbus. With regret I report K81BU joined Silent Keys. The Ohio Single Sideband Net once again conducted a "Candidate Forum" on the air, during which each of the Director and Vice-Director candidates had an opportunity to present his platform and to answer questions submitted by interested parties. The forum was ably moderated by WA8MHQ. The Fifth Light Region ARPS Conference attracted 50 from Mich., W. Va. and Ohio to Trenton Mich. Hosts were Mich. NEC W8MPD and the Motor City RC. Next year's Forum will be at Huntington, W. Va. I attended meetings of the Westpark Radops. and the Treaty City RC. The 1972 SET will be held Jan. 29 and 30. Help keep Ohio on the top of the pile ARPS-wise. Get in touch with your EC and check on the Section Net schedules. Best wishes to all for a Happy and Prosperous New Year. Traffic: (Oct.) WA8FJX 329, W8QCU 280, W8CUI 329, WA8DWL 217, WB8ALU 216, WRMI 214, WB8MD 209, K8ONA 209, W80E 207, WB8GLD 176, W8WAK 160, WA8CY 157, WA8UP 121, WA8ZTV 113, W8JD 98, W8RY 91, W8MOK 94, W8GVX 92, WA8FCO 84, WB8BLH 82, WA8YF 76, WA8GZE 75, K8UBK 74, WA8FW 64, WA8QFK 64, W8QZK 64, WB8CWD 63, W8CHT 60, W8LI 59, K8LGA 56, WA8SLD 53, WA8NOQ 52, K8MLO 51, WA8HGH 50, WB8IC 50, W8UDG 47, W8GRI 41, W8BHL 36, WA8YB 36, W8UX 35, W8VWH 35, K8DHI 33, W8FXD 28, W8GNI 28, WA8VLF 27, WB8AJC 25, WARADU 23, K8BPX 21, W8FNC 20, W8ARW 17, WA8SSJ 17, W8CXM 14, W8BLAM 14, W8GDF 13, W8RAYC 11, WB8AL 10, K8OYR 10, WA8SH 10, W8RRU 9, W8LIC 9, W80UU 9, WA8FX 9, W8ERD 8, W8ETU 8, W8KPN 8, K8MPR 8, W8P8B 8, W8JLE 7, W8RELZ 6, WA8AJZ 5, K8LFI 5, K8LRK 5, W8AMH 3, W8AVNU 5, W8MCR 4, W8B8S 3, W8BJSW 3, K8CKY 2, W8DYF 2. (Sept.) WA8CY 89, W8RY 71.

**HUDSON DIVISION**

EASTERN NEW YORK - SCM, Graham G. Berry, K25JN. Asst. SCM/PAM: Kenneth M. Kroth, WB2VJB. SEC: W2URP, RM WA2VYS. VHF PAM: WB2YQU. Nets: FSX 2300Z daily 3.590 (1 1/2 wpm) NYS 100Z and 0300Z daily 3.675. NY County Net 1400 Snc., 0045Z Tue-Fri, 3.667. NYSPT&EN 2300Z daily on 3.92. Around the section: Congrats to W2PV on winning the May '71 QST Cover Plaque - 2 time winner, with award presented by Director W2TUK. And to K2CBA on winning the Technical Merit Award for his work on 220. FMers note: Westchester Co. ARC meets Wed. 2000 local, 4.460 and 145.680 m. 147.060 out v. K2AVP. Extended coverage available, so drop in. Many area clubs and hams congratulating W2FZ in the Bronx - Frank has directed the Bronx ARC for all 50 of its years of existence! Individual station activities: Renewal this month of W2SZ's ORS appointment finds WA2DFI, WA2JLV and WA2FBI among the traffic handlers RPI this year. K2BK/VP9 during Oct. WA2MJM in new OTH, w. Overlook ME. ARC gang holding antenna raising party. WB2A, back after 4 years in the Coast Guard. WA2KXM control status pending call for new Harmonic Hills ARC Repeater. WB2OLQ new Advanced Class. On the club circuit: Harmonic Hills RC Annual Dinner held Oct. 3. Albany ARA held its traditional ladies night-speaker from Niagara Mohawk Power Co. on new nuclear power plant in Oswego. Crystal RC of Valley Cottage heard SCM appointments etc. Schenectady Auction - Flea Market meeting had special entertainment staged by W2ODC. Auctioneers: WA2AHC and W2AZH. Communications Club of New Rochelle heard K2TTY on testing methods used by Consumers Union. N. officers: Colonie Central HS (Albany) Club WN2RTV, pres.

# CONSIDERABLY SPECIAL CONSIDERING THE SPECS

NEW 2 METER FM TRANSCEIVER

Model SRC-146



Frequency .....143-149 MHz  
(2MHz spread)  
Number of channels.....5  
Supplied with 146.94 simplex,  
146.34/.94 (same plug in  
crystals as SR-C826M)  
R.F. Output.....1 watt minimum  
Sensitivity.....better than 0.4  
uv/20 DB Q.S.  
Audio output.....500 mw  
Meter .....monitors battery voltage on  
Tx, S Meter on Rx  
Current drain.....400 maTx,  
15 maRx SBY  
Size.....8<sup>3</sup>/<sub>8</sub>" high x 3" wide, x 1<sup>1</sup>/<sub>8</sub>" deep  
Weight .....24 oz., less  
batteries

Options: external mic, or mic-speaker, stubby flexible antenna, desk top charger, leather case.

**\$279<sup>00</sup>**  
Suggested  
Amateur  
Net Price



Consider the new VHF-FM hand held Transceiver by Standard Communications Corp., with exclusive Astropoint design. For complete specifications and the name of your nearest dealer, write:

**STANDARD COMMUNICATIONS CORP.**

639 North Marine Avenue, Wilmington, California 90744, (213) 775-6284

# HAM RADIO SPECIALS

## 400 mc 2.99 ea.

NPN HIGH POWER  
UHF TRANSISTORS

2N3632 23W, 3A.



## BRAND NEW! LINEAR IC AMPS

Type	Description	Sale	Price
<input type="checkbox"/>	703 RF-IF, 14 hookups, TO-5	\$1.19	3 for \$3.00
<input type="checkbox"/>	709C Operational Amp ***	.59	2 for 1.00
<input type="checkbox"/>	710C Differential Amp***	.59	2 for 1.00
<input type="checkbox"/>	711C Memory, Sense, Amp***	.59	2 for 1.00
<input type="checkbox"/>	723A Voltage Regulator (DIP)	1.49	3 for 3.75
<input type="checkbox"/>	TVR-2000 Hi-power 723 (DIP)	1.59	3 for 3.95
<input type="checkbox"/>	741C Freq. Comp, 709***	.95	3 for 2.50
<input type="checkbox"/>	748C Freq. Adjustable 741***	.95	3 for 2.50
<input type="checkbox"/>	709-709 Dual 709's (DIP)	1.49	3 for 4.00
<input type="checkbox"/>	741-741 Dual 741's (DIP)	1.98	3 for 5.50
<input type="checkbox"/>	749-749 Stereo Preamp (DIP)	1.98	3 for 5.50

\*\*\* State 1st, 2nd choice. Dual In Line, TO-5.

## FAIRCHILD IC SALE

75¢ 3 for \$2.00

• Factory GUARANTEED!

- 914 Dual 2 In. Gate
- 923 JK Flip Flop



Phase Locked Loop

NATIONAL  
LM565

\$4.95



## LIGHT EMITTING DIODES

Use as logic readouts, either on panel or right on cards. Infinite life.

\$1 Visible



## VARACTOR DIODES

5 for \$1

Variable tuner capacitance diodes. For 100's of tuning circuits. Kit includes: 5-10pf, 10-20pf, 20-30pf, 30-40pf, 40-50pf.

2.5 AMP 1000 SILICON RECT

4 for \$1

- EPOXY
- Microminiature
- Obsolete "bullets"



## GIANT SALE ON NEW TTL TEXAS & NATIONAL ICs

Buy Any 3 — Take 10% Discount!

\*Factory Tested! \*Factory Guaranteed!

Type	Function	Price
<input type="checkbox"/>	SN7400N Quad 2 input NAND gate	.45
<input type="checkbox"/>	SN7401N SN7400 with open collect	.45
<input type="checkbox"/>	SN7402N Quad 2 input NOR gate	.45
<input type="checkbox"/>	SN7404N Hex Inverter	.45
<input type="checkbox"/>	SN7405N Hex inverter, open collect	.45
<input type="checkbox"/>	SN7410N Triple 3 input NAND gate	.45
<input type="checkbox"/>	SN7420N Dual 4 input NAND gate	.45
<input type="checkbox"/>	SN7430N 8 input NAND gate	.45
<input type="checkbox"/>	SN7440N Dual 4 input NAND buffer	.45
<input type="checkbox"/>	SN7441N BCD-to-Decimal driver	1.50
<input type="checkbox"/>	SN7446N BCD-to-7 seg. dec. driver	2.25
<input type="checkbox"/>	SN7447N BCD-to-7 seg. dec. driver	2.25
<input type="checkbox"/>	SN7472N J-K Master slave flip-flop	.69
<input type="checkbox"/>	SN7473N Dual J-K Master slave flip-flop	.88
<input type="checkbox"/>	SN7474N Dual D triggered flip flop	.69
<input type="checkbox"/>	SN7475N Quad bistable latch	1.50
<input type="checkbox"/>	SN7476N SN7473, with preset-n-clear	.88
<input type="checkbox"/>	SN7481N 16-bit memory (scratch pad)	1.50
<input type="checkbox"/>	SN7483N 4-bit binary full adder	2.25
<input type="checkbox"/>	SN7489N Decade counter	1.95
<input type="checkbox"/>	SN7491N 5-bit shift register	1.50
<input type="checkbox"/>	SN7492N Divide by 12 counter	1.50
<input type="checkbox"/>	SN7493N 4-bit binary counter	1.50
<input type="checkbox"/>	SN7494N 4-bit shift register	1.50
<input type="checkbox"/>	SN7495N 4-bit register right-N-left	1.50

15¢ CATALOG on Fiber Optics, 'ICs', Semi's, Parts

Terms: add postage. Rated: net 30, rod's 25%  
Phone Orders: Wakefield, Mass. (617) 245-8829  
Retail: 211 Albion St., Wakefield, Mass.

## POLY PAKS

P.O. BOX 942 M  
Lynnfield, Mass.  
01940

WN2SKD, vice-pres.; WN2SKF, secy-treas.; WN2RYB, ops. mgr.; WN2SKB, OSI. mgr.; WB2KIQ, chief engr. PAM WB2VJB reports NYSPT&EN 9 month operations figures: QNT 11,119, QNC 780, 270 hours of operating time! New Year's greetings to section from the "staff." Traffic: WA2VLS 203, W2SZ 140, K2SJN 57, WB2LXC 49, WB2IXW 46, W2URP 35, WB2JLR 28, WA2VYS 25, WB2VJB 24, WA2WGS 18, WA2LXI 14, W2UC 12, WB2KDC/2 10, WB2AJD 9, WA2LXI 7, WA2QCY 6, WB2FUV 3, W2OOJ 3.

NEW YORK CITY AND LONG ISLAND - SCM, Fred J. Brunjes, K2DGI SEC: K2OVN, RM: K2UAT. HF PAM WA2UWA. VHF PAM: WB2ROF. The following are major ARRL nets, join one!

Area	Frequency	Time	Power
Bronx	28.64 MHz	50.35 MHz	146.17 MHz
Brooklyn	28.64 MHz	50.35 MHz	146.26 MHz
Richmond			146.88 fm
New York	29.50 MHz	50.48 MHz	
Queens	29.50 MHz	50.20 MHz	145.62 MHz
Nassau	28.72 MHz		145.32 MHz
Suffolk		53.51 MHz	146.82 fm
Brookhaven		50.46 MHz	146.82 fm
Huntington	28.30 MHz	50.40 MHz	146.82 fm

Note: Nets usually open 2000 local. Mon. Happy New Year! I trust all had a very nice Holiday Season. It is again my pleasure to serve as your SCM for the next two years. I would like to thank everyone who has tolerated my first term as SCM. I will be looking for your continued support and understanding during my second term as I strive to complete the upgrading and reorganization of the NLI Section. With a new year goes new club officers: Order of Boiled Owls - K2DDK, pres.; W2YCW, vice-pres.; W2GC, secy-treas. W2PF was retired as secy, and dir. of QUWA after 25 years of service! W2ZY had a successful Open House at Brookhaven National Labs in Oct. Over 1000 pieces of traffic handled by 16 operators during the 7 day period. Speaking of traffic: A new slow speed training net (NLS) will commence operation in Jan. 1972 at 2345 GMT (1845 EST) Mon. through Fri. on 3730 kHz. This net is for those interested in traffic operations, whether a newcomer to traffic or an old hand looking to brush up. The net will function on a trial basis during the months of Jan. and Feb., and if the interest is there, it will continue as a permanent Net of NLI. For detailed information, contact WA2UWA, P.O. Box 1158, E. Hampton, N.Y. 11937. WB2LGA reports having fun in the Oct. CD Party despite old Murphy hanging around the shack! Well, it looks like W2LW beat jack frost to the punch this time. Seems Hank has all those trees wired up for sound or something! Congratulations to WB2OYV on his appointment as OPS. K2UDP formerly with Heathkit, Westbury, now is Manager of the new Rochester store. The Hudson Amateur Radio Council is rounding out a speakers bureau for clubs in the Hudson Division. Interested parties contact K2ILS, 6 York Ave. Rye, N.Y. 10580. If your club has had a speaker you think would be of merit to others, give the information to K2ILS. HARC is attempting to expand its services to member clubs, support is needed from member clubs. If you would like to participate in Council affairs contact your HARC representative prior to the Annual Meeting, Jan. 29. Contact K2SJO for information. (13 Jennifer Lane, Port Chester, N.Y. 10573). BPLs: WA2UWA, W2ZY, Traffic: WA2UWA 1018, W2ZY 1107, WB2LZN 393, WB2LGA 184, WB2OYV 91, W2EC 79, WB2WFJ 48, WA2JDX 24, WB2DZZ 18, K2YFF 17, WA1MVL/2 14, W2DSC 8, W2PF 5, W2EW 2, WA2MITP 2.

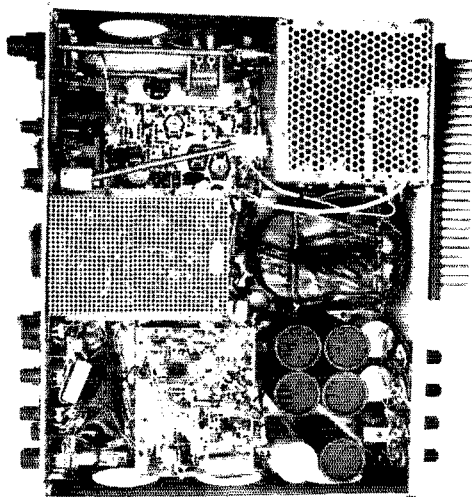
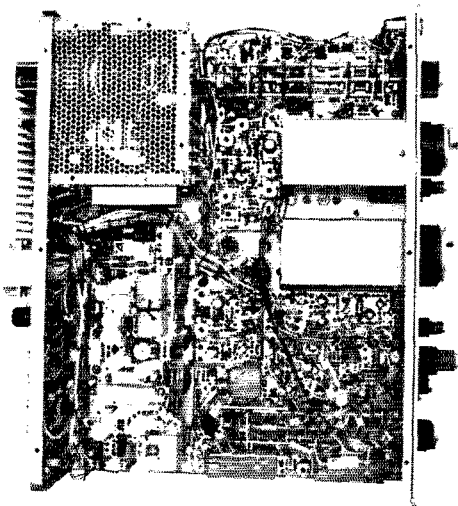
NORTHERN NEW JERSEY - SCM, Louis J. Amoroso, W2ZZ - SEC: K2KDO, RM: WA2TAF and WA2BAN, PAMs: K2KDO and WA2TAF.

Net	kHz	Time (PM)	Days	Seas.	QNT	Loc.	Mgr
NJN	3695	7:00 Dy	31	444	245	WA2BAN	
NJN	3695	10:00 Dy	31	180	56	WA2BAN	
NJSN	3740	8:00 Dy	9	21	6	WA2YVE	
NJEPJN	3950	6:00 Dy	31	479	120	WA2TAF	
PV1BN	145710	7:30 Dy	31	147	37	WA2HW	
ECTN	145800	8:30 Dy	28	121	29	WB2LW	

New appointments: WA2BAT as EC for Springfield and vicinity WB2AEH as EC for Holmdel Township and vicinity. WB2YPO is Net Mgr. for the reactivated Navesink Net which meets each Sun. at 8 P.M. on 145.8 MHz. WA2VH reports that 3 more members of his slow have moved up to General Class. He needs help to keep NJSN active and is looking for NCS. W2CVW operated 4U1IT during his recent trip to Europe. WB2NOM enjoyed the recent CI party while home from college. WB2KNS is now on RTTY. W2FI reports that WA2AHH is a new Tech. in Toms River and is planning 2-meter fm. WA2HJ is attending Rutgers Graduate School. We regret to note the passing of W2FWZ a regular in NJN. He will be missed by his many friends. WA2UDT is building a new kw 100 ft 2 meters. WB2KLD has a new tower and SB-300. WA2INO passes



# We built every imaginable feature into the CX7A.



## Including reliability.

The CX7A was designed as the amateur's ultimate rig and every conceivable feature you could want was incorporated.

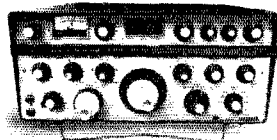
As you can imagine, this design resulted in some pretty complicated circuitry. And at first there were bugs. There always are when you're treading new paths.

Some of the first sets did their job so enthusiastically they went right up in smoke. So we went over the problems with a fine-toothed comb. We learned a lot, and we did something about it.

Now we buy only the finest components obtainable. And we check each component individually. Every resistor, every semiconductor, every whatever, is "burnt-in" before it's put in.

So now when you crank up a CX7A it'll smoke all right — with the heaviest talk power and most sensitive receiver of any rig you can buy. And you can rely on that. For it, you pay \$2,195.

See the CX7A at your signal/one dealer. Or write us for a detailed brochure about it. Then buy one. You'll be the most reliable operator in town.



**signal/one**

a subsidiary of

**Computer Measurements, Inc.**

1645 West 135th Street  
Gardena, California 90249  
Phone: (213) 532-9752

# HAL DEVICES



**HAL DEVICES  
MODEL 1550  
ELECTRONIC KEYS**

All the features of previous HAL keyers and more. TTL circuitry. Optional identifier for sending all letters. DX and RTTY ops. take notice. Transistor switching for grid block AND cathode keying. Rugged crackle cabinet with brushed aluminum panel. Designed for ease of operation. Model 1550 only \$64.95. With ID \$89.95.



**HAL MAINLINE ST-6 RTTY TU**

Complete parts kit for the W6FC ST-6 now includes all parts except cabinet. Only 7 HAL circuit boards (drilled G10 glass) for all features. Plug-in IC sockets. Custom transformer by Thordarson for both supplies, 115/230V, 50-60Hz. \$135.00 kit. Screened table or rack cabinet \$26.00. Boards and manual \$16.50. Shipping extra. Wired units available.

**HAL TOUCHCODER II KIT \$55.00**

Complete parts kit, excluding keyboard, for the W4UX CW code-typer. All circuitry on one 3 x 6" G10 glass PC board. Plug-in IC sockets. Optional contest ID available, \$35.00. Watch for announcement of the new HAL code-typers, both Morse and RTTY.

**HAL ARRL FM TRANSMITTER KIT**

Drilled, plated, glass epoxy HAL PC boards. 2N5913 final transistor. RF detector with 0-1 ma. meter added. All parts, and the RF detector and meter only \$55.00 + shipping. Cabinet and crystals excluded. Board only \$7.50.

## OTHER HAL PRODUCTS

ID-1 REPEATER IDENTIFIER ..... \$75.00 wired  
 W3EFG SSTV CONVERTER ..... 55.00 kit  
 DOUBLE BALANCED MODULATOR ..... 6.50 kit  
 DIP IC BREADBOARD CARD ..... 5.50  
 MAINLINE ST-5 TU KIT ..... \$50.00  
 MAINLINE AK-1 AFSK KIT ..... 27.50  
 HAL RT-1 TU/AFSK KIT ..... 51.50

RESISTOR VALUE CHART

Color	1st Digit	2nd Digit	Multipplier	Decimals	Value
Brown	1	0	x1	0	10
Red	2	0	x1	0	20
Orange	3	0	x1	0	30
Yellow	4	0	x1	0	40
Green	5	0	x1	0	50
Blue	6	0	x1	0	60
Violet	7	0	x1	0	70
Black	8	0	x1	0	80
Grey	9	0	x1	0	90
Gold			x.1		
Silver			x.01		

CAPACITOR VALUE CHART  
 Brown = 100pF, Red = 200pF, Orange = 300pF, Yellow = 400pF, Green = 500pF, Blue = 600pF, Violet = 700pF, Black = 800pF, Grey = 900pF, Gold = 1000pF, Silver = 2000pF.

## ORDERING INFORMATION

Catalog, including photos, of all items 24¢ postage. Please add 75¢ on parts orders, \$2.00 on larger kits. Shipping via UPS when possible. Give a street address.

**HAL DEVICES, Box 365A Urbana, IL 61801**  
Phone 217-359-7373

the Extra Class exam. WA2KVU moved to Ft. Hamilton. WA2PCS is a new member of NIEPTN. WA2FLU is the new trustee of K2MFF. WB2ALZ put up a new 80-meter inverted "V." WA2BAN was reflected mgr. of NIEPTN. Good luck and thanks for the great job during the past year. WA2GBH is the new RACES officer for Passaic County. WB2OUZ has his tower and beam repaired and is back on 15 and 20. WB2LW has a new vertical for 40 and 80 meters. W2ZZ ordered the SK-220. All nets will be active for the SI 1 operation. We hope all can make it. Contact your local IC and offer your help. Last year was great but this is another year. Contact SEC K2KDO for an LC appointment. Traffic: (Oct.) WB2TU 442, WA2EP 274, WA2BAN 221, K2RXO 175, WB2ALH 141, WB2DDQ 131, WA2UDD 127, WA2ALL 125, WA2NLP 100, WB2CDI 98, WB2LW 73, WB2JAE 61, W2ZEP 43, WA2CAK 40, WA2FVH 33, WB2KNS 30, W2CU 28, K2KDO 22, WA2JIM 21, WA2CFE 18, WB2WZ 11, K2EOP 10, WB2NOM 9, K2DEL 7, K2DQT 6, WA2PCS 6, WB2YPO 6, K2EFL 4, WA2FLU 3, W2JDH 3, W2ZZ 3, W2CVW 2, W2FJK 2, WB2TFH 2. (Sept.) K2DQT 20, W2RTB 19.

## MIDWEST DIVISION

**IOWA** - SCM, Al Culbert, K0YVU - SEC: K0LVB. Attended the Dakota Division convention this month and was pleased to see many Iowans in attendance, and watched WA0SRM win a new Matchbox. W0LL has returned. Your SUM and SEC attended the amalgamation meeting of the Des Moines Radio Amateur Assn. and the Polk County Repeater Assn. This group is to be commended for their efforts in public relations of late in which we all indirectly share the benefits such as: the exhibition station K0MEX at the Iowa State Fair, providing communications for coordinating a Hunger March Fund Drive, and their annual Operation Santa Claus. New officers of the Ottumwa Amateur Radio Club are WA0SSU, pres.; K0YPP, vice-pres.; WA0NNR, secy-treas. A new OIS appointee is K0DDO. The Lee County Weather Net is back on 50.480 MHz each Tue. at 8:00 P.M. local time and welcomes check-ins.

Net	GMT	kHz	QNI	QTC
Iowa Edge	1830	3970	1485	68
Iowa Fore	0900	3970	1351	25
Tall Corn	0930	3560	142	79

Traffic: W0LCX 529, K0DDA 101, K0AZI 92, WA0AUX 62, WA0VZH 38, K0YVU 25, W0MOO 20, WA0YTW 20, WA0LH 1, K0JGI 1.

**KANSAS** - SCM, Robert M. Summers, K0BXP - SEC: K0LPE. PAMS: K0JMF, K0ENU. RM: K0MRI, VHF PAMS: WA0CCW, WA0TRO. Halloween brought forth activity in several areas including a parade communications effort in Hiawatha and spook patrols in Johnson County and I believe again in Salina. A new General Class licensee WA0ELC happens to be the XTY of W0B0LY. I hear by the grapevine another ex-Kansan is active in Mo. K0BLX, is now mgr. of Missouri Slow Speed Net, Sun. 1600 3704. New appointments: W0B0LY as ORS; WA0ZLL as OVS; K0LPC as OO. New officers of Pilot Knob ARC - WA0RJX, pres.; W0BGX, vice-pres. W0NYG, secy.; WA0YJL, treas. K5BN QNI 1097, QTC 37 in 26 sessions. KPN QNI 256, QTC 23 in 16 sessions. KWN QNI 750, QTC 17 in 31 sessions. K5FC Net QNI 48, QTC 3 in 5 sessions. Kansas Wx man of month is W0ASY. ARRL Zones 1, 2, 3, 4, 5, 6, 7, 8, 9, 13, 14 and 15A all reporting activity totaling 814 QNI, 25 QTC in 73 sessions. Zone 2 has recently been reorganized under the leadership of W0B1L as EC. The Zone Two net meets Mon. at 7 P.M. on 3920. The Dakota Division Convention was attended by W0H and W0NH for their part in Central Area Staff Meeting of the National Traffic System. W0LNI is chmn. Traffic: (Oct.) W0H 155 W0NH 117, K0MRI 113, K0JMF 88, WA0LBB 87, W0CUI 73, K0BXP 63, W0MA 56, WA0IAS 48, WA0LLC 46, WA0JLC 41, K0LPE 37, WA0ZTW 33, W0CJ 32, W0B0LY 25, W0PH 25, W0LCL 16, W0GUR 13, W0BCZ 11, WA0GPZ 9, W0BGX 8, K0JH 8, WA0SEV 8, W0MCH 7, WA0SRO 6, K0GZF 2, WA0NXI 2, WA0WA 2. (Sept.) W0LNI 256.

**MISSOURI** - SCM, Robert J. Pevler, W0BV - SEC: W0BNI. It is with deep regret I report K0MLS as a Silent Key. New appointments: W0TDR as OBS, OO IV. Appointments renewed WA0LCL as OO, OPS, ORS: WA0RUK as OBS, PAM.

Net	Freq	Time(Z)/Days	Secy	QNI	QTC	Mgr
MON	3585	0400 DV	11	205	72	W0H
MON 2	3585	0445 DV	31	165	88	W0H
MSN	3703	2200 Su	5	26	4	
MoPON	3963	2400 M-S	26	708	94	WA0TA
MoSSB	3963	2400 M-S	26	902	63	K0RP
WEN	3992	0130 M	8	16	0	K0BI
HBN	4280	1805 M-F	21	526	52	W0UP
PHD	5045	0130 F	4	111	5	WA0RUF



SSB-ers:

## Increase talk power, cut "splatter"

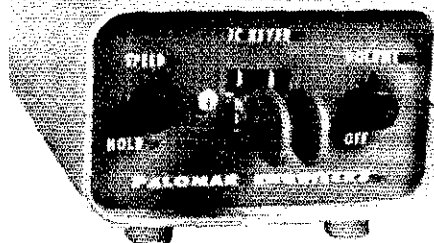
Our 444 base station microphone not only gives you increased talk power, but cuts "splatter" (and QRM complaints) to an absolute minimum! It has superbly tailored response, with sharp cutoffs below 300 and above 3,000 Hz and a rising response characteristic for maximum intelligibility. The 444's rugged, reliable Controlled Magnetic element has been proved in safety communications, and other tough professional communications applications. It delivers a clean signal to the transmitter at levels as high as crystal units! (And, unlike crystal and ceramic units, the element is totally immune to the effects of temperature and humidity.) The 444 also features an adjustable height stand that makes for comfortable "ragchewing" sessions, an optional-locking bar for push-to-talk or VOX operation, and a practically indestructible Armo-Dur® case. Write:

Shure Brothers Inc.,  
222 Hartrey Ave., Evanston, Ill. 60204



# NEW! IC KEYS

Only  
\$77.50  
PPD  
USA



- Self completing dots and dashes.
- Dot memory for easy keying.
- Precision feather-touch key built-in.
- Sidetone oscillator and speaker built-in.
- Relay output keys 300-V @ 100-ma.
- Keyed time base. Instant start.
- 5-50 wpm. Perfect dot-dash ratio.
- Send QSL or postcard for free brochure.

## PALOMAR ENGINEERS

BOX 455, ESCONDIDO, CAL. 92025

## PUT A "PLUG-IN" FOR YOURSELF

TRY RCC's OLD RELIABLE "PLUG-IN"  
SILICON SINGLE PHASE BRIDGE RECTIFIERS

### FEATURES

- Standard 8 pin octal base mounting.
- 1.5 and 3.0 ampere series with voltage ratings from 50 to 800 volts.
- Reliable performance resulting from the use of fully glassivated diode elements which are inter-connected via welding.
- Ideal for use in maximum serviceable applications.
- Direct factory service with delivery of 1-99 quantities either off the shelf or within 2 weeks.

### BASIC RATINGS

TYPE No.	1-99 PRICING \$	Output Aav	COMMON RATINGS		I out A av	1-99 PRICING \$	TYPE No.
			PRV (per element) Vpeak	Surge (1-1/2 elements) A peak			
BRP1500.5	1.00	1.5	50	50	3.0	2.10	BRP1500.5
BRP1501	1.10	1.5	100	50	3.0	2.65	BRP1501
BRP1502	1.25	1.5	200	50	3.0	3.00	BRP1502
BRP1504	1.50	1.5	400	50	3.0	1.45	BRP1504
BRP1506	1.70	1.5	600	50	3.0	3.80	BRP1506
BRP1508	2.05	1.5	800	50	3.0	4.30	BRP1508

FOR MORE INFORMATION CONTACT:

## RECTIFIER COMPONENTS CORP.

124 ALBANY AVE. FREEPORT, N.Y. 11520 TELEPHONE: 516-868-0470

Congratulations to W00UD, who won first place in a po competition sponsored by a literary club in Joplin; to K0EET K0RCO on 25 years of marriage; and to new Novice WN0PF WN0FLX teaches code to Novice aspirants in classes held by Mules Amateur Radio Club in Warrensburg. W0AUB is recuper nicely after long stay in the hospital. K0SGJ reports 27 logs rec so far from participants in the Missouri QSO Party. Traffic: (C K0ONK 1349, W0HH 115, K0YBD 98, W0BV 77, WA0HTN K0BIX 29, W00UD 28, WA0TAA 28, WA0ZLU 22, WA4OE 14, K0SGJ 11, WA0KUH 10, W0GBJ 9, W0CBL 7. (Sept.) K0B 1649, K0SGJ 27, WN0FKY 3.

NEBRASKA - SCM, V.A. Cason, K0OAL - Asst. SCM: V. Sayer, WA0GHZ. SEC: K0ODF. Appointments: WA0HQ W0DJO as OPSS, WA0LRQ as EC. W0DJO as OVS. Renew WA0LWK as EC.

Net	Freq.	GMT/Days	QNI	QTC
NSN I	3982	0030 Dy	1089	22
NLB	3590	0300 Dy	129	34
NMN	3982	1230 Dy	1248	27
WNN	3950	1300 M-S	561	11
AREC	3982	1330 Su	249	2
CHN	3980	1730 Dy	1178	39
DN	3980	2000 M-t	181	19
NSN II	3982	2330 Dy	1125	19
NEC(Sep)	3590	0300 Dy	125	25

K0IXG an FCC employee is transferring from Grand Island to new duty station in Mich. W0EXJ is now WA7SEK. Heard W0FTW and W0UFZ are in the hospital and that W0HOP released. The West Nebraska Tech ARC has eight students in radio theory and code class. WA0CJ reports that the 160-m Weather Net started Nov. 1. Box Butte Co. 2-meter AREC reports QNI 21 for Oct. K0ODF still is looking for more EC AREC members. Total membership in AREC to-date is only Merry Christmas everyone! Traffic: (Oct.) W0L0D 240, WA0 80, W0TQD 36, W0CAU 28, WA0CJ 23, K0FRU 22, W0 16, K0DGD 15, W0HOP 14, W0KPA 14, W0SGA 13, K0KJ WA0GHZ 10, WA0PCC 10, W0NIK 7, WA0YGI 7, WA0BC W0FQB 6, K0JFN 6. K0SFA 6, W0DJO 5, W0HTA 5, WA0J W0VEA 5, K0HNT 4, WA0IKN 4, WA0LOY 4, K0OD WA0OEX 4, WA0YVZ 4, WA0VYX 3, W0ATU 3, WA0E W0HQ2 2, K0OAL 2. (Sept.) K0QNEB 400, WA0LRQ 2.

### NEW ENGLAND DIVISION

CONNECTICUT - SCM, John J. McNassor, W1GVT - WIHHR, RM: K1EIR, PAM: K1YGS, VHF PAM: K1SXF.

Net	Freq.	Time/Days	Sess.	QNT
CN	3640	1900 Dy	62	543
		2200		
CPN	3965	1800 M-S	31	540
		1000 Su		
VHF 2	145.90	2200 M-S	20	111
VHF 6	50.6	2100 M-S	21	110

High QNI: CN - K1EIR, WA1GFH, W1QY and W1MPW. C W1GVT, W1MPW, WA1NMZ, WA1OPB and K1SXF. St. C W1 busy keeping clubs and CD units up to date on AREC. Dir. V Club Letter requests Asst. Dir. nominees and suggestions from club - please respond. With sincere regret we add WIADV Silent Key - as Vice-Dir. and Danbury CARA Bulletin Edit dedication will be missed by many. The CN Fall Meeting was attended and much enjoyed - thanks to K1EIR for all arments. CN Bulletin notes new time for CN Early Session at Tri-City ARC has enlarged Newsletter. Trumbull ARC B includes activity outline. Three cheers and a clear frequen ARRL Communications Dept. on their 100th issue of ti Bulletin! Murphy's Marauders still piling up top scores. Meride new officers are W1YG, pres.; W1WEB, vice-pres.; W1OW WA1MYX, treas.; WIHHR, secy. Thanks to repeater station offered their facilities to Goblin Patrols! Congratulation WA1GTS for Extra Class; WA1LG for General; and WA1M ARRL Life Membership! New Year's Resolution: All clubs, t QST in your local library! Sincere thanks for another wo year and Happy New Year to All! Traffic: W1BFE 299, W1E W1EFW 106, WA1GFH 158, W1MPW 148, WA1NMZ 145, 131, WA1NTR 121, K1SXF 103, WA1NES 89, WA1MC WA1GGN 48, K1YGS 43, W1AW 38, W1BDF 34, W1G WA1KVT 33, W1QV 21, WA1OPB 11, W1KW 10, W1Y WA1PHE 8, W1CDH 5, WIHHR 5.

EASTERN MASSACHUSETTS - SCM, Frank L. Baker, - SEC W1AOG expects to be in Fla. during the SET, re W1ALP, 3945 kHz is the place to look for emergency news Eng. W1AOG received reports from W1s LE, HKG, K1s NF

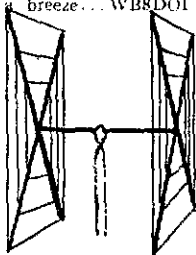
# AHA! YOU THOUGHT GOTHAM

made ordinary, everyday, run-of-the-mill antennas. No, no, no. We make winners through superior materials and design. WAIJFG won the New England Round-Up championship with our 3-element 15-meter beam by a margin of 5,982 points! In QST since '53.

**QUADS** Totally satisfied with quad. Worked DK4VJP, SM7DLH, XE1AB, DM4SEF, FL8SR, F6AUM, HK7YB in few hours. Instructions a breeze... W8RDOI

## 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 fool-proof 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' x 1 1/4" 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' x 1" OD aluminum 'hi-strength' alloy tubing, with telescoping 3/8" 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. . . . . \$37.00
  - 10-15 CUBICAL QUAD. . . . . 32.00
  - 15-20 CUBICAL QUAD. . . . . 34.00
  - TWENTY METER CUBICAL QUAD 27.00
  - FIFTEEN METER CUBICAL QUAD 26.00
  - TEN METER CUBICAL QUAD. . . . 25.00
- (all use single coax feedline)

How to order: Send money order only (bank, store, or United States) in full.

We ship immediately by REA Express, charges collect. DEALERS WRITE!

**GOTHAM, 1805 Purdy Ave, Miami Beach, Fla. 33139**

**BEAMS** "Just a note to let you know that as a Novice, your 3-EI. 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, WAIJFG"

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; 3/8" 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 EI 20. . . . . \$21
  - 3 EI 20. . . . . 27\*
  - 4 EI 20. . . . . 34\*
  - 2 EI 15. . . . . 17
  - 3 EI 15. . . . . 21
  - 4 EI 15. . . . . 27\*
  - 5 EI 15. . . . . 30\*
  - 4 EI 10. . . . . \$20
  - 7 EI 10. . . . . 34\*
  - 4 EI 6. . . . . 20
  - 8 EI 6. . . . . 30\*
  - 12 EI 2. . . . . 27\*
- \*20-ft. boom

## ALL-BAND VERTICALS

"All band vertical!" asked one skeptic. "Twenty meters is murder these days. Let's see you make a contact on twenty meter phone with low power!" So K4KXR switched to twenty, using a V80 antenna and 35 watts AM. Here is a small portion of the stations he worked: VE3FAZ, T12FGS, W5KYJ, WIWOZ, W2ODH, WA3DJT, WB2FCB, W2YHH, VE3FOB, WA8CZE, K1SYB, K2RDJ, K1MIV, K8HGY, K3JUTL, W8QJC, WA2LVE, YS1MAM, WA8ATS, K2PGS, W2QJP, W4JWJ, K2PSK, WA8CGA, WB2KWY, W2IWJ, VE3KT. Moral: It's the antenna that counts!

FLASH! Switched to 15 c.w. and worked KZ5IKN, KZ5OWN, HC1LC, PY5ASN, FG7XT, XE21, KP4-AQL, SM5BGK, G2AOB, YV5CLK, OZ4H, and over a thousand other stations!

- V40 vertical for 40, 20, 15, 10, 6 meters. . . . . \$14.95
- V80 vertical for 80, 75, 40, 20, 15, 10, 6 meters. . . . \$16.95
- V160 vertical for 160, 80, 75, 40, 20, 15, 10, 6 meters. . \$18.95

# DIODES

PIV	TOP-HAT 1.5 AMP	EPOXY 1.5 AMP	EPOXY 3 AMP	STUD- MOUNT 6 AMP
50	.04	.06	.12	.15
100	.06	.08	.16	.20
200	.08	.10	.20	.25
400	.12	.14	.28	.50
600	.14	.16	.32	.58
800		.20	.40	.65
1000		.24	.48	.75

# RESISTORS

## 1/2 Watt Carbon Resistors.

The Following Resistors are all American Made  
1/2 Watt Carbons With Full Leads. Completely  
Standard. Some 5%, Some 10%, Some 20%.

6.8	750	5600	68K	910K
22	1000	6200	75K	1 Meg
27	1300	8200	100K	1.5 Meg
39	1800	11K	120K	2.2 Meg
82	2200	12K	180K	2.7 Meg
100	2400	18K	220K	5.6 Meg
270	2700	22K	330K	9.1 Meg
330	3300	24K	390K	10 Meg
390	3900	33K	470K	22 Meg
620	4700	51K	680K	

Your Cost . . . . 33 for \$1.00 ppd. May be Mixed

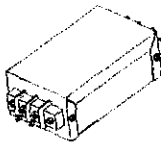
HIGHEST QUALITY AMERICAN  
MADE TRANSISTOR SOCKETS  
2 Types Available—3 Pin TO-5  
5 Pin Universal For TO-5 Etc.  
Your Choice—10 for \$1.00 ppd.



6 Foot Gray Shielded Cable  
With Molded Right Angle  
PL-55 Plug—Very Nice 75¢  
Each or 3 for \$2.00 ppd.



GROUNDING GRID  
FILAMENT CHOKE  
30 Amp Current Rating. Less  
Than .15 Volt Drop At 21  
Amps. Fully Shielded. Small  
Size. High Reactance At All  
Frequencies Above 3 MC.  
Approximate Size 2" x 3" x  
4". Price: \$7.95 ppd.



3 AMP  
BRIDGE RECTIFIER  
400 Volts PIV per leg.  
Manufactured By  
Semtech  
\$1.00 Each or  
3 for \$2.50 ppd.



ITT 1N4002	12¢ Each
ITT 1N4004	18¢ Each
ITT 1N4007	28¢ Each
TI 1N914	16 for \$1.00
RCA 2N3055	\$1.50 Each or 3 for \$4.00 ppd.
IN270	5 for \$1.00

SEND STAMP FOR BARGIN LIST  
Pa. Residents add 6% State sales tax  
ALL ITEMS PPD. USA

**m. weinschenker**  
K 3DPJ BOX 353 · IRWIN, PA. 15642

DZG, WA1S DX1, DMC. W1RJ, WA1KFP and K1GSO are Silent Keys. W1ALP held an LO meeting at his QTH with W1S QYY, AOC DFS, CTR, DOM, CE, K1PNB, WA1S 1E-E, JYO, MFG and KYL present. EM2MN had 22 sessions, 81 traffic, 137 QNIs. DJ0OXX/G3RFU, in Boston for a conference, visited W1PL. You SCM has returned. New officers of 1200 RC W1DC, WA1EIH, pres. K1MUC, vice-pres.; WA1NYR, secy.; WA1LKU, treas. WA1EZH on 2. K1PRB in a new location. W1ETH4 is on 20 ssb. EMN had 6 sessions, 464 QNIs, 250 traffic. WA1GHT is on 2. The T-9 RC met at W1TJP's QTH. WA1EOT is treas. of the Norwood RC. W1SON on 75. WA1FRY is secy. of QRA. WA1HUD is in the service and WA1PGH is in Okinawa. WA1MHJ has new TA-33 jr. and is a coordinator for ECARS. W4SYN is ex-W1GYZ. 6MBCN had 11 sessions, 51 QNIs. K1UAF getting set up again. WA1NIH has new tower. W1ALP attended meeting of Murphy's Marauders at WA1KZE's, also went to meeting of Norwood RC. W1OOP spoke at the South Shore Club. W1N1RT formed the Brockton Area Novice Net on 21120-21130 at 0100Z. XE3LK and HK2CFS/HK1 visited W1MD, who has a new tower. SE Mass. Univ. WA1OEG/1 was in Maine during the VHF Space Net Contest; WA1S DYU, MSK, IYI were the operators. WA1MYK made an antenna tuner. WA1OWQ on 2 and 6. K1EPL reports NEEPN had 5 sessions, 122 QNIs, traffic. WA1MGO has vertical for 10. W1NF doing some DXing. W1N1PF has a 90A transmitter Aro-5 receiver. WA1MSB worked YEPMBC on 80 cw. WA1S KZE, LAK received award at the NEEPN DXCC meeting. New appointees: W1AAL, K4GGL/1 as OVS; K1HRY, W1EJR, ORS; WA1NRJ OPS; WA8WNU/1 ORS. WA1MGO ORS. Endorsements: K9AQP/1 as OVS; K1PNB EC. W1AOG SEC, ORS, OBS; W1MX ORS, OPS, OVS; W1TZ OBS, OC. W1KBN OBS, ORS; K8JLF/1 ORS; W1AQV OBS; W1DOM OPS. W1PL ORS. W1CRO/4 is in Va. W1OQY is on 2 and 6. WA1LF getting to W2-Land on 2. K8JLF/1 now in Sudbury. Barnstable RC. K1PBO elected WA1JWD, pres.; K1EPL, vice-pres.; W1FES, secy. treas.; W1ALT, K1S LEK, EPL, WA1JWD, advisory comm. W1N1PI (W1RHN's son) has a DX-60B and HR-10B. W1RHN is on 75 and 20. Middlesex ARC had a Non Hams Night. W1EJ is on 15. WA1JKD at Holy Cross College, W1UUY. WA1NIH got married. K0UKL/1 on 2 in Marshfield. WA1KXQ home and on 6. Whitman and Massasoit Clubs had a joint meeting. K1IDU has Clegg 2-meter fu rig. K1OPQ now in Magnolia and on 80-10 and 2. WA3QOZ Net Mgr. of the Early Eighty Free Net. W1FY is home from hospital. Boston Repeater Assn., WA1NRJ, W1S DPD, GAB, UMU, UVE. K1PQY are on the Comm. Minuteman repeater. W1HWK a Weston College Observ. Quannapowitt Radio Assn. held an auction. W1LMD went to the 100-Meter Assn. convention in Ghent, N.Y. WA1MD is now in Holliston. Traffic: (Oct.) WA1EY 29; W1OY 272, W1PEX 263, W1CE 184, W1QOM 167, W1ABC 130, WA1FE 78, WA1MSB 73, WA1MYK 71, W1EMG 70, W1MNX 61, W1ATX 31, WA1DJC 25, WA1MWN 24, WA1OWQ 24, K1PRB 2; W1PL 20, W1DOM 18, WA1OG 17, WA1FNM 12, K1EPL 8, W1LX, W1N1RT 8, WA1MGO 4, W1PJN 4, W1FJN 6, W1NF, W1N1PF 1. (Sept.) WA1MSB 50, WA1OMM 17, W1DOM 1; WA1KZE 6. (Aug.) WA1OMM 61, W1DOM 6.

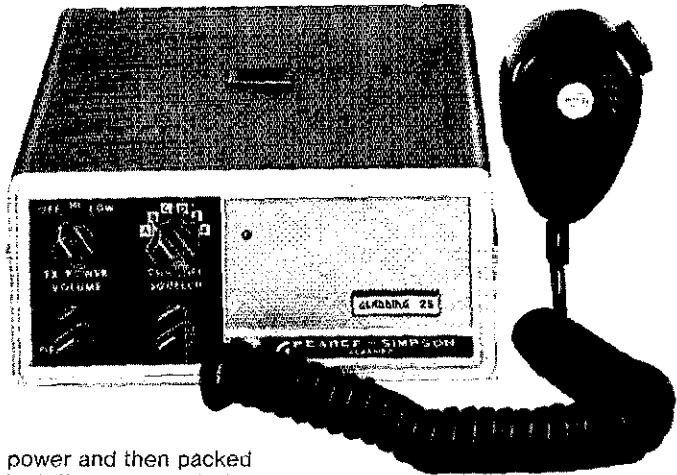
MAINE - SCM, Peter E. Sterling, K1TEV - SEC: K1CL, PAM: WA1FCM. RM: W1BJG, K1SHQ and KYL K1VEB moved Hope, Maine. W1LU has been transferred from Easton to Portland want to thank everyone who participated in the antenna raising Streaked Mountain. The Yankee Repeater, all set to go except 1 license, will be on 145.34 transmit 146.94 receive. It should have very good coverage from Streaked Mountain, located Buckfield. WA1FCM has joined Intruder Watch and would appreciate anyone hearing of intruders to get in touch with him. K1SC is now an Extra Class licensee. W1QXR is still awaiting his repeat New Hams in Maine are W1N1PE, W1N1PEJ, W1N1PEK, WA1PF, WA1PHE, WA1PJS, W1N1PJN. Congratulations, fellows. Interest in an appointment? Get in touch with your SCM for information. Traffic: (Oct.) WA1FCM 202, W1BJG 78, W1CTR 26, WA1JCN 9. (Sept.) WA1FCM 236, K1TEV 9.

NEW HAMPSHIRE - SCM, Robert C. Mitchell, W1SWX. Act RM: W1UBG. Endorsements: K1AC, as ORS; W1ALJ as ORS; OPS. New appointee: K1GMW as ORS. K1RSC was the only EX sent in monthly report. W1UBG, when not on the NHVT Net, 192 DX countries confirmed. Welcome to new hams: WA1PJ, WA1PLRU, W1N1PE, W1N1PJG and W1N1PIY. W1BPW was at the England DXCC meeting. WA1JSD is airing official bulletins nightly on 50.3 MHz. K1BCS was appointed by Governor Peterson to Search and Rescue Study. W1CTW has given up his other W1IQD. W1DXB and K1GMW are very active on the NHVT. W1UBG reports 174 check-ins and 136 traffic on this W2EYM/1 has new QTH in Ringe. Merry Christmas and Ha New Year to all. Traffic: WA1JTM 419, K1YMH 156, W1UBG, K1GMW 73, W1DXB 24, K1CTO 21, W1MHX 7, W1SWX 5.

# 25 Watts isn't everything, but with everything else it's GREAT!

## GLADDING 25™

- 25 WATT • FM
- 6 CHANNEL
- 2 METER
- TRANSCEIVER



We loaded this rugged, new, two-meter radio with 25 watts of power and then packed it with desirable features that make it the most wanted two-meter amateur radio on the market. It's the Gladding 25™ from Pearce-Simpson, Division of Gladding Corporation and the World's largest manufacturer of marine communications equipment. Best of all, because of our unmatched marine volume, we could add a price tag to it that can't be matched by anyone, anywhere, and still give it custom quality. Great! 25 watts and a lot more, from Pearce-Simpson.

- 25 watts output • 0.3uv sensitivity for 12db SINAD • built in 12 volt power supply • matching AC power supply accessory • 6 separately switchable transmit and receive channels • Economical vacuum tube driver and final.
- Plus • 8 pole crystal lattice filter • Transistor sockets • Glass epoxy printed circuit boards • Quick disconnect power plugs • Mounting cradle • 1 watt output switch

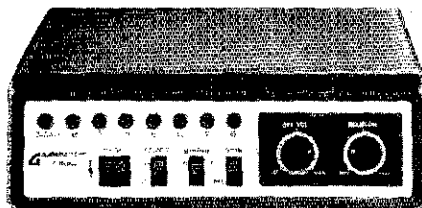
**\$249<sup>95</sup>**

mobile unit

**\$295<sup>95</sup>\***

with accessory  
AC Power Supply

Suggested List Price



## GLADDING HI-SKAN™

### 8 Channel VHF Monitor

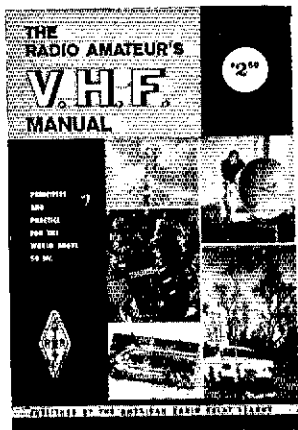
- Automatically scans 8 pre-selected channels • Switch for manual selection of channel • Priority channel • Bypass channel • 115VAC/12VDC built in power supply • Mounting cradle • Can be tuned to 2 meters.

**\$99<sup>95</sup>\***

\*Suggested List Price

**PEARCE-SIMPSON**  
DIVISION OF **GLADDING CORPORATION**  
P.O. Box 800, Biscayne Annex, Miami, Florida 33152





Second Edition

# change of Pace

**BAND** conditions are crowded and noisy — except on the higher frequencies. You won't work the world any time you want, but you can sure get away from all those annoyances on the lower bands. No QRM to speak of, no atmospheric noise to make copy difficult. Just enjoyable ragchewing.

A **LITTLE** time and a few ideas from the **ARRL VHF MANUAL** will put you on the air in this most enjoyable part of the spectrum.

**THINK** about it and look at a copy of the **VHF MANUAL** the next time you are in your local dealer's "ham shack."

**\$2.50** U.S.A.

\$3.00 Elsewhere

AMERICAN RADIO RELAY LEAGUE

Newington, Connecticut 06111

**RHODE ISLAND** — SCM, John F. Johnson, K1AAV - SEC: W1YNE. RM: W1YKO, PAM: W1TXL. VHF-PAM: K1TPK, R1SPN reports 31 sessions, 521 QNL, 54 traffic. The W1OP Club of Providence invites all hams in the state to participate in the events scheduled for their fifty year celebration of ARRL affiliation. Special events will be announced in QST. The Newport County RC of Newport held a successful auction and plans special programs on 2-meter fm. K1LXQ and XYL returned from a trip to Hawaii. WA1CO who also is called "Little Rhody" has been very active running phone patches for the Navy at the South Pole. He puts a very strong signal at the pole with his Swan 500 and Classic-36 beam. W1WAC will be on six meters after he installs his new beam. K1AGA is building some new 2-meter fm equipment. WA1CO will soon have his new Henry 2K in operation and will be working on the hard to find DX contacts. Traffic: W1YNE 237, K1QFD 9, K1CEP 3, WA1HBW 2, K1VYC 2.

**WESTERN MASSACHUSETTS** — SCM, Percy C. Noble, W1BVR - SEC: WA1DNB. CW RM: W1DWW. PAM: WA1MFB. VHF PAM: W1KZS (Berkshire County). AREC members by counties: Berkshire 16, Franklin 5, Hampden 28, Hampshire 28, Worcester 12. Total 84. WA1DVE has resigned as Berkshire County EC. Attendance on our West. Mass. cw traffic net has improved greatly since we have slowed down our speed. During Oct. WMN had 134 ONIs and handled 89 messages. Top five in attendance were: W1BVR, WA1LNF, W1DWW, WA1ITL, WA1LPJ. New appointees: W1YK, WA1ITL, K1VFN as OPS; WA1ITL, K1VFN ORSs. Our PAM reports that the West. Mass. Fone Net held 12 sessions with 36 check-ins and handled 15 messages. Club officers at Worcester Tech's W1YK are WA1JFO, pres.; WA1ZVF, vice-pres. and chief op.; WA1JFW, treas.; Ted Martin, secy.; W1PI, trustee. WA1FBE did right well in the FMT. WA1ITL is active in 4 nets. HCRA reports W1MOK celebrated 80 years as a licensed amateur in June; W1MM has 52 years; and W1ARA will make the 50 mark in another year. The Mt. Tom Repeater Assn. is still getting out its fine monthly publication. Ditto, Murphy's Marauders with their "Murphy Message." MARC reports W1ACP's new mini-ham works fine — 1st contact a WA6 and 2nd a G3. K1YLU and XYL are now in Ariz. Your SCM wishes to thank the club editors who were cooperative enough to run a plug in their bulletins for our WMN and WMFN nets.

Net	KHz	Time/Days
W Mass Emergency	3935	Su 8:30 A.M.
W Mass CW Tfc	3560	Dy 7:00 P.M.
W Mass Fone	3915	M-F 6:30 P.M.

Traffic: K1SSH 152, W1BVR 119, WA1LPJ 81, WA1LNF 52, W1KK 30, W1DWW 23, WA1MFB 15, WA1DNB 14, WA1ITL 12, W1TM 8, WA1FBE 6.

## NORTHWESTERN DIVISION

**IDAHO** — SCM, Donald A. Crisp, W7ZNN — SEC: WA7EWW. W7IUO has qualified for DXCC on 10 meters. W7GHT is no Lawyer Magistrate and Court Administrator for the 2nd Judicial District in Idaho and has still managed to qualify for the PSHR. WA7IRA is the new FARM Net Mgr. replacing K7HLR who has done an outstanding job in that capacity for several years. K7UBC sponsoring JY2 as a YLRL member. Princess Muna is the XYL King Hussein, JY1 of Jordan. WA7HWD, WA7RVV and WA7RC conducted a 2-meter fm test from Kamiak Butte in eastern Was. which resulted in good coverage of Northern Idaho and Eastern Wash. as far west as Walla Walla. W7OWA reports signals were qu in Lewiston. W7AXL reports weather information from the Ent mountain Weather Net on the Ashton BC station. The Net meetings except Sun. at 6 A.M. on 3970 kHz. FARM Net reports sessions, 975 check-ins, 31 traffic handled. Idaho P.O. Net reports 13 sessions, 94 check-ins, 8 traffic handled. Traffic: W7GHT 1, W7IY 59, W7ZNN 31, WA7BDD 29.

**MONTANA** — SCM, Harry A. Roylance, W7RZY — Asst. SC: Bertha A. Roylance, K7CHA. SEC: W7FYN. PAM: WA7IZR. N officers for the Yellowstone Radio Club are K7VCA, pres.; K7BC vice-pres.; K7GHC, board. New OO appointee is K71TV. East College has a new RC. A VHF meeting was held in Helena Oct. with 44 VHFers attending from all over the state. Reports on seven repeaters was given and a VHF Advisory board was set up to coordinate the input and output of the different repeaters in state. Two more repeaters are proposed for tone access via auto-call and the works. Endorsements: WA7IZR as PAM; K7O K7PIQ, K7NDV, K7EGL, K7CHA as ECs; W7JRG and W7OIK OVSS, W7IEJ and W7DB are making tone modules for their 2-m rigs. WA7IQS was appointed to head the VHF Advisory Board. W7LBK appears in the PSHR monthly. K7ECF is back from C. Montana Traffic Net reports 837 check-ins and 45 pieces of ton



## BARRY ELECTRONICS

**BARRY PAYS CASH** for your unused equipment, tubes, components, semi-conductors, etc. Send your list today for a fast cash offer.

### BARRY HAS SLOW SCAN TV

Robot Mod. #80 camera—\$465.00 & Mod. #70 monitor—\$495.00 (f 1.4 Macro lens \$60.00)

**SWAN 250** 6 meter SSB transceiver, excellent condition with new 117XC power supply/speaker \$325.00.

**P&H 6-150 TRANSVERTER**, 5 watts of 20 meter drive gets 150 watts pep out on 6 meters, good condition, \$95.00.

**PEARCE-SIMPSON GLADDING 25**, 2 meter transceiver, brand new with AC/DC power supply, FM, \$299.00.

**LAFAYETTE HA-144** 2 meter portable transceiver in like new condition, with leather case, \$95.00.

**DYCOMM BLOCK BOOSTER** 2 meter FM mobile amplifier provides 50 watts out for 10 watts in. \$89.95.

**DYCOMM "10-0"** 2 meter mobile amplifier puts out 100 watts when driven by 10 watts of FM, \$185.00.

**DYCOMM "BRICK" or TR-22 BOOSTER**, one of the most popular your 1-2W HT can push out 20-25W, \$69.95.

**DYCOMM "SUPER BRICK/TR-22 BOOSTER"** Now you can have from 35-45W for 8-2 watts input. Typically 38W output for a 1 watt input, \$99.95.

**DYCOMM PRESCALER** divide by 10 prescaler will work with any counter, operates up to 240 MHz, \$89.95.

**DRAKE TR-4 TRANSCEIVER** covers 80-10 meters, excellent condition, with AC-4/MS-4 power supply, \$335.00.

**HAMMARLUND HQ-100** general coverage receiver with ham bandsread, good condition, \$95.00.

**HAMMARLUND HQ-170/CLOCK**, a ham band only receiver giving superior performance on 6-160 meters, \$165.00.

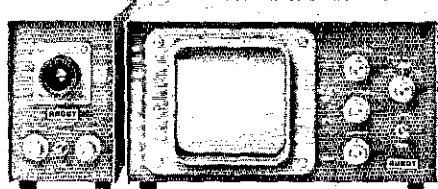
**DX ENGINEERING RF SPEECH PROCESSOR**, an RF-type speech clipper designed for the KWM-2 or 32S series. Contains an integral mechanical filter for splatter suppression. Specify model 32S or KWM2, \$79.50.

**COLLINS 7553 B** and Collins 7553 C. New condition. Write, \$795.00.

**TMC-GPR90 RXD w/TMC GSB-1** both units \$495.00.

**COMPLETE** Collins S/line. Write!

**BARRY ELECTRONICS** 512 Broadway New York, NY 10012 Tel: Walker 5-7000



**FREE:** With purchase of Monitor only—5 min. demo tape. Gets you on the air for only \$495.00

**PAPST "PAMOTOR"** a small muffin type fan of all metal construction good for cooling hot final tubes for longer life. Brand new/sealed carton, \$14.95.

**ITC Oil Filled Plate Transformer 6636 VCT @500 ma** continuous duty, 110/220 primary, 120 lbs, \$85.00.

**SURGE SUPPRESSOR CE-PS220C** protects silicon diodes from transients coming in on the power line. For 2 KW avg. power and a 220 VAC line, \$35.00.

**CE-PS120A** similar to above but 110VAC @1KW, \$10.

**TRANSMATCH PARTS . . . WE CAN SUPPLY THE PARTS NEEDED FOR BUILDING A HIGH POWER TRANSMATCH SUCH AS THE ONES DESCRIBED IN QST (JULY '70, OCT. '71 etc.)**

**CERAMIC SOCKET** for 3-500Z, 4-400A etc. \$2.50.

**CAPACITOR**, 1000 mfd. @400VDC, \$2.50.

**JENNINGS UXC-500**, 25-500pf@15KV DC r/e, \$110.00.

**IUCXF-2300** (2300 pfd at 10 KV), Write.

**UTC TYPE CG-310 Transformer**, puts out 4000 VDC @ 1 amp on a continuous duty basis. Reg. Net. \$1080. \$350.00.

**WE STOCK AIR-DUX COILS. WRITE.**

**CORNELL-DUBILIER "HAM-M" ROTATOR**. New/complete, \$99.95.

**GONSET COMMUNICATOR IV (3341)** 2 meter transmitter/receiver with matching GONS VFO, excellent, \$195.00.

**HALLICRAFTERS SX-122** general coverage receiver in very good condition, .54-34mhz + ham bandsread, \$295.00.

**YAESU FLdx400 TRANSMITTER** 80 to 10 meter transmitter with built in power supply, mint condition, \$295.00.

**SONA LABS "SCAN-O-MATIC"** 2 meter 10 channel receiver with scanning and channel lock-out, \$139.95.

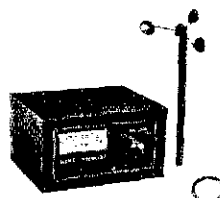
**CRYSTALS** for the above receiver, \$5.00 EA.

**COLLINS MP-1** mobile 12 VDC power supply, designed for the 32S series and KWM-2 but will work with most other modern 200 watt pep transceivers of transmitters, \$125.00.

**AMECO TX-62 TRANSMITTER** covers both 6 and 2 meters on AM and CW, W/matching Ameco 621 VFO like new, \$165.00.

**.. COMPLETE YOUR HAM SHACK** with OUR NEW HOME WEATHER INSTRUMENT.

- READ WIND SPEEDS ON TWO SCALES; CALIBRATION to 105 mph
- HANDSOME HARDWOOD CASE
- 12 YEAR WRITTEN GUARANTEE
- ELECTRONICS EMPLOYS INTEGRATED CIRCUITS
- 5% DISCOUNT TO ALL HAMS ACTIVE IN WEATHER NETS



**\$ 69.95 COMPLETE POSTAGE PAID**  
(dealer inquiries invited)

**associates, BOX 333, GOODYEAR, AZ. 85338**

### THE BIGGEST SIGNAL

GREENE water tight center insulator with or without BALUN

Patent D219106

Unconditionally Guaranteed

---

GREENE center insulator with BALUN \$12.00 post  
 GREENE center insulator NO BALUN \$ 9.00 paid  
 DRAGON FLY construction drawing \$ 5.00 U.S.A.  
 FLIER FREE

---

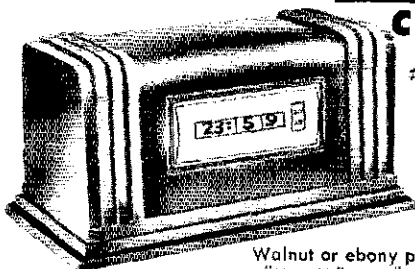
**GREENE INSULATOR** 3 Pilgrim Dr. Bedford, NH 03102

# TYMETER®

"Time At A Glance"



# 24 HOUR CLOCK



#100-24H

## \$16

Made in U.S.A.

At Your Dealer, or DIRECT FROM

Walnut or ebony plastic case, 4" H, 7 1/2" W, 4" D. 110V 60 cy. Guaranteed One Year.

### PENWOOD NUMECHRON CO.

TYMETER ELECTRONICS

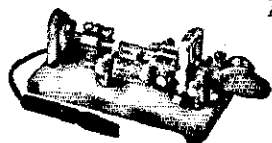
7249 FRANKSTOWN AVE.

PITTSBURGH, PA. 15208

ENJOY EASY, RESTFUL KEYING

With **VIBROPLEX**

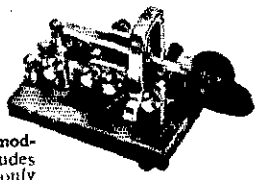
Sending becomes fun instead of work with the SEMI-AUTOMATIC Vibroplex. It actually does all the arm-tiring nerve wrecking work for you. Adjustable to any desired speed. Standard models have polished Chromium top parts and gray base. Deluxe models also include Chromium Base and red finger and thumb pieces. Five models to choose from. Priced at \$29.95 to \$36.95 for the deluxe "Original" Vibroplex.



and thumb pieces. Five models to choose from. Priced at \$29.95 to \$36.95 for the deluxe "Original" Vibroplex.

### VIBRO-KEYER

Works perfectly with any Electronic Transmitting Unit. Weighs 2 1/2 lbs., with a base 2 1/4" by 4 1/2". Has Vibroplex's finely polished parts, red knob and finger, and thumb pieces. Standard model \$22.95; Deluxe model includes Chromium Plated Base at only \$29.95.



Order today at your dealers or direct

### THE VIBROPLEX CO., INC.

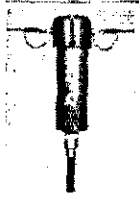
833 Broadway New York, N. Y. 10003

FREE Folder

DIGITAL TTL		IN DUAL IN LINE PACKAGES		DIGITAL TTL	
1489 4 Channel NAND 15	240 2 Channel NAND 15	240 2 Channel NAND 15	240 2 Channel NAND 15	240 2 Channel NAND 15	240 2 Channel NAND 15
1490 4 Channel NAND 15	241 2 Channel NAND 15	241 2 Channel NAND 15	241 2 Channel NAND 15	241 2 Channel NAND 15	241 2 Channel NAND 15
1491 4 Channel NAND 15	242 2 Channel NAND 15	242 2 Channel NAND 15	242 2 Channel NAND 15	242 2 Channel NAND 15	242 2 Channel NAND 15
1492 4 Channel NAND 15	243 2 Channel NAND 15	243 2 Channel NAND 15	243 2 Channel NAND 15	243 2 Channel NAND 15	243 2 Channel NAND 15
1493 4 Channel NAND 15	244 2 Channel NAND 15	244 2 Channel NAND 15	244 2 Channel NAND 15	244 2 Channel NAND 15	244 2 Channel NAND 15
1494 4 Channel NAND 15	245 2 Channel NAND 15	245 2 Channel NAND 15	245 2 Channel NAND 15	245 2 Channel NAND 15	245 2 Channel NAND 15
1495 4 Channel NAND 15	246 2 Channel NAND 15	246 2 Channel NAND 15	246 2 Channel NAND 15	246 2 Channel NAND 15	246 2 Channel NAND 15
1496 4 Channel NAND 15	247 2 Channel NAND 15	247 2 Channel NAND 15	247 2 Channel NAND 15	247 2 Channel NAND 15	247 2 Channel NAND 15
1497 4 Channel NAND 15	248 2 Channel NAND 15	248 2 Channel NAND 15	248 2 Channel NAND 15	248 2 Channel NAND 15	248 2 Channel NAND 15
1498 4 Channel NAND 15	249 2 Channel NAND 15	249 2 Channel NAND 15	249 2 Channel NAND 15	249 2 Channel NAND 15	249 2 Channel NAND 15
1499 4 Channel NAND 15	250 2 Channel NAND 15	250 2 Channel NAND 15	250 2 Channel NAND 15	250 2 Channel NAND 15	250 2 Channel NAND 15

DIGI-KEY

Box 126, Little River Falls, Wisconsin 54707



### THE "HI-Q-BALUN"

- For Dipoles—Yagis—Inverted Y—Doubt
- Puts Power in Antenna
- Full Legal Power 5-40 MC.
- Small—Light—Weather-proof
- 1/2 Impedance Ratio—Easy Fitting
- Takes Place of Center Insulator
- Built-in Lightning Arrestor
- Helps Eliminate TVI
- Fully guaranteed

\$11.95 PPD U.S.A.

VANGORDEN ENGINEERING  
Box 513, Brielle, N.J. 08730

traffic: Montana PON reports 610 check-ins, 45 formal traffic and 31 sessions. Traffic: WA7JOS 130, W7EKB 102, W7LBK 3, WA7IZR 13.

OREGON - SCM, Dale T. Justice, K7WWR - SEC: W7HL, RM: K7GGQ, PAM: K7ROZ. Traffic: K7NTS 156, K7OUF 11, K7OPG 92, WA7BYP 13, WA7MOK 13, W7LT 6, W7MLJ, K7WWR 4, WA7KRH 3.

WASHINGTON - SCM, Arthur Henning, W7PI - SEC: W7UW, RM: W7GYP. PAMS: W7GVC, W7MCW, VHF PAMS: K7RBB, K7LRD. New appointments: WA7BLW as EC, Grays Harbor County, K4ZDK/7 as EC, Island County, WA7ELI, K7NZV as OVS, K4ZDK/7 as OPS and OD, WA7AVI passed Advanced Class exam. Regret to report W7PQS became a Silent Key. Best wishes to new engaged WA7LVN and WA7FKM.

Net	Freq.	Time(Z)	QMI	QTC	Sex	Mgr
NTN	3970	1930	1245	182	31	W7AHL
NSN	3700	0300	342	93	31	W7AOC
WSN	3590	0245	239	125	31	W7GY
NWSSB	3945	0230	1102	37	31	K7KE
AREC	3930	Su 1800	38	2	4	W7UW

Congrats to W7BA on achieving his 240th consecutive monthly BP certificate - that's 20 years straight, fellows, Swap-N-Shop operated by W7SYS meets Sat. 9:30 A.M. on 3960 kHz or try 145.35 A.M. Tue. following AREC net at 0200Z for vhf Swap-N-Shop operated by WA7OBC and other NCS's. The HAMS Club of Everett on 146.1 operated "Pumpkin Patrol" Halloween with Marysville Police Dept. the Walla Walla Club had 14 members also working with local Police on Halloween. WSN (cw) now has 11 members with 160-met capability. QCWA Section One dinner had a big turnout at the El Club, Seattle. WA7OCV is new mgr. NSN and looking for new check-ins in this net on net and traffic handling procedures. The Boeing Beas Wash. State QSO Party had their biggest party yet with 152 entries. W7SAB increased power to 800 watts for winter operation on 3845 kHz SSV Net. WA7IKZ is looking for check-ins for 29.6 kHz CD Net. New officers of Skagit ARC are WA7GD (pres.); W7GHO, vice-pres.; K7DBO, secy-treas. Traffic: (O.U.) W7BB, 842, WA7HKR 248, W7PI 231, W7KZ 207, WA7AVI 182, W7H 111, K7CTP 102, W7MCW 75, W7AXT 73, W7GYF 62, K7OXL 5, WA7OCV 54, WA7HCL 51, W7GVC 32, WA7LMO 30, K7OZA 2, W7HUN 27, W7APS 26, WA7LDO 23, W7EY 23, K7BBD 1, WA7LOQ 15, K7LRD 14, K7OKC 13, WA7CYV 12, W7QCV 1, W7ZHJ 10, K7WTG 5, WA7B 5, WA7GVB 4, WA7LOV, WA7OBC 4, W7RXH 3, K7EFB 2, K7NZV 2, K7JRE 1. (Sept. K7NZV 1.

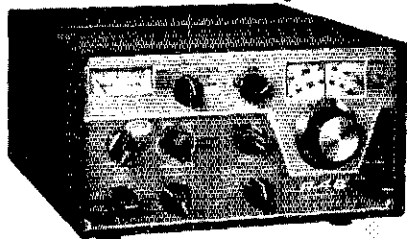
### PACIFIC DIVISION

EAST BAY - SCM, Paul J. Parker, WB6DHH - RMS: W6IP and WA6D11. Not too much news this month. K6TX back from Tex. says booming there is E.B. WB6VFW working hard on NC and NCN/2. W6IPW also working hard with much 1CC and NC work. Here is another Novice Net for those who are still crys controlled; The West Coast Traffic Net (WCTN) which meets Mo. Wed. and Fri. at 4:00 P.M. local time (0000Z) on 7180 kHz plus minus 10 kHz. They are looking for an NCS for the Mon. Net. interested get in touch with WA6LKS. I would love to hear from you and your station activities, be they ever so trivial. Traff W6IPW 185, WB6VFW 33.

HAWAII - SCM, Lee R. Wical, KH6BZF - SEC: KH6GQ Asst. SEC: KH6RZF. RM: KH6AD. PAM: KH6GJN, VHF PA KH6GRU, OSI Mgr.: KH6OD, ECS: KH6GPO, BAS, GKD, B and GLU. RACES Nets: Coordinate with Dick Hamada, F Preparedness - something no emergency should be without. I ARRL SET takes place Jan. 29, 30 '72. Get involved by contact your local EC, Island RO or SEC KH6GQW for further details. Phone is 488-5693. Full SET details in this issue of QST. KH6GQ reports the Honolulu DX Club did another outstanding job during the CQ WW Test. W8AKS/KH6 is on 2 meters with his new Ya FT-2F. Ditto reports KH6BZF. KH6GKD plans a new rig of meters. K1GGS/KH6 said Aloha and transferred back to a assignment in "snowland." Fx-KH6GKI is now WA1O! KH6YL/6 now signing K6QT. K5CTP/KH6 now has WA9FF KH6's Henry No. JK Rf Deck and will soon be on w/high power town for surf and sand is WA9 VGY/KH6 and company (XY W6UOV wants to run high power 2-meter (double hop E) tests via an interested KH6er. Ex-KH6BSL now back in the islands sig KH6GSH. KH6FGA has a new antenna up in Hawaii Kai. KH6C reports activity at the low end of 40 meters. WB8FA/KH6 b new FT-101. WA2KDZ/KH6 recently returned from a Far I swing. Keep your monthly reports coming. Remember to mail it on the first of each month. Aloha, Seasons Greetings.

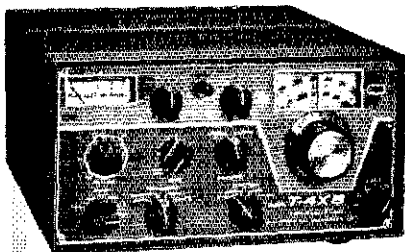
NEVADA - SCM, Leonard M. Norman, W7PBV - SEC: Mike Blain, WA7BEU, 560 Cherry St., Boulder City, NV 899

# **DRAKE 4 LINE** — Superior performance



Versatility ...  
Accuracy ...  
Dependability

Use VFO of either  
R-4B or T-4XB for  
transceiving or  
separately.



## R-4B RECEIVER

- Linear permeability tuned VFO with 1 kc dial divisions. VFO and crystal frequencies pre-mixed for all-band stability
- Covers ham bands 80, 40, 20, 15 meters completely and 28.5 to 29.0 Mc of 10 meters with crystals furnished
- Any ten 500 kc ranges between 1.5 and 30 Mc can be covered with accessory crystals for 160 meters, MARS, etc. (5.0-6.0 Mc not recommended)
- Four bandwidths of selectivity, 0.4 kc, 1.2 kc, 2.4 kc and 4.8 kc
- Passband tuning gives sideband selection, without retuning
- Noise blanker that works on CW, SSB, and AM is built-in
- Notch filter and 25 Kc crystal calibrator are built-in
- Product detector for SSB/CW, diode detector for AM
- Crystal Lattice Filter gives superior cross modulation and overload characteristics
- Solid State Permeability Tuned VFO
- 10 tubes, 10 transistors, 17 diodes and 2 integrated circuits
- AVC for SSB or high-speed break-in CW
- Excellent overload and Cross Modulation characteristics
- Dimensions: 5½"H, 10¾"W, 12¼"D. Wt.: 16 lbs.

**\$475 00**

## T-4XB TRANSMITTER

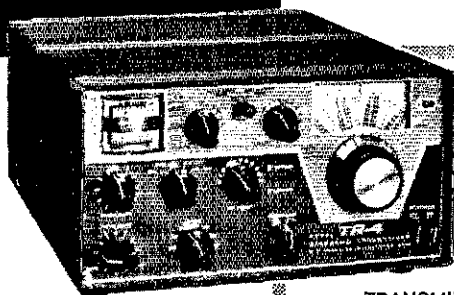
- Covers ham bands 80, 40, 20, 15 meters completely and 28.5 to 29.0 Mc of 10 meters with crystals furnished; MARS and other frequencies with accessory crystals, except 2.3-3, 5-6, 10.5-12 Mc.
- Upper and Lower Sideband on all frequencies
- Automatic Transmit Receive Switching on CW (semi break-in)
- Controlled Carrier Modulation for AM is completely compatible with SSB linear amplifiers
- VOX or PTT on SSB and AM built-in
- Adjustable Pi-Network Output
- Two 8-pole Crystal-Lattice Filters for sideband selection, 2.4 kc bandwidth
- Transmitting AGC prevents flat topping
- Shaped Grid Block Keying with side tone output
- 200 Watts PEP Input on SSB—200 watts input CW
- Meter indicates plate current and relative output
- Compact size; rugged construction
- Solid State Permeability Tuned VFO with 1 kc divisions
- Solid State HF Crystal Oscillator
- 11 Tubes, 3 Transistors and 12 diodes
- Dimensions: 5½"H, 10¾"W, 12¼"D. Wt.: 14 lbs.

**\$495 00**

R. L. DRAKE COMPANY • 540 RICHARD STREET • MIAMISBURG OHIO 45342

# DRAKE TR-4

The ultimate in  
**SIDEBAND TRANSCEIVER**  
performance



**\$599<sup>95</sup>**

34-PNB Plug-in  
Noise Blanker ... \$100.00

RV-4 Remote  
VFO for TR-4 ... \$110.00

**GENERAL:** • All amateur bands 10 thru 80 meters in seven 600 kc ranges • Solid State VFO with 1 kc dial divisions • Modes SSB Upper and Lower, CW and AM • Built-In Sidetone and automatic T/R switching on CW • 30 tubes and semi-conductors • Dimensions: 5½"H, 10¾"W, 14¾"D. Wt.: 16 lbs.

**TRANSMIT:** • VOX or PTT on SSB or AM • Input Power: SSB, 300 watts P.E.P.; AM, 260 watts P.E.P. controlled carrier compatible with SSB linears; CW, 260 watts • Adjustable pi-network.

**RECEIVE:** • Sensitivity better than ½ uV for 10 db S/N • I.F. Selectivity 2.1 KHz @ 6 dB, 3.6 KHz @ 60 dB. • AGC full on receive modes, variable with RF gain control, fast attack and slow release with noise pulse suppression • Diode Detector for AM reception.

**R. L. DRAKE COMPANY**



**DRAKE**

540 Richard Street  
Miamisburg, Ohio 45342

# CRYSTAL BARGAINS

Depend on . . .

We can supply crystals from 16 KHz to 80 MHz in many types of holders. Over 6 million crystals in stock including CR1A/AR, FT243, FT241, M67, HC-6/U, HC13/U, etc. ORDER DIRECT with check or money order to JAN CRYSTALS. For first class mail add 15¢ per crystal -- for airmail, add 20¢ per crystal. Inquire about special quantity prices.



DIVISION OF BOB WHAN & SON ELECTRONICS, INC.

2400 Crystal Dr.  
Fort Myers  
Florida 33901  
(813) 936-2397

Send 10¢ for new catalog with oscillator circuits and lists of thousands of frequencies in stock.

## SPECIALS

Color TV crystal (3579, 545 KHz) wire leads	4 for	\$1.80
100 KHz frequency standard crystal (HC 13/U)		4.50
1000 KHz frequency standard (HC 6/U)		4.50
Any CB crystal, trans. or rec. (except synthesizer crystals)		2.50
Any amateur band crystal in FT-243 holders (except 80 — 160 meters)	4 for	1.50
80 meter crystals in FT-243 holders		5.00
		7.50

# CQ de W2KUW

The Ted Dames Company  
308 Hickory Street  
Arlington, NJ 07032 (201) 998-4246

## WANTED FOR CASH

R390 and 390A Receivers  
EIMAC/VARIAN Tubes 61813 Transceivers  
304TL Tubes 445A Klystrons 490T Load Coils

## WINTER SPECIALS

Tektronix 105	\$95.00
Tektronix 107	60.00
Tektronix 19A or 19B	95.00
Tektronix 531A	350.00
Tektronix 530	150.00
Tektronix 551	375.00
Tektronix 581A	350.00
Tektronix 1121	29.50
Tektronix Plug-ins from \$29.50	
Henry Radio 2KPG	195.00
Collins 30S1	600.00
Collins 618T2	795.00

We will buy for cash any tube, transceiver, receiver or test gear at 5 percent over prevailing market price.

K6BAH now is W7IQO. Welcome to K6BXW and K6MGR. The K7ZMA/7 fm repeater 34194 provides good coverage into Boulder City and Las Vegas as well as Williams and Phoenix, AZ. Neelie and Palm Springs, CA. New appointees: WA2MRQ/7 ORS, W7II GPS, W7TVE hunting in Colo. for his annual elk. WA7DIA and WA7RHU spent many hours in the cold and snow getting the WA7NHV repeater back on the air. WA7KFD is in new QTH. WA7LGP and WA7MEH would like to start holding the club meetings at the Chevy garage. WA7GYE, WA7KOS, WA7MOT, WA7RPS and WA7RVW have made and created 2-meter fm sign along the highway, under the eudemon of W7DIX and K7OOH. WA7BHU, WA7DSP, WA7BSM, WA7JYC, W7PRM, W7PRV and K77OK have the Drake 2-meter fm transceiver. Moberling in the West Coast: WCARS-7255 daylight hours and WPSS-3952 night time and New 34794 24 hours around the clock Traffic: W7IX 25 WA2MLQ/7 9.

SACRAMENTO VALLEY - SCM, John I. Mike, HI, W6KY.

SEC: W6SAMU. Now is the time to get ready for your S1 I count up Jan. 29, 30. Here is a chance to test yourself in a simulate emergency. Would you be prepared in a real emergency? There is new traffic net on 40 meters, in the novice segment. Known as the West Coast Traffic Net, it meets at 4 P.M. Mon., Wed. and Fri. on 7180 KHz. Contact WA6LKB or W6BQT for further information. W2MEI in New York County is looking for Calif. counties, has nightly skeys with W6JAI at 4400Z on 7040 and will break for call. W6VUZ has built a flying spot scanner for slow-scan TV. Mike says S5TV is fun and a good education. Your SCM has been busy chasing DX and have tested many Sacramento Valley members doing likewise. Wonder what the interest would be in forming a D club up here? Perhaps we are too close to the Northern Calif. D Club in the bay area to really start another club. Anyway, an opinion? Traffic: W6VUZ 4.

SAN JOAQUIN VALLEY - SCM, Ralph Sarovan, W6JPU.

The new EC for Mono County is W6JHI, ex-W4HNO. Amateurs in the vicinity of Coleville, contact W6AII for an emergency work and organizational work. W6EJUC for Forest County; K6DUI for Merced County. WA6PP is an expert eliminating electric fence QRN. WA6LYN is active on 10 s. K6PKO is active on 220 MHz and also in DX. W6KTV was chasing DX during the QY contest. W6INSR is on 2-meter ft. W6LUK is mobile on 2-meter fm. W6URK, WA6BUH, W6GV5, K6OFR are active in installing Navy MARS repeater. W6JMP active in Air Force MARS. WA6LVX has daily skeys with W6FE and WA6HXW on 432 MHz. The 6-meter Net meets Mon. 8:00 P.M. on 50.25 MHz. The 2-meter Net Thur. 8:00 P.M. on 145.35 MHz. Southern San Joaquin Valley Net Tue. 7:00 P.M. fm. W6LKB on 2-meter RTTY. W6DDP is active on 6- and 2-meter ss. OIEBMD, an exchange student and guest of K6QPI gave a talk the FARC. W6IKO is recovering from a heart attack. W6ARE is on 2-meter fm. W6OIB is handling phone patches on 15 and 2 meters. A very Happy New Year to everyone. Traffic: WA6PP 1.

SANTA CLARA VALLEY - SCM, Albert E. Gaetano, W6VZ.

RM: W6LEA. W6GJE has finished his keyer keyer spending a lot of time on ex. W6MAG has a new ham in the family his son W6NJI. W6NIG who recently completed the construction of an SB220 linear has also built a Heath scope to monitor the signal. Nice going Gordon. K4BVD6 finally has received his call and now is heard on the air as W6OAF. The Santa Clara Amateur Radio Assn. celebrated their 50th anniversary in Dec. 1 club was formed in 1921. Several of the original members were present. W6AUC has been very active handling phone patch traf to Hawaii and Okinawa. W6ZRJ is again in full operation in his shack which incidentally is much better than his old one. K6DY has been very active with slow-scan TV experiments. W6JQU recovering nicely from his accident and after three months has cast off his arm and hand. Frank is now back on the nets. Traff: W6RNY 491, W6YBV 229, W6LEA 156, W6NW 152, W6B 125, W6AUC 91, W6VZT 66, W6DEF 61, W6GJE 36, W6NIG, W6RFD 10, W6ZRJ 10, W6DNE 4, W6OAT 2.

## ROANOKE DIVISION

NORTH CAROLINA - SCM, Charles H. Bridges, W4WEZ SEC: W4LVN. PAM: WB4JMG. The S1 I will take place Jan. 29, 30. This issue will carry details on the S1 I. Contact your LC, S or SCM to help in this serious operating exercise. New LCS: W4NXXS, K4MSP/4, W4JLP, W44YBP, W4OIO and W4JCS. Need more LCS. W4NRZ delivered a message in Charlotte: received fan mail from an eight year old girl who was the address K4OGB is the Stanley County ARC. The Forsyth ARC opera from the Dixie Classic Fair (on) mobile club van as W4DI. Buncombe County ARC officers are W4AFM, pres., K4J

vice-pres: WB4PNY, secy.; W4DPF, treas. Forsyth ARC officers are WB4IGZ, pres.; WB4SJV, vice-pres.; W4IRE, secy.; W4WXZ, treas. K4RJ, ex-W3GKP, is Moonbouncing from Franklin with a big dish. Bill was visited by HB9RG and XYL. The Franklin ARC had Open House to interest folks in radio. Had rigs on, displays and XYLs served goodies. The IBM News carried pictures of W4COJ and WB4DAR operating during Ginget.

Net	Freq.	Time(Z)/Daily	Mgr.
PHEN	39.23	00.30 Dy	K4ODX
LEK	39.23	2.30 Dy	WB4FMG
NCSSRN	39.38	03.30 Dy	WA40PI
CN/Early	35.73	00.00 Dy	K4LNDISC RM)
CN/Late	35.73	0.00 Dy	WB4FTF

Traffic: (Oct.) WB4PNY 236, W4EYN 190, K4MC 43, W4RWL 37, W4WXZ 36, W4IRL 34, WB4PWZ 25, K4VBC 23, WA4KWC 10, W4ACY 8, WB4JGS 7, WB4QLP 2, W4TYE 2, WB4BGL 1, (Sept.) K4COG 16.

**VIRGINIA** SCM, Robert J. Slagle, K4GR Asst. SCM: A.F. Martin, Jr., W4THV. SEC: WA4PBG. Asst. SEC: WB4CVY. PAMS: WA4GC, WA4YXK. RMs: WA4LJL, WB4NNO, W4SHU. Potomac Area VHF Society pushing activities well. WB4NNO says he can think only of one thing he likes better than traveling. WB4LOV trying hard to QNT every night. W4SHU says VA. was fairly well represented at the N.C. State Convention. W4DM keeping skeeds with dad. New PVRC members W4HUR, WA4HQU, W7BBX/4. W4LQO has new antenna. We have a welcome addition in WRVDA/4 in Woodbridge. KØPIV/4 hoping to be on 6 soon. WA4WOG has 2843 counties, W4JLU 2386, WB4SIK with WB4FD made 88,000 points in CD party. K4KA how 2-meter mobile. New tower up here with JA-36. K4JYM reports new TA-35 jr. up. WB4RNT reports shack flooded out last 10 days of Oct. W4MK active in CD party. Roanoke Division Dir. W4KFC attended the Rock Hill, S.C. and Gaithersburg Hamfests. Happy to report XYL of WA4GC up and well. Biggest turnout yet at Gaithersburg. W4Gt stayed in touch via 20-meter mobile while out west, WB4JFK reports he is back from K4KDI. We need to break W4KK away from broadcasting WTVA/WI-VA fm. WB4DRB keeping active in hamming at William and Mary ARC, has half of them on 2-meter fm! WB4PWP bowing to school pressure. Come join the Salt Mine Net - a net of us who work and of us don't - on 3947 at 0715 and 1630 local.

VSNB	3935 kHz	1800/2200 Dy
VSN	3860 kHz	1830 Dy
VN	3860 kHz	1900 Dy
VFN	3947 kHz	1930 Dy

Traffic: (Oct.) W4UQ 190, K4KNP 177, WB4KSG 151, W4TE 144, K4KA 116, WRVDA/4 92, WB4SIK 85, KØPIV/4 72, WA4FGC 68, WB4EIK 66, WB4RNT 65, WA4JL 59, W4KFC 52, K4USS 50, WB4KBJ 44, WB4KIT 42, WA4PBG 27, K4GR 17, W4THV 14, WB4RDV 12, K4JM 8, K4CGY/3 6, W4MK 6, WA4WOG 6, WB4PWP 5, K4JYM 4, W4LQO 4, K4POL 4, W4YZC 3, WB4DRB 2, WB4DRG/8 2. (Sept.) WB4NNO 366, W4SHU 9, W4LOV 1. (Aug.) W4GEQ 26.

**WEST VIRGINIA** SCM, Donald B. Morris, WRJM - SEC: WA8NDY. RM: WB8BBG. PAMS: W8DUV, W8IYD, K8CHW. Phone Net Mgr.: WA8POS. CW Net Mgr.: WB8CYB. New officers of the MARA ARC are WA8NPA, pres.: WB8BMW, vice-pres.; WB8AAT, secy.; W8IOT, treas.; WB8BMV, act. mgr. State-wide Novice Net now operates on 37.30 at 2 P.M. Sun., with WB8BMV as NCS. The State Radio Council and Convention Assn. now combined with W8DUV, chmn. and W8IIF and WA8PB on nominating committee to select officers for the State Radio Council. Next meeting in Charleston, Mar. 4. The WYN CW Net reports 31 sessions, 119 stations, 80 messages, Phone Net, 31 sessions, 348 stations, handled 58 messages. WB8CYB has new antenna. WB8FKG working DX on 15. MARA has code and theory classes conducted by WA8ZAF. New Novices, MARA area are WN8ETD, WN8EWS, WN8HTV, WN8IRI, WN8JPL, WN8LGP. Prepare for SUI: offer your services to SEC WA8NDY, Box 523, Buckhannon, OCWA. WVA chapter held dinner meeting in Charleston. WB8DMS now active on the air and in the Greenbrier ARC. Operation Radio Society and Kanawha ARC publish monthly newsletters. Slow speed cw net nightly at 6:30 P.M. before the WYN cw net at 7 P.M. on 35.70. Traffic: (Oct.) WB8CYB 169, WB8BMV 124, WA8NDY 94, WA8POS 58, WA8WCK 27, WRJM 25, WA8EC 16, W8DUV 12, WA8I-FW 12, K8QLW 12, WB8AKQ 11, WB8EKG 11, WB8DXE 10, WB8DQX 5, WA8OKG 5, W8GDP 3, W8FZP 2, W8BLFZ 2, W8CKX 1, W8GWR 1, W8KAN 1, W8KWL 1. (Sept.) WA8NDY #2.

### ROCKY MOUNTAIN DIVISION

**COLORADO** SCM, Clyde Penney, WAØHLO - SEC: WAØOOY. RM: WØLRN. PAMS: WØAWG, WØCXW, KØIGA, WØLRW. The Denver Radio Club elected WAØUMI, pres.; KØPGM,

## "CHOICE OF THE DX KINGS"



All models available "WIDE-SPACED"  
2 ELEMENT—3 BAND KIT SPECIAL

- CONTENTS ONLY
- 8 Fiberglass Arms—skyblue color
  - 2 End Spiders (1 pc. castings)
  - 1 Boom/Mast Coupler—h.d. aluminum
  - 16 Wraplock Spreader Arm Clamps
  - 1 CUBEX QUAD Instruction Manual
- ADD \$7.50 FOR PPD FRT. CONT. U.S.

**\$69.95**

2-3-4 or more element Quads available  
Write for FREE BROCHURE and Price List

## CUBEX COMPANY

P.O. Box 732, Altadena, California 91001  
Phone: (213) 798-8106

YOU CAN'T SAY "QUAD" BETTER THAN "CUBEX"

# NEW FROM R.P. TONE BURST ENCODERS

- UP TO 5 FIXED TONES (factory set)
- ADJUSTABLE: —Duration —Output
- NO BATTERIES needed.
- FULLY ADAPT-ABLE
- EASY INSTALLATION
- CONTINUOUS TONE POSSIBLE
- FULL 1 YEAR RP WARRANTY

FREE SPEC SHEETS NOW AVAILABLE

Prices: MODEL TB-5  
5 tone (std) \$37.50  
2 tone \$32.50  
Special tones—Inquire

(Ill. Residents, add 5% tax)

R.P. Electronics  
Box 1201 Q  
CHAMPAIGN, ILL.  
61820

# IT'S CONTEST TIME. . .and



THE *ALPHA SEVENTY* IS CONTEST BRE



**EHRHORN TECHNOLOGICAL OPERATIONS, INC.**  
 Brooksville, Florida 33512 • Phone (904) 796-8400

**I** would like the following League publications shipped to me postpaid. I am enclosing payment of \$\_\_\_\_\_ (These prices apply only to the USA.)  
 Ship to this address:

NAME ..... CALL .....  
 STREET .....  
 CITY ..... STATE ..... ZIP .....

- |  |   |
|--|---|
| <input type="checkbox"/> <b>ARRL HANDBOOK</b> \$4.50<br>The standard comprehensive manual of amateur radiocommunication    | <input type="checkbox"/> <b>A COURSE IN RADIO FUNDAMENTALS</b> \$1.00<br>Use this in conjunction with the Handbook  |
| <input type="checkbox"/> <b>UNDERSTANDING AMATEUR RADIO</b> \$2.50<br>Written for the beginner—theory and how-to-build it. | <input type="checkbox"/> <b>ANTENNA BOOK</b> \$2.50<br>Theory and construction of antennas  |
| <input type="checkbox"/> <b>VHF MANUAL</b> \$2.50<br>A new and thorough treatment of the amateur v.h.f. field              | <input type="checkbox"/> <b>SINGLE SIDEBAND FOR THE RADIO AMATEUR</b> \$3.00<br>The best s.s.b. articles from QST   |
| <input type="checkbox"/> <b>LICENSE MANUAL</b> \$1.00<br>Complete text of amateur regs, plus Q&A for amateur exams         | <input type="checkbox"/> <b>THE MOBILE MANUAL</b> \$2.50<br>The best mobile articles from QST   |
| <input type="checkbox"/> <b>HOW TO BECOME A RADIO AMATEUR</b> \$1.00<br>All about amateur radio and how to get started     | <input type="checkbox"/> <b>HINTS AND KINKS</b> \$1.00<br>300 practical ideas for your hamshack   |
|  | <input type="checkbox"/> <b>OPERATING MANUAL</b> \$1.50<br>The techniques of operating your amateur station—DXing, ragchewing, traffic, emergencies, etc. |

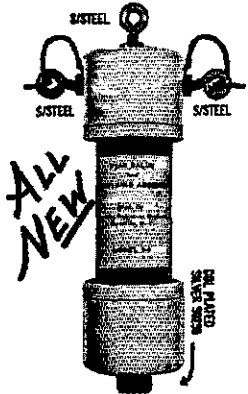
(Please see the other side of this page for an application for membership in ARRL and 12 issues of QST)

THE AMERICAN RADIO RELAY LEAGUE, INC., NEWINGTON, CONN. 06111

QS 1-72

# THE BIG SIGNAL

## "W2AU" BALUN \$12.95



IT'S WHAT'S INSIDE THAT COUNTS!

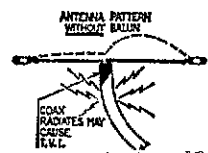
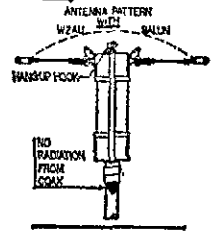
1. HANDLES FULL KW INPUT—THEN SOME. Broad-Banded 3 to 40 Mc.
2. HELPS TVI PROBLEMS By Reducing Coax Line Radiation
3. NOW ALL STAINLESS STEEL HARDWARE. S0239 Double Silver Plated
4. IMPROVES F/B RATIO By Reducing Coax Line Pick-Up
5. REPLACES CENTER INSULATOR. Withstands Antenna Pull of Over 600 Lbs.
6. BUILT-IN LIGHTNING ARRESTER. Protects Balun —Could Also Save Your Valuable Gear
7. BUILT-IN HANG-UP HOOK. Ideal For Inverted Vees, Multi-Band Antennas, Dipoles, Beam and Quads

NOW BEING USED EXTENSIVELY BY ALL BRANCHES OF THE U.S. ARMED FORCES, FAA, RCA, CIA, CANADIAN DEFENSE DEPT. PLUS THOUSANDS OF HAMS THE WORLD OVER

### BIG SIGNALS DON'T JUST HAPPEN—GIVE YOUR ANTENNA A BREAK

Comes in 2 models. 1:1 matches 50 or 75 ohm un-balanced (coax line) to 50 or 75 ohm balanced load. 4:1 model matches 50 or 75 ohm unbalanced (coax line) to 200 or 300 ohm balanced load.

AVAILABLE AT ALL LEADING DEALERS. IF NOT, ORDER DIRECT



We'll GUARANTEE no other balun, at any price, has all these features.

UNADILLA RADIATION PRODUCTS

MFRS. OF BALUNS  
Tel: 607-369-2985

UNADILLA, N.Y. 13849  
Dept. H

# Yes!



I would like to become a member of ARRL and help support its many services to amateurs and amateur radio. Here's my \$6.50 (in the U. S. and Canada, \$7.00 elsewhere). Sign me up for a year's membership and twelve big issues of QST! Additional family members at the same U.S. or Canadian address, \$2.00

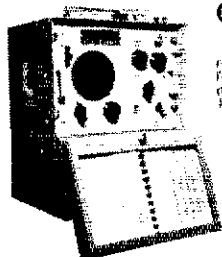
My name ..... Call.....  
 Street .....  
 City ..... State..... Zip.....

(Please see the other side of this page for a list of available League publications.)

THE AMERICAN RADIO RELAY LEAGUE, INC., NEWINGTON, CONN. 06111

QS 1-72

## TS-323/UR FREQUENCY METER & CRYSTAL CALIBRATOR



20 to 480 MC. Portable self-contained crystal controlled heterodyne type, used for testing CW, MCW and pulsed signals. Fundamental Freq. range 20 to 40 MC. Accuracy 0.05%, audio 20 MW at check pts. Radio Freq. output 50-1000 MV. Sensitivity 50M MV sig. Gives audio beat note output of 10 MW. Range 2500 to 500 MV. Power required: 2 dir. batteries, BA-203 (4 VDC) and 8 BA-59 (45 VDC). Size: 12 x 12 x 10". Wt.: 35 lbs. Prices — F.O.B. Lima, Ohio: Used, serviceable: \$60.00 checked: \$75.00 100% SUPPLY — 115 Volt 60 cycle \$24.95

Dept. QST • Send For Big FREE Catalog!

**FAIR RADIO SALES**  
P.O. Box 1105 • LIMA, OHIO • 45802

SSB-SSB-SSB-SSB-SSB-SSB-SSB-SSB-SSB-SSB-SSB-SSB-SSB-SSB-SSB-SSB

### SIMON SIDE BAND COMPANY

Holland Mt. Rd., Oak Ridge, N. J. 07438

201-697-4246

Dealer for Kenwood, Tempo & Henry Amplifiers

Service to all makes of Ham Radio Equipment. We sell, buy, and trade all used equipment. Antennas by — Hy-Gain, Newtronics, Cush Craft, etc. Hours: Tues. — Fri. 4:30 — 9:00 P.M. (mornings by appointment)



Sat. — 11:00 — 6:00 P.M.

Sun. — 11:00 — 4:00 P.M.

Proprietor — Bert Simon W2UUN

SSB-SSB-SSB-SSB-SSB-SSB-SSB-SSB-SSB-SSB-SSB-SSB-SSB-SSB-SSB-SSB

## RADIO TELETYPE EQUIPMENT

Teletype Models 35, 33, 32, 29, 28 ASR, 28 KSR, 28 LPR, 28 LARP, 28 LXD, 28 LBXDI, 14, 15, 19, Page Printers, Perforators, Reperforators, Trans-Dist. polar relays, tape winders, cabinets. Collins Receivers, 51J-3, 51J-4, R-388, R-390A, SP600JX, Frequency Shift Converters. D.C. Power Supplies.

ALLTRONICS-HOWARD CO.

Box 19, Boston, Mass. 02101 Tel: 617-742-0048

## QSL FORWARDING TO BUREAUS

1½ cents FREE mgrs directory, send 50 cents for mailing & handling

### SCOTT'S QSL SERVICES (WA5UHR)

1510 Lynnview, Houston, TX 77055

## GROUNDING GRID FILAMENT CHOKES

30 AMP BIFILAR WOUND FERRITE CORE

SIZE ¾ x 5" 3-30 Mc \$5.00

RF PLATE CHOKES 2500VDC \$80.00 \$3.00

Special Sizes Available

WILLIAM DEANE 8831 SOVEREIGN RD.

SAN DIEGO CALIF. 92123

POST PAID USA 48 CALIF. ADD TAX



Can give you personal service on helping you select better gear per dollar for your operating pleasure. Over 30 years experience. Big trades, easy terms. Used bargains.

VAN SICKLE RADIO SUPPLY CO.  
Gene Van Sickle, W9KJF Owner  
4131 N. Keystone Ave.  
On the northeast side of Indianapolis, Indiana 46205

vice-pres.: WB0BNP, secy.: WA0:BV, treas.: newly elected to the board of dir. WB0BNP and WB0TD; reelected were WA0UME and K0LDC. The Arapahoe Radio Club — W0LRN, pres.: W0GAQ, vice-pres.: WA0YIH, secy.: WA01RB, treas.: W0LQ, dir.-at-large, Pikes Peak Radio Amateur Assn. W0CCH, pres.: WA0ZCS, vice-pres.: W0KWV, secy.: W2RPV/0 treas.: K0UDG, K0ZPG, W0LKD and W0MCT, dir. Congratulations and best wishes to these newly elected officers for the coming year. Also congratulations and best wishes to WA0SLX on her election as chmn. for the 10th district of the YL Radio League. Reports from Colo. section QOs indicate no reportable infractions of operating practices by Colo. amateurs during Oct. This is indeed encouraging. Keep up the good work! Congratulations to W0NOU on receiving his SBWAS award. Net traffic for Oct.: Hi-Noon QNI 887, QTC 37, informals 94, phone patches 12, phone calls 6, with 29 sessions. SSN QNI 309, QTC 104, informals 38, time of 860 minutes for 31 sessions. Columbian QNI 1001, QTC 65, informals 194, time of 1257 minutes. Traffic: (Oct.) W0WYX 300, W0LQ 178, W0LRW 71, K0JSP 62, W0SIN 53, WA0MNL 51, W0NZL 42, WA0ZWA 42, W0PCX 35, W0LLA 35, W2PTV/0 27, K0DSP 26, WA0YGO 16, W0CQJ 11, W0BY 10, W0LCL 10, WA0YLD 7, WA0HO 4, K0IGA 2. (Sept.) W0CXW 50.

NEW MEXICO — SCM, James R. Price, W5NUI The New Mexico Net (NMN) now is in full swing on 3750 kHz. Stations wishing to brush up on code and net procedure check in QNI at 1000Z. The NMN and Roadrunner Net both need outlets in the northeastern part of the state. An updated directory of New Mexico hams has been prepared by the New Mexico Hamvention, Inc. Copies from W5SDM, P.O. Box 14381 Albuquerque, NM 87111, \$1.50 plus postage. W5MIIY has a new regency 2-meter fm rig. Information submitted for station activity other than traffic has been mostly nil. Traffic: W5RE 106, K5MAT 92, E5DAB 49, W5MYM 27, W5NON 18, W5DMG 14, W5OJH 13, W5JXM 10, W5DAD 8, W5BWV 6, W5JNC 2, W5MIIY 2.

UTAH — SUM, Carroll F. Soper, K7SOT — SEC: W7WRF, RM: W7OCX. An RITY repeater should be in operation in the Salt Lake area before the 1st of Dec., input 146.10 output 146.70 MHz. The repeater for the Cedar City area, input 146.34 output 146.94, is completed and should be in operation shortly. The repeater in the Salt Lake area, input 146.34 output 146.94, has proved to be of great benefit to the amateurs along the Wasatch front. It operates under the call WA7AKI. The Beehive Utah Net (BUN) operates daily on 7277 kHz. QNI 863, QTC 43 average time 15.74 minutes. Traffic: W7PM 85, W7OCX 41, K7SOT 28, K7CLO 5, WA7MLL 3.

WYOMING — SCM, Wayne M. Moore, W7CQU — SEC: K7NOX, RM: W7GTM, PAMS: W7TZK, K7YUG. OBS: K7NOX, W7SDA, WA7EHA, K7YUG. Nets: Pony Express, Sun, at 0800 on 4920; YC daily at 1830 on 3608; Jackalope Mon. through Sat. at 1215 on 7260 (alt. 3,920); Wx Net Mon. through Sat. at 0630 on 4920; PC Net 1900 Mon. through Fri. on 3950. A new one on the air is W7JRL, ex-W7VIL. New appointments: K7YUG as PAM of the Jackalope Net and OBS: K7WRS as ORS, WA7OHL and W7OHH have moved to Adak, Alaska. W7PVN was in the hospital with a slight heart attack, is out now and busy again down on the ranch. Wyoming is joining New Mexico in the 1972 QSO Party. Watch QST for dates and rules. WA7JNZ has been in the hospital since Nov. 1 with a broken back. At this writing, he is recovering rapidly. Traffic: K7NOX 305, K7KNA 78, K7VWA 48, W7TZK 33, K7TZX 17, WA7NHP 12, W7SDA 10, K7QJW 6, K7WRS 5, WA7MNG 4, WA7OFC 3, W7NKR 2.

## SOUTHEASTERN DIVISION

ALABAMA — SCM, James A. Brashear, Jr., WB4IKJ — SEC: W4DGH, RM: W4HLD, PAM: W4WLG. ARRL appointees in this section who failed to receive a certificate please let me know. A endorsements should be renewed (or cancelled) annually. WB4ML reports the Andalusia ARC has applied for ARRL affiliation. The club also set up a public service demonstration of ham radio in conjunction with CU at the Covington County Fair. Nominees to the 1972 North Ala. Hamfest to be held in Aug. 1972 are W4SVN, pres.: K4KKR and WB4NI-A, vice-pres.: K4HHT, secy.: W4HFL, treas. Honorary members of the Huntsville ARC are W4HLE, W4FOG, W4YXW, W4ZWL, W4YFN, K4VJL, WA4WTD, WA4KM, and W4HRU. Ready for the SF-1? All ECs make your plan everybody jump in and help load NIS with traffic, let the ECs and SF-1 know how and what you did. Check this issue for details on life in the fun! My apology to K4AOZ for omitting his traffic in the Nov. QST. The Mobile ARC reported in the "Alabama Skip" that had 10 visitors at their previous meeting; 8 later joined the club. WB4PIY has been appointed mgr. of W4CUE, Birmingham AR station. The Birmingham ARC has their Sinclair Duplexer



operation. WB4OKT, NM of our training net (AFND) notes that many non-member stations from 2-, 3-, 8- and 9-Land have been heard. K4IK qualified for Class 100 and has been endorsed. Says he also met and worked WN4TIX who lives in the next block from him! Endorsements: K4OAZ, WB4JMI, as OBSS; W4HI U, W4SVM, ORSS; K4AJR, WA4JGN, OPSS; WA4DBO, WA4HGN, OVS.; K4AEB, OO. Traffic: (Oct.) WB4SVX 266, WB4SVH 146, WB4OKT 94, WB4EKJ 50, WB4KSL 47, WB4JMI 45, WB4TFB 40, K4AOZ 29, K4HJM 7, WB4VKW 7, WB4NIK 5, W4DGH 4, WA4VEK 3. (Aug.) K4AOZ 54.

**CANAL ZONE** - SCM, James L. McMillen, KZ5ZZ. SIC: KZ5GW, RM: KZ5BB, KZ5SD, KZ5WH, KZ5MP as FC; KZ5OU as OPS; KZ5DT as ORS; KZ5GB as OO. The Canal Zone Phone Net meets weekly at 0130Z Tue. on 3790 kHz with KZ5GW as Net Control. The Canal Zone cw Net meets weekly at 0001Z Tue. on 3790 kHz with KZ5BB as Net Control. Participation from Stateside cw stations is encouraged.

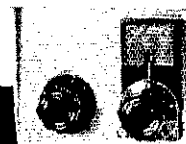
**EASTERN FLORIDA** - SCM, John P. Porter, W4KGI - Asst. SCM: Regis Kramer, W4JLE. SIC: W4IYT. Asst. SIC: W4SMK. RMs: K4HJY and W4JLE. PAMs: W4OGX 75 and W4SDR 40. Traffic picked up in Oct. WB4OMG and W4NVU made BPL. WB4PNG made PSIR. WB4QFH made 53,625 in the CD Party. W4OZE received 160 endorsement on DXCC. Hollywood ARC had 31 students in their Fall class. W4DQS, Dir. SF Division gave a talk on the Malpuelo Island DXpedition at the Lake Amateur Radio Assn. Oct. 28 meeting. The Ocala Club also took part in the meeting. K4QG has now joined the traffic gang in Fla. K4YK gave a very interesting talk on ham TV at the Nov. 8 meeting of the Brandon ARS. K4NA, retired from FCC, QMLs the Fla. Midday Traffic Net and UKWA. WB4CRP has been losing sleep phone patching to KC4-Land. W4JCD of Miami gets back on air with a Swan after many years of inactivity. W4BRB completed a new dock at this water front home with help from WB4OUH - for his top-loaded 75-ft. tower! The West Palm Beach ARC started free code and theory classes for Novice tickets Jan. 10, 1972. The SPRING NEWS featured FB Public Relation article and photo on K4HSC and her ham radio activities. The Orlando ARC now owns a copy of Hams Wide World which is available for area public relation showing. Contact K4VJV. WB4TUP applies for AREC and has the Collins S-Line on order! A Fla. section restructuring committee has been appointed by W4DQS to study possible North-South divisioning. At present W4RKH, W4IYT, W4IKR, W4SMK, WB4FQU are members with W4JLE as chmn. Comments and suggestions are invited. Traffic: (Oct.) WB4OMG 513, WA4SCK 475, WB4AIW 284, W44JH 262, W4JLE 205, W4FPC 192, WB4JHW 186, W4NVU 176, K4EAC 156, WB4MIQ 121, W4SDR 101, WB4NCH 91, K4QG 86, WB4OVO 65, WB4PNG 64, WB4JMI 62, WB4TPJ 59, W4DVO 57, W4NGR 56, W4DQS 49, W4SMK 47, W4LSR 41, K4BLM 40, W4IA 39, W4OGX 35, WB4PHJ 33, W44HJH 32, W4IYT 27, W41AD 24, K4IEK 24, K4JWM 23, W4TJM 21, W4DFP 18, W4ZAK 18, WA4BGW 17, W4KGI 16, W4BCZ 15, WB4SKJ 15, WB4JY 12, W4RGO 11, K4DVGW 10, K4SJJ 9, W4EH 6, WA4SXB 6, W4TJM 5, WB4QFH 4, WB4RXJ 4, K4IWT 3, K4ECC/4 1 (Sept.) WB4TPJ 19, W4UK 8, W4DFP 3.

**GEORGIA** - SCM, A.J. Garrison, WA4WQU - Asst. SCM: John T. Laney, III, K4BAI. SEC: WA4VWV.

Net	Freq.	Time(s)/Days	QNT	QTC	Mgr.
GSN	3595	0000/0300 Dy	926	278	K4BAI
Ga. SSB	3975	0100 Dy	066	77	WB4DMO
GTN	3718	2300 Dy	149	79	WB4SPB
Ga. Cracker	3995	1300 Su	195	0	WA4HQV

It's been a pleasure and a privilege serving you, the hams of the Ga. section these past two years. Thanks for your splendid support and cooperation. You have made our section what it is today. On Oct. 31, the Georgia Single Sideband Assn., (formerly known as The Georgia Amateur Radio Assn.) held its annual meeting in Macon, Ga. The following officers were elected: WB4DMO, pres.; K4KEC, vice-pres.; WA4HYW, secy.-treas.; K4OUB and WA4LLE, board members at large. WA4NMU will be QRT for a year while serving his third assignment in Vietnam. Traffic: WB4RUA 192, WB4QGN 180, WB4SPB 90, WA4NMU 89, K4BAI 86, W4EEP 79, W4AMB 65, W4PIM 52, WA4WOU 50, W4RNL 48, WB4RMO 46, WA4KAV 37, W4CZN 35, WB4TAO 20, W4JM 14.

**WESTERN FLORIDA** - SCM, Frank M. Butler, Jr., W4RKH - SIC: W4IKR, RM: K4LAN, RTTY: W4WEB, PAM: W4NOG. Pensacola: New hams include WN4WOX and WB4WQB. K4DOT renewed OO; WB4JHO was appointed OBS for 6-meter net and OVS. K4DOT added an NB-200. A 6-meter cw net is planned, to meet Mon at 8:00 P.M. CST. WB4KGI received his 1st phone ticket. FL. Wilton: WASMM is recovering from heart attack; K4CLM was appointed OO. WB4VUP had his 3-band quad toned up, with



Unique

## WIRE TUNER

### RANDOM WIRE ANTENNA TUNER

All band operation (80-10) with any wire over quarter wavelength. Absolute 1:1 SWR. Full amateur legal power. Turn counting dial on rotary inductor for exact resetability. Ideal for portable or field day operation.

- ALL BAND OPERATION
- UNITY STANDING WAVE RATIO
- IDEAL FOR PORTABLE
- COMPACT, 5" x 6½" x 10"
- FULL YEAR MONEYBACK GUARANTEE

SOLD FACTORY DIRECT ONLY - \$63.00  
We's add 5% California sales tax. Send check or money order (\$15.00 deposit on C.O.D.'s)

Price F.O.B. factory.

to: **Unique PRODUCTS COMPANY**

1003 SOUTH FIRCREFT STREET  
WEST COVINA, CALIFORNIA 91791  
TEL. 213-331-2430

NEW  
from  
NRI

## Home training in AMATEUR RADIO

NRI, leader in Communications, Television, Electronics and TV-Radio home training, now offers the first in Amateur Radio courses, designed to prepare you for the FCC Amateur License you want or need.

### Don't lose your favorite frequency

The FCC has said "either-or" on licensing, but to pass Advanced and Extra Class exams, you need the technical guidance as offered by NRI. NRI Advanced Amateur Radio is for the ham who already has a General, Conditional or Tech Class ticket. Basic Amateur Radio is for the beginner and includes transmitter, 3-band receiver, code practice equipment. Three training plans offered. Get all the facts. Mail coupon. No obligation. No salesman will call on you. NATIONAL RADIO INSTITUTE, Washington, D.C. 20016.



..... **MAIL NOW** .....

• NATIONAL RADIO INSTITUTE 50-012  
• Washington, D.C. 20016

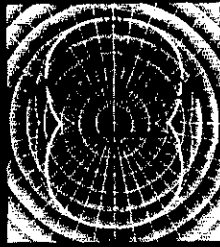
• Please send me information on Amateur Radio training.

• Name \_\_\_\_\_ Age \_\_\_\_\_

• Address \_\_\_\_\_

• City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

• ACCREDITED MEMBER NATIONAL HOME STUDY COUNCIL



PUBLISHED BY THE  
AMERICAN RADIO RELAY LEAGUE \$2.50

## What Antenna's Best for YOU?

Dipole, long wire, vertical,  
beam quad?

Is space a problem?

The twelfth edition of the Antenna Book is jam-packed with ideas for antennas of all types, for all bands.

More Quad information than ever before. A whole chapter on the construction of wire antennas, with ideas you may not have considered.

Get a copy of the ARRL Antenna Book and make use of the latest in antenna information and ideas.

**\$2.50 U.S.A.**

**\$3.00 Elsewhere**

**AMERICAN RADIO RELAY LEAGUE**

Newington, Connecticut 06111

aid of W3ZBW, WB4TPR and others. WB4WRT and W5YGGZ/4 a new ham in town. W4WKQ will winter in Punta Gorda. W4FQNLs the QFN. WB4NH is reworking his Drake 2B. Bonifa W4LXK, WA4GTA, WN4PIT and W4IKB manned a ham rad exhibit at the Holmes Co. Fair, Panama City. Some fair traffic handled on 2-meter RTTY by WB4GAO and W4WEB; WB4LEL and WA4IMC put the rest on QFN. WA4IMC was appointed OBR for the Bay Co. area. K4FOJ interested in satellite tracking and 432 MHz TV. K4VFX relinquishes QFN Mgr. job to WB4OMG this month. *Mariana: W4HPF active again on 40-meters hopes to join WFP Chipley.* W4IKB made Honor Roll in last I-MT. Blountstown: EWB4UQH took part in tri-county disaster drill. Traffic: K4VFX 250, WB4LEL 207, WB4SBD 136, W4IKB 38, W4NOG 12, W4RKK 10, WB9FUZ/4 9, WB4VUP 5.

### SOUTHWESTERN DIVISION

ARIZONA - SCM, Gary M. Hamman, W7CAF - SEC: K7GP RM: K7NHL, PAM: W7UXZ. The Amateur Radio Council Arizona (ARCA) is sponsoring its annual Winter Hamfest on Sun Feb. 6. Final details will be in next month's issue or contact W7CAF, address p. 61. The annual SET will be Jan. 29 and 30. A7EN will have three sessions each day to handle the traffic on 3.992 kHz. There will be some local exercises during the SET as well as a slant on Jan. 30. Your participation would be appreciated. More information may be obtained from W7CAF on A7EN (3.992 kHz, 1900 MST daily). New officers of the Sun City-Youngtown AR which meets on the third Tue, each month at 1930 in the Federal Savings Bldg., Sun City, are W7HYT, pres.; K7W vice-pres.; W7HUB, secy-treas.; K7RDC, WA7MOY, dir. The Maricopa County RACES group is planning to operate WA7HLD as repeater from Papago Butte on 145.65 input and 146.88 MHz output. The Arizona ARC had a hamburger fry at Squaw Peak Park on Oct. 31 with K7JJC and W7LXX as chefs. Yavapai County RACES RO W7KAG has the new call W7VP. K7IRV was regrettably added to the list of Silent Keys Nov. 2. Stations earning Section Net Certificates: K7EMM, WA7HUT, WA7XC, WA7KQ, K7MTZ, K7NTG, W7OUE and K7RLT. Traffic: K7MTZ 13, K7NHL 116, K7NTG 110, W7PG 20, WA7QVN 20, K7EMM 1, W7OUE 13, W7CAF 12, W7DQS 9, K7RLT 8, WA7XC 3, W7LX 3, W7VD 2.

LOS ANGELES - SCM, Eugene H. Violino, W6INH - AS-SCM: Arctic Wilks, W6LPI. One of the large events of the year has been completed; the ORWA Fall Banquet with 218 attending. No others are W6BA, pres.; W6MAB, vice-pres.; W6PG, secy-treas. Everyone had a good time including the XYLs. Talks were given by W6KW and W6MLZ; W6HS was program chmn. W6LYY is getting SCN prepared for the upcoming holiday traffic. K6QPH waiting for QSLs for SBWAS and now going for SBWAC. W6MZW has been heard recently on all bands. San Gabriel Valley RC has a new crystal bank and could use more crystals, any ex-Novices welcome. K6GXO is motorcycle-mobile. K6TVC received a nomination for his EB job as pres. of the Ramona Radio Club. The pres. is W6GGSV. K6SUI arranged for field trip to the local stations. The SCN traffic net has become busy after the summer holidays. We still need some interested hams in the San Fernando valley for ARFC operation, anyone interested contact W6LPI or W6QZ. The San Fernando Valley RC had a good demonstration on mod heart technology by Dr. Rampton from the Veterans hospital. Western Public Service group (300 members) soon will have election of new officers. The Society of Wireless Pioneers meets 3555 kHz Thur. at 8:30 P.M. local time. This is a nice group of O6BUII has passed the 120 mark in countries worked and headed for 150. Those of you who want to join a radio class novice otherwise please contact WB6QJ E 357 4355 of the San Gabriel Radio Club. K6DYK still making BPE. WB6GKG very active on meters. The Crescent Valley Radio Club plan a Christmas dinner. W6DHH is building a slow-scan TV monitor and study for Advanced Class license. W6AJJ has joined the L.A. County Sheriff RACES, is active as OBR. W6LVH getting antenna ready for Dec. 160-meter contest. W6LVC active on SCN RATTSS N RN6 PCN sure a busy fellow these days. WB6ZOK has been quite while opening new radio store in Dana Point. Section net certificates were received by W6HUJ, WB6OLD and K6QPH. K6KA active Intruder Watch. Traffic: W6INH 360, K6LYK 301, W6LYY 1, WB6ZVC 134, WB6YJZ 67, W6QAL 58, WB6MKV 48, W6LVC 1, W6ESY 44, W6AZK 35, W6CAW 26, W6JPH 16, WB6GKG, WB6ZL 14, W6BHG 13, W6ADHM 11, W6DGH 6, K6QPH WB6GGI 4.

ORANGE - SCM, Jerry L. Verdure, W6MNY - Asst. SC Richard W. Birbeck, K6TD. SEC: W6CQR, RM: W6AKR. I designate W6PB as an Asst. SCM for the western portion of section in addition to K6HJ for the eastern portion. W6JSC

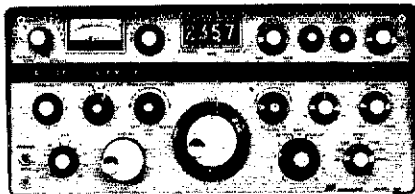
the  
**Magnificent**

**CX7-A** by



**Features:**

1. All modes 10 through 160 meters in full 1 MHz ranges.
2. Broad band tuning. Instant band changes without tuning.
3. True break-in CW with T/R switching.
4. IF shift—a real QRM slicer.
5. Pre IF noise blanker that really works.
6. RF envelope clipping sounds like a KW.
7. Transceiver — Plus — Receiver built-in, two VFO's.



Phone or write

**DON PAYNE K4ID**

for a brochure and  
a big trade-in on  
your gear

**PAYNE RADIO**

Box 525

Springfield, Tenn. 37172

days  
(615) 384-5573

Nites - Sundays  
(615) 384-5643

8. Calibration within 100HZ on frequency meter nixie digital counter.
9. 300 watt p.e.p. continuous duty cycle.
10. Built-in: FSK shift, spotter level, watt meter, SWR meter, transmit offset, CW electronic Keyer.
11. Quality-Plus. American-made. Hand-picked instrument grade components.
12. New unequalled Reliability. "Ham" tested by-hams
13. Perfection for \$2195.00

PICKERING RADIO CO  
Post Office Box 29  
Portsmouth R.I. 02871



**IS IT EASY TO LEARN THE CODE?**



Frankly, no. Neither was it easy to learn how to read without two things: Proper instruction, and practice. CODEMASTER tapes, proven in over five years of sales of thousands of tapes all over the world, give you that essential instruction. No other teaching system offers you a more proven method, more accurate sending, more complete guidance. Select your CODEMASTER tapes below!



**CM-1:** For the beginner. A complete course of instruction is on the tape. Practice material at 5, 7, 9 WPM. Prepares you for Novice exam. Includes code groups and punctuation.

**CM-1½:** An intermediate tape, especially for General Class exam study. No instruction; just practice. ½ hr 11 WPM; 1 hr 14 WPM; ½ hr at 17 WPM. Includes coded groups and straight text.

**CM-2:** For Extra-Class license study. Mostly straight text; some code groups. 1 hour at 20 WPM; ½ hour each at 25 and 30 WPM. For real QRQ, play this tape at twice speed!

CODEMASTER tapes are 2 track monaural, available in two styles: 7 inch reel (3¾ IPS) and cassette. Be sure to specify both the program (CM-1, etc) and the style (reel or cassette). Any tape, \$6.95 postpaid USA 4th class. Any two tapes, \$13.00; all three, \$17.00 PPD. For air shipment in USA add 50¢ per cassette or 80¢ per reel. Immediate delivery. Mastercharge and BankAmericard honored, give us your account number. CODEMASTER tapes are made only by Pickering Radio Company, PO Box 29, Portsmouth, RI 02871. See your dealer or order direct. Satisfaction guaranteed.



**ELECTRONIC FIST** THE PROFESSIONAL KEYSER

- Check the Reviews
- QST, March 1971
  - POP. ELECT., July 1970
  - CQ, January 1971
  - 73, January 1971
  - Ham Radio, August 1970, December 1970, March 1971
- ★ WRITE FOR DESCRIPTIVE BROCHURE

From your ham dealer or direct  
Box 4090 Mountain View California - 94040



- SATURN SIX MOBILEER**
- S-2 6M Ant. only \$12.50
  - S-1 Ant, Mast & Mnt 17.75
  - 3L 6M Hilltopper 14.95
  - SL 2M Hilltopper 16.95

Also 6 & 2 Lunenburg Beams, Halos, Hula-Hoops  
HI-PAR PROD. Box 88 FITCH, MASS. 01420

**WORLD QSL BUREAU**

5200 PANAMA AVE. RICHMOND CA 94804 USA

THE ONLY QSL BUREAU to handle all of your QSLs to anywhere; next door, the next state, the next country, the whole world. Just bundle them up (please arrange alphabetically) and send them to us with payment of 5 cents each.

**STAR-TRONICS**

**INDUSTRIAL AND GOVERNMENT  
ELECTRONIC SURPLUS**

SEND FOR OUR LATEST ALL DIFFERENT  
MONTHLY PICTURE CATALOG. NOW!

Box 17127, Portland, Ore. 97217



# L/C/F CALCULATOR

EVER TRY TO DETERMINE COIL  
DIMENSIONS FROM THE FORMULA

$$L = \frac{a^2 n^2}{9a + 10b}$$

?

Then you can appreciate the L/C/F Calculator. It will tell you at the flick of the wrist the number of turns you need for a particular coil, and determining the resonant frequency of a coil and capacitor is a snap!

Save time and be accurate  
with this handy calculator.

\$2.00 Postpaid

AMERICAN RADIO RELAY  
LEAGUE

Newington, Conn. 06111

new OO at El Toro. Congrats to WB6VTK of 29 Palms who made BPL K6YNB has been nominated to ARRL Hq. for the Contest Advisory Committee. New officers of the Newport ARS are WA6TVA, pres.; W6JYS, vice-pres.; WA6BPM, secy.; WB6KIL, treas. The Desert RATS club meeting has been changed to the 1st and 3rd Wed. of each month at the Palm Springs Police Station, 8 P.M. Citrus Belt ARC has installed a repeater, WA6ALV, with input of 146.34, output 146.85, 1800 cycle tone. WB6ASR reports that Cal Poly Radio Assn., WA6GYI, will provide communications for the Cal Poly Rose Parade float as it is moved to and from Pasadena. W6QBD has been 100% QNT on SCN for over seven months. WB6AKR has completed his RTTY converter. WA6YWS reports the Inyo County AREC is running a series of drills to determine the best band/mode for an AREC net. WA6FIT is keeping a regular sked with ZL1AQF on 15 meters. W6VOZ has installed another Swan linear amplifier. A new ham in Corona Del Mar is 14-year-old WN6MBG who recently moved here from Costa Rica. W6WRJ is doing an FB job of putting the ARRL official bulletins on the various section emergency nets. Alex helped the Orange Co. 2-meter AREC provide communications for the International Boat Races at Lake Havasu in Nov. With the addition of Orange Co. 40-meter AREC and the new Inyo County AREC organization, our 1972 SET should be the best ever. Be sure and participate by supporting your county EC. PSHR: W6MNY 40, WA6TVA 37. Traffic: WB6VTK 185, W6QBD 81, W6BNX 70, W6MNY 62, WB6AKR 44, WA6TVA 22, W6WRJ 15, K6GGS 10, W6JSC 10, WB6ZOK 5, W6FB 3.

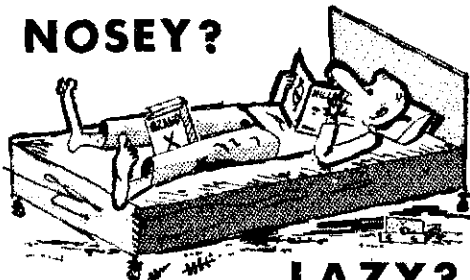
SAN DIEGO - SCM, Paul C. Thompson, W6SRS - Asst. SCM: Art Smith, W6INI. The SDCARC sponsored a 40-ft. booth at the San Diego Home Show the end of Nov. REI, AREC, ATV, QCWA, NTS displays demonstrated to the public the wide variety of amateur activities. Local publicity of the event was effective in promoting the amateur image in this area. Remember that your efforts in the SET this month plays the important part in making it a success. Clubs - K6NY was the speaker at El Cajon. SOBARS heard about direction finding. IVARA has again started license classes. North Shores is busy with new officers. Palomar had SW Division Director W6KW as speaker. Station participation with SDFM has increased. SDDX Club held their meeting at the QTH of K6EC. Active support of the SDCARC by local clubs has increased their ability to promote additional programs. SD State Club did organization for the Home Show display. Station activities - WA6GAV set up display at Public Library. WA6MTW and WB6RMG handled communications for De Anza rescue. W6MAR has a two-element 40-meter Yagi. Thanks to W6BGF for his work as RM for SDSN. W6TAI worked CD Party. WA6AMK is getting 2-meter gear on the air. PSHR: W6LRU, W6BGF. Traffic: W6VNO 468, W6BGF 356, W6JOU 282, WA6AMK 253, W6LRU 169, W6YKF 40, WA6BDW 15, W6DFY 8, W6INI 8, W6SRS 4, W6TAI 2.

SANTA BARBARA - SCM, D. Paul Gagnon, WA6DEI - SEC: W6JTA. PAM: K6EVO. RM: W6UJ. W6JTA back from vacation in Northern Calif. is making plans for the SFF in Jan. This section had its first showing in the 1971 SET. Let's all participate in this years test and make an even better showing of our emergency preparedness. Contact your EC for assignment. WA6FUA is temporarily off the air while he changes QTH in Ventura. WA6WYD handled traffic from the Space Fair at Point Mugu. New officers of the Ventura County ARC are WA6JOX, pres. and WA6GFS, vice-pres. SCN Mgr. W6LYY recommended Section Net Certificates for WB6MRM, WA6FUA and W6UJ. A new OO in Camarillo is W6MUL. SEC: W6JTA met with the Mike and Key Radio Club in Camarillo to discuss the new emergency plan for the section. WA6DEI is now mobile with an NCX-3. Let me hear from you regarding your monthly activities. I have report forms for the asking. A review of the appointments has been completed. Many inactive appointments were cancelled and many are still available. If you are active in a particular facet of ham radio and want an appointment let me know. Traffic: W6JTA 124, WA6FUA 91, WA6WYD 76, WA6DEI 12, WA6JOX 6, W6UJ 5, W6MQF 2.

## WEST GULF DIVISION

NORTHERN TEXAS - SCM, L.E. Gene Harrison, W5LR - Asst. SCM: Gene Pool, W5NEO. PAM: W5BOO, RM: W5QGZ. Asst. SEC: W5KHE. Tex. Sorry folks my SEC reports getting behind. Nobody said "I do" as yet. Your SCM and XYL traveled another 1200 miles this month visiting clubs and swapests. Texoma Hamorama attendance near 600. QCWA breakfast highlight of meeting. W5IZU thanks Tyler QCWA meetings may spark revival E. Tex Radio Club. FB Frank. WA5KHE now Class 4 OO. W2EMW/5 lives in Ken's hometown and wants ORS. Over 20 members Panhandle ARC met with SCM in Amarillo Oct. 25. RM W5QGZ having a ball on 160 meters, worked 21 states with 70 watts. Army

**NOSEY?**



**LAZY?**

**WHY NOT BE BOTH?**

Be *nosey* and avoid future disappointments. Check into the full line of fixed and adjustable R.F. inductors, wind 'em yourself coil forms, I.F. and antenna transformers, wave traps, filters, capacitors, shields, and other products of the J. W. Miller Co.

Be *lazy* and don't tear all over looking for quality parts for amateur, project, or repair needs. Just see your helpful J. W. Miller distributor... he has the parts and our catalog.



**J.W. MILLER COMPANY**

19070 Reyes Ave. ■ P.O. Box 5825  
Compton, California 90224

Full line Catalog available on request.

**NEW DRAKE TR-22**

**2-METER FM**



**PORTABLE**

**OR**

**MOBILE**

**TRANSCEIVER**

**ALSO COMPLETE HAM SUPPLIES**

**Midwest Ham Headquarters**

*For Over 33 Years*

*HAMS! Write For Free Catalogs and Wholesale Prices!*

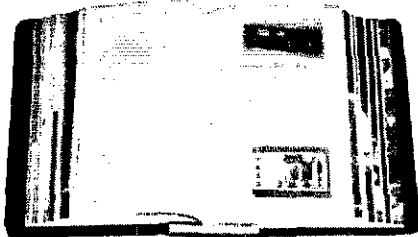
**ELECTRONIC DISTRIBUTORS, INC.**

1960 Peck St.

Muskegon, MI 49441

Tel. 616-726-3196

HRS. 8:30 - 5:30 SAT. 9-4



**PROTECT  
YOUR  
INVESTMENT!**

**PRICE \$4.00 EACH**

*Available only in the United States  
and Possessions*

*You* do have an investment in your copies of QST.

*Don't* endanger your investment by letting QSTs gather dust on a shelf or in a corner.

*Protect* them with sturdy QST Binders; each holds 12 issues. Gold labels are included for showing what year QST is inside.

**THE AMERICAN RADIO RELAY LEAGUE, INC., NEWINGTON, CONN. 06111**

# KW

## ELECTRONICS LIMITED

A complete line of world famous British equipment  
Transceivers; separates, and auxiliaries: 160-10M  
**KW ELECTRONICS**

10 Peru St., Plattsburg, N.Y. 12901

# NOW in the USA

2.3 db loss per 100 ft. at 432 MHz



Aluminum Jacket Semirigid Cable

Low Loss 50Ω Coaxial Cable

1/2 inch with noncontaminating jacket  
Compare these figures  
Attenuation in db/100 ft.

3.5—28.5 MHz—0.2 db/100 ft.

50 0.6 " "

144 1.2 " "

220 1.5 " "

432 2.3 " "

Cost 0.29/ft.

VHF Associates

1420 Hebron Ave.

Glastonbury, Ct. 06033

## THE MILLIWATT NATIONAL JOURNAL OF QRPP

All about under-five watt ham radio

- Construction Projects • Operating News
- WAS & DXCC QRPP Listings • Log Reports

RATES: \$3.40 (yearly), Reprints: Vol. 1—\$4.00  
Vol II—\$3.50 (both \$7.00, plus subscription—\$10.00)  
SASE for info to:

DADE WEISS K8EEG/I  
117 Central F-10, Acton, MA 01720

## 160 METER ANTENNA



MODEL 48MV MATCHVERTER WILL RESONATE ANY 40 OR 80 METER DIPOLE/INVERTED VEE ON 160 METERS

- Handles 250W PEP (140W DC)
- Use coax or open feedline
- Use with any SWR bridge
- Made in USA—Guaranteed

\$3995 Ppd

TOP BAND SYSTEMS

5349 Abbeyfield, Dept. 4, Long Beach, Calif. 90815

### NOVICES

Need Help For Your General?  
Recorded Audio-Visual

THEORY INSTRUCTION  
EASY - FAST - PROVEN

No Electronics Background Necessary  
For Complete Free Information

Write: Amateur License Instruction,  
Box 6015 Norfolk, VA 23508

MARS has repeater in Dallas courtesy W5VSD. W5GG also on 160. It is with regret we learn of W5EZY's resignation. New RM S.T.x is W5SSE. W55CPG has applied for OPS. W5JJ and W5KE sent copy of Collector/Emitter. Thanks. WINM addressed the Richardson WK Oct. 11, attendance 100. W5VJB reports 6 meters open to Fla. Oct. 8 and Tarrant City Emergency Net meets nightly on 50.70 MHz. The Temple ARC W5L1M is in full operation. W5VLF reports 2-meter gear unnecessary for RACES and conditional license report was discussed at last meeting. K5IB1 reports many Amarillo hams attended Brownfield including W4SHSQ, W5FN, W5TRA, W5CBT, W5PLO and W5IQ. Garland ARC SCM representative Jim Walter advises possibility of West Gulf Convention NoTex in '73, not '72. Glidman Upchurch interested in OO appointment. W5QU reports on Nat'l. Traffic System at Texoma. NETEN picnic held Hogg Park Oct. 24 per K5DOM NMGR. W5IZU reports Delta SSB officers as W5KZB, mgr.; W5AVBK, asst. mgr.; K5BTG, secy.-treas. The net meets M-Sat. 6:00 P.M. 3905 kHz. W5TI submitted OO report. KC Club, Ft. Worth has a real hwyewer club. Traffic: W5QU 159, W5VJW 119, W5NFO 52, W5IAR 29, W5ARUF 20, W5TI 8, W5CJT15 7, W5LR 7, W5SAAR 1.

OKLAHOMA - SCM. Cecil C. Cash, W5PML - Asst. SCM: Joe M. Schlosser, W5IMO. SEC: W5F5N. RM: W5RB. PAMs: W5MFX, W5WHV, K5DLE and W5ZRU. Congrats to new appointees W5IMO and W5RB. Another Texoma Hamarama is now history. We had 447 registered with an estimated 150 floaters and drifters that didn't prefer to register. Congratulations to a 100% amateur family W5DXP, W5NEFF, W5NEWN and W5NELM who were at the Hamarama. New officers of the Enid ARC are K5YBP, pres.; W5FVJ, vice-pres.; W5SCHD, treas.; W5NYX, secy. W5LAE/5 reports some great skip on 2 meters. The Muskogee ARC started code and theory classes in Nov. Ex-W5DG and G5AEF now H52AGJ is looking for A-17 and 14 MHz contacts. It's a boy at the OTH of W5NTL. W5IQ and K5PBE, after such hard work on the Hamarama, are on a well deserved vacation to Calif. Congratulations to new licensees: W5OVO Advanced; W5ZMO, W5SBPK and W5SCLI General; W5F5PN Technician; W5SEFH, W5SPNT, W5SFOJ, W5SFQH, W5SEOI, W5SEOS, W5SFQW and W5SFR1 Novice.

Net	kHz	Local Time	Sex	QNT	QTC	WX
OPEN	3915	0800 Su	5	231	3	
OPON	3913	1700 M-F	21	383	84	
STN	3850	1730 M-S	26	363	13	
OTWXN	3913	1745 M-S	26	433	14	271

Traffic: K5TEY 477, W5CFZ 90, W5PML 25, W5ZOO 23, W5IMO 22, W5NZM 13, W5MFX 10, W5DXP 8, W5SOUV 8, W5FKL 5, K5WPP 4, W5RB 1.

SOUTHERN TEXAS - SCM, E. Lee Ulrey, K5HZR - SFC: K5HXR, PAMs: W5FUA, W5KLV, RM: W5EZY. Congratulations to new OPSs W5JFZ, K5LWL and to new OO W5MIN. W5EZY has resigned as RM. Our thanks to him for a most efficient cw net. W5SSE is the new RM effective Nov. 1. Orange ARC hosted a meeting for the Golden Triangle Club with W5EYB as guest speaker. The San Antonio Repeater Organization elected W5DFQ, pres.; W5QDB, vice-pres.; K5PKX, treas.; W5VZV, secy. Houston QWA chapter elected W5OY, chmn.; W5FE, vice-chmn. and W5JKC, secy. I wish to welcome W5NDVS to our AREC ranks. The El Paso ARC club house has a new interior paint job. OO K5SBR has moved to Galveston and is in business again. EC W5YCK is building a vhf repeater near the observatory at Fort Davis. Moonbounce might help get over the mountain from there. Reports were received from W5ZHEY/5 and W5OVH; OO reports from K5IJZ, K5HHA, W5NGW, W5RBB, W5RIY and W5VW. W5RBB and K5ROZ again made the PSRR. I regretfully report the passing of W5AOK of Corpus Christi and Concan. W5AC's repeater is now in the testing and shake-down stage.

Net	kHz	Sex	QNT	QTC
TEX*	3770	62	345	203
T2N*	3961	31	1728	96
1290 Tfc	7290	42	1849	468

\*NTS. Traffic: (Oct.) W5SSE 154, W5ABQ 83, W5RBB 66, W5EZY 62, W5JFZ 55, W5F5N 53, W5QO 52, W5AC 48, K5ROZ 48, K5HZR 47, W5GZX 43, W5MUM 32, W5KLV 31, W5VW 26, K5RVF 16, W5AUZ 12, W5YXS 12, W5BGE 11, W5TFW 11, K5EJL 8, K5HHA 5, W5CBT 2, W5IRQ 2. (Sept.) W5AUB 36, W5MKV 13.

### CANADIAN DIVISION

ALBERTA - SCM, Don Sutherland, VE6FK - Asst. SCM: Mrs. Doney Booth, VE6YL. SEC: VE6XC. The newly elected officers of the Calgary DX group are VE6TK, chmn.; VE6GN, vice-chmn.; VE6AGV, secy.-treas. VE6AUY is spearheading a move to generate

Is it accurate?  
Are you sure?  
**ELIMINATE GUESSWORK!**  
SEE PAGE 146



# HAM RADIO CENTER ANNOUNCES DIAL-A-DEAL

**NOW:** Call your order in, and we'll pick up the tab for the phone call. (Minimum order \$10.00)

**HOW:** Place station to station call. When phone bill is received, forward copy along with our invoice covering order phoned in, we'll send refund check. **DO NOT CALL COLLECT.**

**PLUS:** We will ship your order PREPAID if destination is in our UPS surface shipping area. (Limit-108" width & girth combined and 50 lbs. max wt.)

**COMPLETE STOCKS ALL NATIONAL BRANDS**

**WE BUY-SELL-TRADE USED EQUIPMENT**

**WRITE FOR LIST**

**HAM RADIO CENTER, INC., 8342 Olive Bl., St. Louis, Mo. 63132 Phone (314) 993-6060**



## DIGITAL FREQUENCY METER

Modernize your station by displaying your transmitter frequency while on the air. 100 Hz readout on AM or SSB transmitters through 35 MHz. Kit or assembled. 170 MHz prescaler available for 6 meter and 2 meter operation.

**MICRO-Z COMPANY**

P.O. Box 2426, Rolling Hills, Calif. 90274

## LRL-66 ANTENNA

66' LONG. 80 THRU 10M

Power rating 2 Kw. P.E.P. or over on 80, 40, 15  
On 20 and 10 1 Kw. P.E.P. Transmitter Input



Price  
\$45.00  
in Cont.  
USA ppd.

### OPERATES ON 5 BANDS AUTOMATICALLY

1. Loading coils for 80 & 40M doublet operation
2. Adjustable ends to set 80 meter resonance
- 3, 4. Decoupling stubs for 20 & 10 meters

5. Center insulator with female coax connector to take PL-259 plug
6. Fittings on insulators to tie on rope

**LATTIN RADIO LABORATORIES**

Box 44

Owensboro, Kentucky 42301

## UNDERSTANDING AMATEUR RADIO

\$2.50



## Just Getting Started?

Then Understanding Amateur Radio is for you! Most of the material for this book has been drawn from the popular Lewis G. McCoy *QST* series for beginners and novices. The book is really a mini-Handbook, with all the basics you need to know about transmitters, receivers, antennas, setting up a station and operating.

SECOND EDITION

**\$2.50** Postpaid

U. S. A. • \$3.00 Elsewhere

If you are just starting out in amateur radio, this is a *must* book for you.

**THE AMERICAN RADIO RELAY LEAGUE, INC.**

NEWINGTON, CONNECTICUT 06111

## THE LEAGUE EMBLEM



● Available in the form of a rubber stamp for use on QSL cards, correspondence or any other place you want to indicate your League membership. Same size as the illustration above.

● With both gold border and lettering and a black enamel background, the League Emblem is available in either a lapel-type pin (with safety clasp) or screw-back button.

● Special colored emblems in the pin type only, are available to League Appointees: Red for SCM; Green for RM, PAM, EC, SEC; Blue for OO, ORS, OPS, OBS, OVS.

● The Emblem Cut is a logotype (solid cast metal) 5/8" high for use in printing letterheads, cards, etc.

PIN, BUTTON, CUT or RUBBER STAMP

**\$1.00** each  
POSTPAID

**THE AMERICAN RADIO RELAY LEAGUE**

Newington, Connecticut 06111

more VE6 activity in various contests. In the RTTY 55, ORS VE6LZ made 140 contacts. In the WW DX Contest the memorial station VE6AO of the Calgary DX group made 105276 points. With newly acquired 28 MHz phone privilege VE6APE made 425 contacts in this same contest. VE6HN has recovered from his bout with pneumonia. VE6TG is again on the air after an operation in Calgary Foothills Hospital. The CARA Stampede City certificate is being reprinted in a new attractive 4 color design. This should keep chmn. VE6MX and Boy 592 Calgary very busy with the applications showing 10 Calgary contacts. VE6AUF is taking piano lessons - VE6HM can give instructions on the use of the piano in frequency measuring. EC VE6AZU is now VE6BM. Traffic: VE6FK 18 VE6XC 9, VE6SS 4, VE6YL 4, VE6HD 2.

**BRITISH COLUMBIA** - SCM, H.E. Savage, VE7FB - RM RUFN; VE7QQ QSL Mgr.; VE7HR BC/N Slow Speed Net, 1650 kHz of 0330 GMT. Kamloops ARC: VE7BHL, pres.; VE7RPH, secy. BC Oil Country Radio Club: VE7ATV, pres.; VE7ATO, secy. Welcome to the new club. The British Columbia Centennial RTTY contest was a great success. The Centennial Certificate Committee is calling Dec. 31 the last day for this activity and Jan. 1972 the last month to receive logs. Chilliwack ARC: VE7XV, pres.; VE7AYZ, vice-pres.; VE7BHG, secy. The code and theory class has six students and the repeater is working fine. VE7BVU is home but must remain in bed; he has 2 meters beside him. Victoria Short Wave Club: VE7BD, pres.; VE7BWF, vice-pres.; VE7ZH, secy. VE7LP-9M2UP is home from Malaysia. Officers of Friendly Fists Wireless Assn.: VE7QQ, pres.; VE7BHA, secy. Traffic: (Oct.) VE7LL 70, VE7BLO 31, VE7SF 27, VE7QQ 23, VE7TT 1, (Sept) VE7QQ 5.

**MANITOBA** - SCM, Steven Fink, VE4FO - With regret we record the passing of VE4WS, one of our most active amateurs, who will be greatly missed. New appointees: VE4WC as SEC; VE4NE as Dauphin EC; VE4RO as RM and new MTN Mgr.; VE4KE as OBS; VE4EW and VE4SW as OOS; VE4MA as OVS and VE4DI as ORS. VE4s IH, HI, SE, HR and LA spent Halloween helping the West Kildonan police on Goblin Patrol. VE4CE was elected to the new Winnipeg uni-City Council. VE4MA received special permission to transmit facsimile on HF, the first Canadian station to do so. MTN meets daily at 0045Z on 3660 kHz and reports 29 sessions with 118 QNI and 41 QTC. MEPN meets daily at 0100Z on 3765 kHz reporting 30 sessions, 1010 QNI and 26 QTC. The Winnipeg 2-meter net meets on 147.33 MHz at 7 P.M. Wed. and 11 A.M. Sun. Don't forget the SET Jan. 29, 30. Traffic: VE4RO 51, VE4KE 39, VE4KN 14, VE4FO 11, VE4HR 10, VE4CR 9, VE4EF 6, VE4NE 5, VE4QJ 5, VE4LN 4, VE4YC 4, VE4HA 3, VE4EJ 3, VE4OL 2, VE4YO 2, VE4DO 1, VE4FK 1, VE4LA 1, VE4OM 1.

**MARITIME** - SCM, W.D. Jones, VE1AMR - Asst. SCM: Clarence Mitchell, VO1AW. SEC: VE1HL. It is with deep regret I report VE1XG and VE1HR as Silent Keys. Our sympathy to their families and many friends. A section net certificate has been awarded to VE1ARB. Janet is doing yeoman service acting as APN representative to FCN; any volunteers to help? VE1AVA is the new pres. of NBARA with VE1ANZ as secy. VE1RO has been awarded a regional net certificate. VE1YO has been appointed mgr. of the Maritime Phone Net. VE8AB now is VO1JH and VE1LL is VO1GO. ARCON executives include VO1DF as pres. and VP9GP/VO1, secy. ARCOWL: VO2PB, pres. with VO2AC, secy. The Central Nfld. repeater (2-meter fm) re-installed at Rattling Brook 46 in 94 out. VO1DF has a five-element delta loop on 2-meter fm looking for mainland contacts. Congrats to VO1CP on Advanced. Keep your QSL Mgr. supplied with your SASE. APN reports QNI 123, QTC 99, sessions 30. Traffic: VE1RO 97, VO1CA 75, VE1ARB 73, VE1AMR 62.

**ONTARIO** - SCM, Holland H. Shepherd, VE3DV - It is very gratifying to be able to report that the Ont. Training Net on 3695 kHz Mon-Fri. is very active under the guidance of VE3CYR and could become a regular feature of the Ont. field organization. All clubs are asked to refer their new amateurs to the CTN so that they can get an idea of what traffic handling is all about. Your SCM wishes to remind all appointees that Jan. 1, '72 is the date for all appointment endorsements. If you read the fall issue of the CD Bulletin you will note that the certificate does NOT have to be mailed to me. Send a formal message giving me your expiration date of membership in ARRL and I will send you a gummed endorsement sticker. SCM Bulletin No. 3 spelled out in detail the number of comments received on our SEP '71 activities. With SEP '72 scheduled for the week end of Jan. 29 and 30 it is hoped that all FCs have included the suggested recommendations in their plans. Your SCM attended the 1971 RSO Convention sponsored by the Guelph ARC and a fine show it was. A highlight was the presentation of the Clifford Marsh Trophy for service to his fellow



amateurs to our own Noel Eaton, VE3CJ, Canadian Division Dir. As Noel attempted to express his gratitude he was given a standing ovation by the large assembly. A special thank you to VE3ERU, mgr. of the Ont. Region Net, I C N for being so thoughtful; he issued a Region Net certificate done in Braile for VE1RO, the mgr. of Section Net APN, who is a White Cancer. May I take this chance to wish you all a Happy Holiday. Traffic: VE3DPO 116, VE3FRU 114, VE3DV 106, VE3ARS 100, VE3GFN 99, VE3FOZ 80, VE3CYR 66, VE3FXI 58, VE3AWF 44, VE3FRG 21, VE3GIG 16, VE3ASZ 12, VE3BPC 12, VE3CRW 9, VE3GV 9, VE3AUD 2, VE3DH 2.

QUEBEC SCM, Joe Unsworth, VF2ALI - New officers for the St. Laurent Radio Club: VF2DMR, pres.; VF2WS, vice-pres.; VF2DDO, secy-treas.; VF2DLB, pub. rel. VF2ARI is now at Fox River. VE2DKZ, XYL of VF2WM, presented OM with harmonic Oct. 20. VE2BR1 now is an Advanced Class licensee. Ne tardons plus pour devenir membre de RAQI et obtenir nos plaques VF2: c'est nous a RAQI des aujourd'hui. Le réseau du Québec utilise maintenant les régions administratives de RAQI. Une soirée a été organisée lors du déménagement de VF2XW. La soirée du réseau VE2OM VF2BVU, vous invite a vous signaler nombreux tous les soirs a 1940 VE2DDO est de retour sur l'air avec un très bon signal. VE8YC (ex-VE2AG) opere de Forbisher Bay. La répétitrice VF2VD est maintenant sur l'air avec de l'équipement transistorisé. VF2DLJ est de nouveau arché sur VE2OM. VE2BUB est le gagnant du test de mesure de fréquence de VF2DLD. VE2BUB ont remporté le premier prix du rallye de la semaine de la Radio Amateur. VE2RM now has a permanent Hydro power line and the Triplex extension previously used donated to VE2XW. VE2RM recently acquired batteries and with its transistorized equipment could be operated for a week on emergency power. VF2OM again in Barbados for vacation. PSRR: VF2APF 31. Happy New Year to all. Traffic: VE2DHY 58, VF2DR 57, VE2WM 46, VF2DLG 45, VE2ALE 14, VE2BC 12, VE2API 7.

SASKATCHEWAN - SCM, Barry Ouden, VE5BO - Welcome to all new VEs heard on the Hertzians these days! It would appear that the emphasis is on training classes, especially in new areas, during the past year or so. I B! Many will be, and are, sponsoring "White-Camers." The Swap Net (Cine, after Fone Net) ably operated by VE5TA does a land-slide business. It appears that a wise move is being made by many, that of improving the antenna setup, especially in the congested areas. A further word on Fone-Patches, these are listed separately from formal traffic in order to qualify for Public Service listings. Good luck to VE5SC, SAFA Net Mgr. and VE5GL RM on their new association with District D-1! Traffic: VE5GL 75, VE5SC 42, VE5BO 17, VE5HP 10, VE5KZ 8, VE5RD 5, VE5BW 3, VE5DM 3, VE5ES 3, VE5KS 3, VE5KG 3, VE5YR 3, VE5KE 2, VE5OS 2, VE5RA 2, VE5DF 2, VE5IX 1, VE5GW 1, VE5SE 1.



**EXERCISE REGULARLY, MODERATELY**  
 Physically active people have a lower heart attack risk.

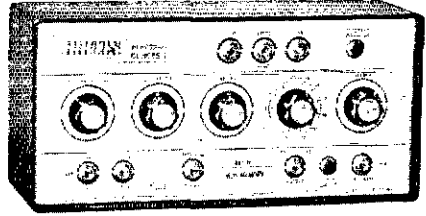
**AMERICAN HEART ASSOCIATION**

**QUADS! QUADS! QUADS!**  
 Prices are for complete quads. Enjoy all the advantages of a full-sized quad. All quads complete with hardware. Noisy locations our specialty.  
**SPECIAL DEAL ON A QUAD/ TOWER COMBO, OR ON A TOWER ONLY.**  
 Ppd to nearest freight terminal.

- ★ 2 element, 3 band (10-15-20) \$69.95
- ★ 3 element, 3 band (10-15-20) \$99.95
- ★ 4 element, 3 band (10-15-20) \$129.95

F.O.B. TAMPA, FLORIDA

(813) 988-4213  
 406 Bon Air Ave.  
**SKYLANE PRODUCTS** Temple Terrace, Fla. 33617



**PROGRAMMABLE - REPROGRAMMABLE!!**

- The KING of Electronic Keyers
  - 20 Character Read/Write Memory
  - Every Conceivable Feature...
- EK 402 \$289.95 Complete, FOB Factory  
 WRITE FOR BROCHURE



**HUMMEL ELECTRO DEVICES**

Box 4890, Mountain View, California - 94040

**GROTH-Type**  
**COUNTS & DISPLAYS YOUR TURNS**

- 99.99 Turns
- One Hole Panel Mount
- Handy Logging Area
- Spinner Handle Available

**Prices:**  
 TC2 - \$6.00  
 TC3 - \$6.60  
 Spinner (-\$) - \$9.00

Case: 2x4"; shaft 1/4"x3"  
 Model TC2: Skirt 2 1/2"; Knob 1 3/8"  
 Model TC3: Skirt 3"; Knob 2 3/8"

**R. H. BAUMAN SALES**  
 P.O. Box 122, Itasca, Ill. 60143

**TELETYPE-RIBBONS-TOROIDS**  
 Lowest prices anywhere!  
 88 mhy TOROIDS 40/\$10. ppd. -  
 Fresh RTTY Ribbons 12/\$3.50 ppd.  
**MACHINES - GEARS - SUPPLIES - TAPE**  
 Stamp for CATALOG **VAN W2DLT** 302Z PASSAIC AVE. STIRLING, N. J. 07980

**A NEW TRANSMATCH - MODEL UT-1**  
 A New Universal Transmatch from the ANTEC COMPANY

- 80 thru 10, including all MARS
- 2kw, PEP, SWR 1:1, any frequency
- provides 50-70 OHM resistive load
- fully guaranteed, made in U.S.A.
- use with all antenna-feeding combinations
- will match dipoles, quads, beams, zeps, random wires, verticals, etc.

Write for details to: \$94.95 (ppd. continental U.S.A.)  
**ANTEC COMPANY, INC.**  
 67 Briarcliffe Road, Buffalo, New York 14225 Tel: (716) 637-7408

*you always get a fair deal at*

# TRIGGER Electronics



Where the  
HAM IS KING



**FREE**

NEW 1972  
TRIGGER  
CATALOG

TO HELP YOU  
SHOP  
BY MAIL

**BRAND NEW! Everything for the Ham!**

Send for this reliable buying guide to carefully selected Amateur gear. You'll find it easy to shop at TRIGGER by mail. We make fast shipment from complete stocks of all the leading brand equipment—generally the same day your order comes in.

**CHECK COUPON FOR YOUR FREE CATALOG**

**Shop at our store just west of Chicago**

**EASY ACCESS:** Located at the western limit of Chicago. On North Ave. (State Route 64), 3 blocks west of Harlem Ave. (State Route 43). Accessible from all expressways and freeways. Plenty of free parking.

**HOURS:** 10:00 A.M. to 5:00 P.M.; Friday 10:00 A.M. to 9:00 P.M.; Saturday until 3:00 P.M. (Central Time). Come in and browse.

**ALL PHONES: (Area 312) 771-8616**

**BEST TRADES IN HAMDOM**

Trade high with TRIGGER. You'll find we allow you more for your present gear. Write for quick quote.

**INSTANT CASH FOR YOUR USED GEAR**

Tell us what you want to sell (use the coupon below)—get our cash offer quick.

Clean as a whistle like-new bargains for January

75A4.....	\$349	HQ110AC.....	\$159	100V.....	\$299
2.1 KC FILTER..	29	HQ110A/VHF NEW.	189	HR10B.....	79
30L1.....	329	HQ145XC.....	169	DX60B.....	79
DRAKE 2A.....	139	HQ180A & NB...	299	SWAN 240& AC...	179
DRAKE 2B.....	159	HQ180A.....	279	AMECO TX62....	99
DRAKE 2CQ.....	24	HT40.....	59	SX146 NEW.....	179
DRAKE R4A.....	279	SX73.....	369	WATERS 361 NEW.	59
DRAKE R4B.....	319	SX110.....	99	GALAXY RV550...	49
DRAKE SPR4.....	369	SK130.....	147	GALAXY VOX.....	19
DRAKE T4XB.....	319	CRX102 NEW....	24	GALAXYAC(GT550)	69

**CHECK COUPON TO GET OUR LIST OF LIKE-NEW GEAR**



**free**

TRIGGER (Attn. W91VJ)  
7361 North Ave., River Forest, Ill. 60305

Q1-72

Rush the following: \_\_\_\_\_

\_\_\_\_\_ \$ \_\_\_\_\_ enclosed

- Send **FREE 1972 TRIGGER Catalog**  
 Send complete list of like-new gear

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

**Instant Cash for Your Used Gear**

Describe fully what you have: Make, model, modifications, accurate description of condition: \_\_\_\_\_

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**GET A GOOD DEAL FROM TRIGGER**

# HAM-ADS

(1) Advertising shall pertain to products and services which are related to amateur radio.

(2) No display of any character will be accepted, nor can any special typographical arrangement, such as all or part capital letters, be used which would tend to make one advertisement stand out from the others. No Box Reply Service can be maintained in these columns nor may commercial type copy be signed solely with amateur call letters. Ham-ads signed only with a post office box or telephone number without identifying signature cannot be accepted.

(3) The Ham-Ad rate is 50 cents per word, except as noted in paragraph (6) below.

(4) Remittance in full must accompany copy, since Ham-Ads are not carried on our books. No cash or contract discount or agency commission will be allowed.

(5) Closing date for Ham-Ads is the 20th of the second month preceding publication date.

(6) A special rate of 15 cents per word will apply to advertising which, in our judgement, is obviously non-commercial in nature. Thus, advertising of bona fide surplus equipment owned, used and for sale by an individual or apparatus offered for exchange or advertising inquiring for special equipment, takes the 15-cent rate. Address and signatures are charged for, except there is no charge for zipcode, which is essential you furnish. An attempt to deal in apparatus in quantity for profit, even if by an individual, is commercial and all advertising so classified takes the 50-cent rate. Provisions of paragraphs (1), (2) and (5) apply to all advertising in this column regardless of which rate may apply.

(7) Because error is more easily avoided, it is requested copy, signature and address be printed plainly on one side of paper only. Typewritten copy preferred but handwritten signature must accompany all authorized insertions. No checking copies can be supplied.

(8) No advertiser may use more than 100 words in any one advertisement, nor more than one ad in one issue.

(9) Due to the tightness of production schedules, cancellation of a Ham-Ad already accepted cannot be guaranteed beyond the deadline noted in paragraph (5) above.

*Having made no investigation of the advertisers in the classified column except those obviously commercial in character, the publishers of QST are unable to vouch for their integrity or for the grade or character of the products or services advertised.*

QCWA Quarter Century Wireless Association is an international non-profit organization founded 1947. Any Amateur Radio Operator licensed 25 or more years is eligible for membership. Members receive a membership call book and quarterly news. Write for information, Q.C.W.A. Inc., Box 394, Mamaroneck, NY 10543.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't, police, etc. invited to join Society of Wireless Pioneers - W7GA/Q6 Box 530, Santa Rosa CA 95402.

FREE sample copy Long Island DX Assn bulletin. Latest DX news, business size sase to K2AFY Box 74 Massapequa LI NY 11762.

AN INVITATION NYC area hams and SWLs are invited to attend NY Radio Club meetings - 2nd Monday of every month, Williams Club, 24 E. 39th St., near Madison Ave., at 8 PM - New members wanted, interesting programs.

ROCHESTER, N.Y. is again Hamfest. VHF meet and flea market headquarters for the largest event in the northeast, May 13th. Write WY Hamfest, Box 1388, Rochester, NY 14603

21st Annual Dayton Hamvention will be held on April 22, 1972, at Wampler's Dayton Hara Arena. Technical sessions, exhibits, hidden transmitter hunt, flea market, and special program for the XLV. For information write Dayton Hamvention, Dept. Q, Box 44, Dayton, OH 45401

TOLEDO Mobile Radio Association's 17th annual hamfest & auction, will be held at the Lucas County Recreation Center, Maumee, O on Feb. 20, 1972. RI registration, open table sales, map and info. Write TMRA, W8HFF, Box 273, Toledo, OH 43601

EDITING a club paper? Need public relations help? You should belong to Amateur Radio News Service. For information contact Rose Ellen Bills, WA2FGS, Secretary, 17 Craig Place, Pennsville, NJ 08070

SPIDERS for boomless quads, Heliate welded aluminum, A's Antennas, 1339 So. Washington St., Kennewick, WSN 99336

WE buy electron tubes, diodes, transistors, integrated circuits, semiconductor and resistors. Astral Electronics, 150 Miller St., Elizabeth NJ 07207. Tel. 216-354-3141

WANTED: Teletype machines, parts Models No. 28, 32, 33, 35, 37. Cash or trade for Drake equipment. Alltronics-Howard Co., Box 19, Boston MA 02101. (Tel: day or night 617-742-0048)

VERY in-ter-est-ing! Next 6 big issues \$1. "The Ham Trader," Sycamore, IL 60178

QSL Cards??? Personalize made-to-order. Samples 25c. DeLuxe 35c. Religious 25c. (deductible) Sakkers, WRDWD, Box 21K, Holland, MI 49423

QSLs. Second to none. Same day service. Samples 25c. Ray, R7HLR, Box 331, Clearfield, UT 84015

3-D QSLs. Far more spectacular, little more cost. Samples 25c. (refundable). 3-D QSL Co., Monson 2, MA 01057

GORGEOUS QSLs, Rainbows, etc. Top quality! Low prices! Samples 10c. Refundable. Joe Harns, W4BLQ, Box 158, Edgewater, FL 32032

PICTURE QSL cards of your shack, etc. from your photograph. 500, \$12.50. 1000, \$16.25. Also unusual non-picture designs. Generous sample pack 25c. Half pound of samples 50c. Raum's, 4154 Fifth St. Philadelphia PA 19140.

QSLs, samples 10c. Fred Leyden W1NZJ 454 Proctor Av. Revere MA 02151.

CREATIVE QSL cards. Personal attention. Imaginative new designs. Send 25c. Receive catalog, samples and refund coupon. Wilkins Printing Box 787-1, Atascadero CA 93422.

SAMPLES 15c. Harry Sims, 3227 Missouri Ave. St. Louis MO. 63118.

QSLs 3-color glossy 100, \$4.50. Rutgers Van-Typing Service. Free samples. Thomas St. Riegel Ridge, Milford, NJ 08848.

QSLs 300 for \$4.50, samples 10c. W9SKR, George Vesely, Rte. 1, 100 Wilson Rd., Ingleside, IL 60041.

RUBBER stamps \$1.50 includes tax and postage. Clint's Radio, W2UDO, 32 Cumberland Ave., Verona, NJ 07044.

QSLs "Brownie," W3CJH, 3111 Lehigh, Allentown PA 18103. Samples 10c. Catalog 25c.

DELUXE QSLs. Petty, W2HAZ, PO Box 5237, Trenton NJ 08638. Samples 10c.

DON'T buy QSL cards until you see my free samples. Fast service, economical prices. Bolles, Little Print Shop, Box 9848, Austin TX 78757.

QSL, SWL, WPE cards. Samples 25c. Log books, file cards, decals. Malgo Press, Box 375 Toledo OH 43601.

QSLs, SWLs, WPE samples 15c. Nicholas & Son Printery, PO Box 11184, Phoenix AZ 85017

FRAME Display, and protect your QSLs with 20 pocket plastic holders - 3 for \$1, 10 for \$2, prepaid and guaranteed. Tepabco Box 1987 Gallatin TN 37066.

QSLs 100 3 color glossy \$4; 200 \$6; globe, eagle or straight key on front; report form on back; free samples. Rusprint Box 7575 Kansas City MO 64116

QSLs - Thin dime brings samples. Alkanprint, Box 3494, Papago Station, Scottsdale, AZ 85257

100 TWO color QSLs, \$3.25. Stamp for samples, Joe Yutz, W3LXY, Pottsville, PA 17901

QSL, SWL cards that are different. Quality card stock samples. 20c. Home Print, 2416 Elmo Ave., Hamilton, OH 45016

NEW, original, exclusive prof. QSLs. Samples 25c. W1FLX QSLs, 20 Britton, Pittsfield, MA 01201

QSLs - Fast service, free samples. W7IIZ Press, Box 2387, Eugene, OR 97402

EXCELLENT QSLs. Reasonable. Samples 25c. W9CL Press, RR #1, Box 811, Carmel, IN 46032.

C. FRITZ, yes, we're still printing better QSLs! Samples 25c. Box 1684, Scottsdale, AZ 85252

QSLs, 3 color glossy, globe, eagle, straight key, ham with earphones on front, report form on back, 100 - \$4.75 postpaid, Rusprint, Box 7575, Kansas City, MO 64116

WANTED - All types of tubes. Top prices paid for Varian and Eimac. Since Nov. 20 new location: 412 27th st., Orlando, FL 32806, Jaro Electronics Corp.

WE BUY all types of tubes for cash, especially Eimac, subject to our test, Maritime International Co., Box 516, Hempstead, NY 11551

CASH paid for your unused tubes and good ham and commercial equipment. Send list to Barry, W2LNI, Barry Electronics, 512 Broadway, NY 10012.

WIRELESS sets, parts, catalogs, bought, traded. Lavery, 118 N. Wycombe, Lansdowne PA 19050.

AMATEUR museum buying old radios, books, magazines, catalogs, parts. Selling QST's and CQ's. Erv Rasmussen 164 Lowell, Redwood City CA 94062.

WANTED: An opportunity to quote your ham needs. 33 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. 290 Mira Mar Av. Long Beach CA 90803.

RECEIVING & Industrial Tubes, Transistors, all brands - Biggest discounts. Technicians, Hobbyists, Experimenters - Request Free Giant Catalog and save! Zalytron 469 Jericho Turnpike, Mineola, NY 11501

CLUBS: Send membership list for QSLs, World QSL Bureau, 5200 Panama Ave., Richmond, CA 94804

TRANSFORMERS rewound, Jess Price, W4CLJ, 507 Raehn, Orlando, FL 32806

DUMMY loads, 1 kw, \$9.95; phone patch, \$8.95. Wired, \$4.00. Ham-kits, Box 175, Cranford, NJ 07016

PRIVATE collector wants old wireless gear. Buy, trade, Dick Sepic, 1945 E. Orange Grove Blvd., Pasadena, CA 91104

WEST Coast hams buy their gear from Amrad Supply, Inc. Send for flyer, 1025 Harrison St., Oakland CA 94607

GREENE - ceiling insulator, with or without Rainin - a tough number to beat - free flyer, Greene Insulator, 3 Pigeon Dr., Bedford, NH 03102

WANT wireless (early) magazines and equipment for W4AA historical library, Wayne Nelson, Concord, NC 28025

TOROLDS e. teletype. Lowest prices anywhere, 40/100 postpaid, 32 KSR printer, reconditioned, \$225. Mite UGC 41, too! Model 14, 15, 19, 26, 32, 33! Many more bargains. List, stamp please! Van, W2DLT, 3022 Passaic, Stirling, NJ 07980

PREPARE for Amateur FCC exam! You need Post-Check. Original, expertly devised, multiple-choice questions, covering all areas tested in FCC exam. Same form as FCC exam. Over 300 questions and diagrams for each class. Keyed answers, explanations, IBM sheets for self-testing. Basic questions duplicated where they apply. General Class \$4.25, Advanced Class \$4.50, Extra Class \$4.75, including first class mailing. Add 25c each copy for air mail. Send check or money order to Post-Check, P.O. Box 3564, Urbandale Station, Des Moines, IA 50322

FREE Electronics magazines, list \$1. Electronic Publications DEW26, Wannwright, AK 99782

PROFESSIONAL service for your quality ham gear. For information send card to Dave W4AL, South Shore Radio Phone, Municipal Airport, Marshfield, MA 02050

WANTED: R389, R390, R390A, R391, R220. Raal and 5181 receivers. SWRC, Box 10948, Kansas City, MO 64111

WANTED: Heath keyer HD-10. Trade HW32A for HW 12 A. W2UGM, 66 Columbus Ave., Closter, NJ 07624

CASH paid for R390A receivers, 61873 transceivers, and Fima/Varian tubes. The Ted Dames Co., 308 Hickory St., Arlington, NJ 07032

WANTED to buy - Ten meter s-m transceiver. F. E. Knapp, W7EQV, P.O. Box 854, Scottsdale, AZ 85259

AUTOMATIC Morse Code copying machine. Copy up to 120 wpm without knowing cw! Simply hook to your receiver's audio and read printout. Send \$14.95 for detailed construction plans. VMG Electronics, 2138Q West Sunnyside, Phoenix, AZ 85023

KWM-2, 11843 w/516F-2 - very good condition \$645. Like new Clegg Thor 1 w/1 wps \$140. Eico 720 \$35. NCL-2000 w/new tubes \$285. W2LCE

WANTED: QST magazines, 1928 or older. Give price. W3QII, 5839 Barnes Ave., Bethel Park, PA 15102

WANTED: Original Hallcrafters "Skyder" T.R.F. Regen receiver. Also other early Hallcrafters receivers. Howard Hoagland, 639 North Sierra Bonita, Los Angeles, CA 90036

2-METER fm 10-20 brand new, solid state, 12 channel, stacked for four, 1610 watts, modular construction, with mike, m-mount, & cables. \$225. K7NHE, 15112 SE 44th, Bellevue, WA 98006

TELEFX beams, new, orig. pkg., 6el 20 meter, 1tel 10 meter, 4el 40 meter, all for \$300. New, rest \$200. E. Plinn, Jr., Box 100, Carrollton, GA 30117. Phone (404) 834-2000

SELL: National NCX-5 MK-II, NCX-A, XCU-27 \$400, WA7LFE, 116 Shasta Dr., Walla Walla, WA 99362

MUST sell KWM-2, ac and dc pwr supply, mobile mount + antenna, Ham-M, 40 crank tower, H 1-15 keyer, Sig. gen., 1 & 4 1500 V ohmvs, ART-1B, s-27 rev. - All kinds of goods, 1215 674-6500. R. Wilson, 1215 W. County Line, Warminster, PA 18974. Call and bring money.

THOR transceiver with modulator/power supply. Excellent condition. \$130. Frank McDannet, 11557 Evanson North, Seattle, WA 98133

SELL Johnson Thunderbolt kW. Works great. (in original carton \$775; in any old carton \$775. W5LJT AC 713 781-2470 11927 Wink Rd., Houston, TX 77024

WANTED: H-brand ant coil assy for R-274/SX-73 rec. W0FAN, 1284 W 6th, Broadnield, CO 80029

HEATH SB-301, s-w filter, excellent condition, \$200. HM-15 SWR meter, \$10. Any offer considered. Bill Lowe, 900 Oakland, Ann Arbor, MI 48104. 313-761-4281

NATIONAL NCX5 and NCXA with sure 444 mike. Fig used less than 50 hours. Original cartons, all manuals. Mint condition. x325 83RHV, Don Gomme, 8800 Blvd. East, North Bergen, NJ 07047, 201-869-3723

GK-54, Globe Chief 90-A, 100 kHz xtal calibrator, HS-24 speaker. Sacrifice for first \$110. Keith Frank, 555 E. Franklin St., Berne, IN 46711

DRAKE 2C & Drake 2NT & Hustler trap ant - all mint - best offer. WN2NTR, Richard H. Hammond, 605 Point Rd., Little Silver, NJ 07739

RTTY Western Union Simplex printer, Type 2R. Will sell or trade. W2LYR

HRO-50 receiver AR300, 600Hz and AB coils, calibrator \$150 24K linear, part 4-10 best components 3600 coil adjustable ps in 5 H rack \$125. NCX5 transceiver \$275. Homemade ac supply \$30. NCXD supply \$85. Rudy Kurotmeier, Lunstable, MA 01827. Tel: 617-645-7678

MOTOROLA 161GDU with accessories, \$75. S.A.S.E. Intl. Stotts, Ten-Four Communications, 1141 Lakeview, Mesquite, TX 75149

SELL: Hallcrafters HT-37, srb transmitter Mike. antenna relay. All good \$200. Hallcrafters SX-101 mk1 receiver, fair, \$75. National NC-88 receiver \$20. Heathkit HR-10B receiver \$30. Will ship. David White, 55 Huntington, Sharon, MA 02067. Phone: (617)-784-5613

ELCOCO largest exclusive ham dealer in the Gulf South. All major product lines in stock. New and re-conditioned equipment. Before you buy, sell, or trade, check our low prices and high trades. Elevated, 608 Papworth Ave., Metairie, LA 70005. (504) 834-9100

SELL: SB-301 & SB-401 receiver and xmittr with Heath desk mic, and all connecting cables & power supplies. \$175. W4RLX, Xenia, OH 45385. Tel: 513-372-7793

COLLINS R388/UR 5-30.5 Mc. W.B.K. excellent. \$325. T5175H/1 frequency meter, 85-1100 Mc. new, calibration book, modulation \$45. Safety Bell/Lansray, \$21.50. Hand-talkers \$25.00. Heathkit HR-10B receiver \$35. Signal generator, HR-608B 9.5 kc, 30 Mc. \$125. Link, 1000 Monroe Terr. Monroe, CT 06468

WANTED: Collins 30S1 linear, also good used bug. Hal Cushing, W61NZ, 5224 Bohue Ave., San Jose, CA 95130

VHF/HF receiver 3R MHz thru 1000 MHz with 3 tuning heads, i-f unit and demodulator with S meter, and matching s meter Panadator and spectrum analyzer. All 120 VAC 60 cycle, gud wkg condx. Govt. cost \$3800. Sell \$135. W4UCB

HALLCRAFTERS SX-130 communications cwy, matching R-50 speaker and manual. Excellent condition. Good for atm and SWL. Paid \$230, sacrifice \$125. Also 50' tilt-over tower, with anchor and mounting for rotor \$250. HG-10 VFO and manual \$35. Want 'R3 or Swan for trade or buy. Mike Moore, W9BR9R, 918 Hunter, Wilmette, IL 60091

BEST offer HRO-500 (National). Heath (Hoden, 84 Hickory Dr., Gastonbury, CT 06034. Tel: 203-633-7121

NCX5 MK II, ac supply, 1X501 \$295, two Robin 25 towers 100 and 80 feet. Write for details. K1C8J Dan Morgan, 82 Peabody St., Middletown, MA 01949

HW-12 with ac supply - \$115. Good condition, prefer local. Gary Pearce, W4NN0, 14 Robin Hood Ln., Northfield, IL 60093. Ph: 262-1260

WANTED: Heath path and wattmeter, Knight R-C checker, Tom Dornback, K9MKX, 2515 College Rd., Downers Grove, IL 60515

WANTED: SR150 and ac supply. Must be clean and unaltered. W. Cotter, 817 Westwood Ln., Wilmette, IL 60091

COLLEGE: Mint HT-37 \$150, 2A with cath \$100, WB601L, 1181 Castlegate Ln., Santa Ana 92705

SWAN 250-C with noise spacer mint \$295. Ken Massie, 116 Woodlawn Dr., Ironton, OH 45638

HEATH: Sell complete station. DX-608 xmitr, HG-10B VFO, HR-10B receiver, HA-101 plug-in 100 kHz xtal calibrator. Excellent condition. Ideal for Novice or General. Also, 100 watt year old. Manuals included. \$150 takes all. Gene McGuire, WN2AXP, 600 Washington Ave., Pleasantville, NY 10570. 914-769-4086

SELL: Drake 2B, 2AC receiver \$180; SB200, \$180. Sonar VFO with xtal. 2 thru 80 narrow band fm and cw. 4-7 watts. 350 with tonals. D104 Astatic mike with G stand \$20. H. U. Davis, 112 Woodland Ave., Wayne, PA 19087. 215 MU 8-2117

HEATH SB101 and HP-23A pwr supply, used 3 months \$350. BSE-219 mike \$25; HD-15 phone patch \$20; HM-15 swr \$10. W4J3Y, 308 East Derry Rd., Hershey, PA 17033

GONSET G-60 six meter transceiver, very good condition, \$125. W4BPUJ, 600 Ringier Rd., Shelbyville, TN 37160. 615-684-7886

WANT ED: 1-1 plug-in complete, for Collins R391/URR, K1GVA, 61 Warwick, Portland, ME 04102

COLLINS 325-1 \$325, 516F-2 \$75. Immaculate Swan 500' and 17XC. less than five hours operating time \$120. 100' RG17U coax. Hy-Gain 203BA, McCullough gasoline generator 1KW excellent condition. Best offers. K8YVA, 2901 Cricket Ln., Woughtry Hills, OH 44092

SELL: Heath DX60B with built-in antenna relay, HR10B with key monitor, HRA-101 calibrator, excellent condition, all for \$148. Heath HP10 Warner linear, \$149. Swan SW-140 with Heath HP20 and HP10 supplies, \$139. All manuals. Harry Legler, 301 Miami, Hiawatha, KS 66144 (913) 742-1102

RANGER 1, Hallcrafters SX71, Mansfield 8mm Magsound Profor (Trade), W1lox recorder, RCA cassette recorder, Craftsman 12HP motor, set or trade. W42DDU, 1122 Victory Ave., Plainfield, NJ 07060 (201) 756-8767

SALE: From estate of W2VFW: Hallcrafters SR150 complete gfts. power supply, like new \$250; Johnson Lowpass filter \$5; Powerstat 10 ohm a.m.p. \$15. Antique Atwater-Kent and crystal receivers, QSTs, meters, antenna, microphones, reflectometer, etc. All letters answered. Adeline Pittenger, 18 Meacham St., Milburn, NJ 07041

WANTED: Collins 30K-L; HRO-50 coils; Hallcrafters HT-9, Sam Thompson, 6809 Iris Circle, Hollywood, CA 90028

**GOTTAGO!** Heath HW-12 modified to cover 14-14.2 MHz, including all original HW-12 parts, ac and mobile supplies and mike, Telrex 6-el W.S. 6-meter and 17-el W.S. 2-meter beams, new opening for other items. Any reasonable offer! R. K. MacDowell (W4VGS), Haymarket, VA 22069

**SELL:** QST June 1921 thru June 1971, some 1920, in bound volumes thru 1929. \$250. W9CWH, 706 N. Elmhurst, Mt. Prospect, IL 60056

**SELL:** Swan TV-2, 117X P.S., Vanguard 407 2mitr conv. All 28 MHz i-f \$250 for all. Rich Aronson, 1440 E. 52 St., Brooklyn, NY 11234.

**TX62** xmitr, 621 VFO, CN-144 converter with power supply. All in excellent condition. Also SX 101 in very good condition. Sell separately or as a station. WA9BYR, 827 Dundee Ave., Barrington, IL 60010

**SALE!** Collins 3281 transmitter \$350; Heath Monitorscope HO10 \$25, W2TR, 212-229-3260

**RTTY** receiving converter R532/FCC and transmitting converter T378A/FCC both \$45. Pick up only. W4ZFS, 516-482-2737

**FOR SALE:** New 6 meter equipment - never on the air - one-third off list - Drake TR-6 xmitr with noise blander - RC-6 remote VFO-MS-4 speaker - Raytrack Horizon VI L linear Amplifier - sell complete package \$900. J. F. Gillis, Box 608, East Falmouth, MA 02536. Phone 617-548-1175

**TUBES** - new and used, mainly transmitter tubes, limited quantity - shack clean-out - low price. List at request. WA3CBB, P.O. Box 93, Cresco, PA 18326

**SELL:** Heath transmitter HX-10, Heath linear amplifier HA-10, manuals, extra crystals, Dows-Kev relay package \$300 firm. Mint condition, pre-wired no modifications. Bill Robinson, 1640 Wandering Drive, Monterey Park, CA 91754

**WANTED:** Choite, power, swinging, for Hallcrafters P45 power supply (HT 45 linear), 4 to 16 HY, 350 MA. WA6WKA, 14031 Peach Grove, Sherman Oaks, CA 91403

**ALUMINUM** jacket semi flexible low loss 50 ohm coaxial cable. See Advertisers Index. VHF Associates.

**FOR SALE:** Ten-Tec PM2 transceiver, perfect condition, 11 months old, ear phones, two 40 meter crystals, \$42. Jim Lundy, 524 East Lansing, MI 48823. Telephone 517-332-6102

**4CX250B** tubes; new p.p., \$21 pair. C. M. Fruett, Route 8, Box 399, Fort Myers, FL 33902

**URGENTLY Needed:** Equipment for independent missionary support net to handle messages for 39 Bible translators in Liberia, West Africa. Need: tower 70 ft. or more, linear-SB-220 or similar, 15-20 quad or beam. Donated equipment welcome or send absolute lowest price. Also need Novice and other used equipment to prepare translators before they go to the tribes. We are interested in any extra equipment you have . . . even on a temporary loan - will pay shipping. Please help if possible. Ambassadors For Christ Net, Box 366, Concordia Seminary, Springfield, IL 62702

**COLLINS:** 755-3 rec. \$475 and 325-3 transmitter \$550. With factory cartons, manuals, and cables. Like new. Must see to appreciate. Will outperform all factory spees. Want new KWM2. Prefer local sale to demonstrate. Call eve. 212-PA-4-4818 or write Ted Petruci, 3637 Willett Ave., Bronx 10467 NY. WZEYJ

**MINT** Collins KWM-2 w/Q multiplier, plug-in gold contract reels \$695; noise blander w/NB-40 antenna \$57; 516F2 ac power \$65; 516E1 dc power \$79; 351-D2 mobile mount w/rotator \$62; M-2 portable ac power \$85; C-2 carrying case \$49; 312R2 mint Hallcrafters HA-6 transceiver w/built-in Ameco power \$95; HA-2 w/built in preamp and voltage regulator. P-26 ac power \$160; Finney 6N2 beam \$22; mint SP-600-JX-26, cabinet BC thru 54MHz \$175; Mobile Master linear w/remote control-indicator 750W average power complete w/pc power \$140. W4ERZ, 2866 N.W. 34th Tr., Ft. Lauderdale, FL 33311

**CRYSTAL** blanks 4100-6800 kHz. Assortment 40/51 while they last. Nat Stinnette Electronics, Umattilla, FL 32784

**FOR SALE:** Heath TR101 frequency counter. Best offer. Dana Polan, 211B Cary Hall, RPL, Troy, NY 12181

**COLLEGE** forces sale: Novice xmitrs, DX40, HT40. Also HW101, HP13A, SX101 mk2, Codax keyer, VPI VFO. Make offer. WA7DKZ, 1612 S. Spruce, Casper, WY 82601

**CAPACITORS** - Brand new aluminum electronics, 2750uf at 50volts for \$19.50. K4HP, 6835 Sunnybrook Ln., NE, Atlanta 30328

**FOR SALE:** TA33-40 Sr., \$60. Will deliver within 150-mile radius. W1QBI. Tel: 203-237-3354

**FOR SALE:** HW-100 excellent condx, factory assembled, modifications, and HP-23A power supply \$295. Dr. Abdo Elkholly, WBAZZ, Dept. of Sociology, Northern Illinois Univ., DeKalb, IL 60115

**WANTED:** Electronics instructor. General, theory, workshops, science camp, minimum 19. Write Eppstein, Apt. 4B, 440 Westend Ave., NYC 10024

**FOR SALE:** QST's 1931-1969, 39 years, 4 issues missing (March 1933, February 1938, April 1965, March 1969); 1931-1956 - each year in a binder, 1957-1969. Loose. All of the above in excellent condition. Mary F. Molloy, 6 Morton Terr., Milton MA 02187

**FOR SALE:** Heath SB-620 ham band scanner - in excellent condition, factory aligned. Ideal for DXer finding hole in QRM. \$85 prepaid. W2CVY, 70 Beech Terrace, Wayne, NJ 07070

**HOUSE** cleaning. Lou sez "Get it out or get out." SASA for big list. Richelieu, WJNS, 215 S. Washington, Wheaton, IL 60187

**SELL:** Drake 2-C, plus Q-mult., N.B., xtal cal., excellent, \$245. Johnson Viking Invader 200, cw, a-m, ssb, 6000, \$150. David Wyzant, 1097 2nd Ave., Newport, MN 55055

**SELL:** Heath DX-60, HR-10, IIG-10B yfo, TR switch. Excel. station, \$130, or offer. W8JZQ, Jeff Gabor, 85 Lind Ave., Mansfield, OH 44903

**FOR SALE:** Ham estate Collins, Hallcrafters, Galaxy, Eico, Johnson, air, others. SASE for list. W0NBF, 2246 Lamplight, Grand Junction, CO 81601

**WANTED:** HRO5 or other series with coils and power supply. Price first letter. W5PM, RFD 1, Box 399, Covington, LA 70433

**CRYSTALS** \$1 ppd. Must sell following best offer. Tubes, VOM: T552, Simpson 260, Frequency meter, T5174, RC-221. Transceivers: BC-745, RTA-1B, RT-6, TCS. Supply: Lambda 2K 1/2 resistors. Choke: 12A, 650A, 4 1/2" microamplifier. Capacitors: 3kv filter, 200 uf 750V volt variable. Details, more for SASE. Dick Wilder, W2ZCZ3, Box 7523, Pittsburgh, PA 15213

**SR-102, HP-23A, SB-600, and cw filter** (built by K3SUN) \$475. DX 40, \$35. B&W 5100B & 515B-B \$150. B&W TR switch, \$15. K3DPQ, 201 Poplar Ave., Wayne, PA 19087

**DRAKE 2-B, 2-BQ, 2-NT, HA-5, homebrew transmatch, all cables, mnt, F. L. Phelps, WA8ZED, 272 Wjlodale, Morgantown, WV 26505**

**SELL:** Heath SB-401 transmitter with crystals and fan, \$250. SB-301 receiver \$200. SB-600 speaker, \$10. SR-630 console \$65. SB-610 monitor scope, \$65. Gilbert Kunster, Jr., 225 West 232 St., Bronx, NY 10463

**SELL:** Hallcrafters SX-111 receiver, good condition, \$100/best offer. Joshua Mermelstein, WA2OHP, 29 Maple St., Brooklyn, NY 11225 (212) UL-67782

**HEATHKIT HX-10 Marauder, WA88YE, 1861 Lexington, Warren, OH 44485. Tel: 395-4938**

**WANTED:** Hy-Gain antennas 2048A, 2038A, 1538A, 1038A, and Ham-M. Would like to trade, but will pay cash if the price is right. Have the following to trade: plate transmitters, Varian, Weston model 301 panel meters, and a H.B. G.G. 4-1000A linear amp, new tube, vacuum variables, fully metered, with Varian controlled 4000 VDC power supply. WA5PYW, 317D Tackney Ct., San Antonio, TX 78226

**HEATH SB-100 with ac supply, absolutely mint condition \$300. Hallcrafters HT-32 transmitter FB \$180. Both shipped prepaid. Cine, W6LXI/7, Box 6127, Salt Lake City, UT 84106**

**FOR SALE:** Swan VFO model 210 for 6 meters and VOX, both \$60. Hy-Gain new unused 4 elements 6 meter antenna \$18. Will ship. George Konnick, 64 Cynthia Ln., Center Moriches, NY 11934

**SELL:** QST: complete years 150 PP 1941 and 1945 thru 1968, 1940 Mar missing. Single copies 50 cents pp Dec. '63 Jan. '67. Nov. '68 Mar. Apr. Jul. Aug. Sept. Oct. '39. Write Folk, 3 Dewey, Natick, MA 01760

**SB-301 A-m, cw filters 6M converter \$260; SB-401 \$245; DX-60A \$55; HG-10 \$25; unassembled SB-110A (with power supply) \$320; AR-15 stereo \$320; All built by engineer with kit experience. WB4LYZ, 133 Laird, Nashville, TN 37205**

**HEATH HW-100 80-10 meter ssb/cw transceiver, HP-13A dc supply, HP-23A ac supply, SBA-100-1 mobile mount, GH-12A microphone, all cables and manuals. \$300. Robert Dixon, W4ERD, 311 East Kelso Rd., Columbus, OH 43202 614-267-6595**

**SELL:** SB-301 a-m, cw filters, \$230; A-2515 receiver, \$75, both in fb condition. Arveh Weiss, WB9GQJ, 3848 Kirk, Skokie, IL 60076. 312-679-3855

**TRADE:** NCXD dc supply, for SB-10 adapter. Write B. P. Bogarets, American Embassy, APO New York 09156

**SWAN 500CX, 117XC P.S. D 104, Bug \$400. Buzz Muscutt, Sherwood Ave., Greenwich, CT 06830. 203-869-1990**

**TV Camera kits, plans, parts. Go ham TV the easy, economical way. Catalog 25c. ATV Research, Box 453-Q, Dakota City, NE 68731**

**FOR SALE:** Swan 500CX transceiver, with 117XC power supply, and 510 crystal OSC: mint condition less than one year old, \$450. W2NSLG, 56 Van Riper Ave., Clifton, NJ 07011

**SELL:** HR-10R \$50, DX-60B \$50, used one year also, TR-44 \$80. TA-33 tribander \$90, never used. You ship. WA2QJN, 68-07 Main St., Flushing, NY 11367

**HEATH SB-102 transceiver, cw filter, HP-23A power supply, and SB-600 speaker for sale at factory list price (\$473). Factory aligned. Please contact Philip Syddell, WA2MQG, at 81 Mohawk Rd., Short Hills, NJ 07078**

**R4A - excellent \$260; Heath keyer, \$25; Randy Campo, University Park, PA 16802. Phone: 1-814-865-6205**

**WANTED:** Heath Keyer HD-10, W8BJVQ, James Kurtz, Box 139, Hartsville, OH 44632, 1-216-877-9737

**WANTED:** Yaesu or Collins transceiver or receiver and transmitter. Carlos Saavedra, CP1EVS/W5, Box 3158, Tulsa, OK 74115. Tel: 918-838-8642

**SELL:** 4-1000A - new \$50, used \$30. DI172's - new \$50. Socke \$21. PCS30 \$22. KC-60 \$21. Massa B2250 2-channel oscilloscope \$150. Leitz Ortholux Research Microscope, many accessories \$500 or trade. Trammell, 1507 White Oak Ct., Martinsville, VA 24112

**SWAN 240, late model, like new, with ac power supply, manual, mike, spare set tubes. \$200 FOB Houston, 77036. W6ORW 666-7635**

SWAN Cygnet 260 just factory overhauled and modified, excellent \$235. Hammarlund HQ110A mint \$70. Heathkit HL10 keyer \$29. Truckey jumpstart keyer \$16. Just sell, college expenses. WA3EKW, 260 Ellen Dr., Buffalo, NY 14225

TO SELL: Johnson 6N2 xmtr, Eico modulator, HQ110A vhf rx; Heath Shawnee, DX-100; Elmac AF67; new 6 m. beam, 4-el. All reasonably priced. Wanted: Heathkit Pawnee, Robert J. Bohland, WA8BCX, 6470 Strasser St., N.W., North Canton, OH 44720. Ph: 216-499-3105

NO Room! Hallicrafters HT-44 xmtr, Ps-150-120 ac ps, SX-117 rxr, HA-10 LF tuner, many extra xtls, all very clean, \$400. Iam-M \$80, TB-1000-4 4el beam (Swan TB-4H) \$80, both unused, Together \$150. Sixer with mike, cables, \$20. WA4SCA, Alan Biddle, Box 64, Moody AFB, GA, 31601.

SELL - QSTs Jan, 1928 to date. Covered. Good shape. Best offer. WA2JEM, Box 3, Montauk, NY 11954

QST mags 1947-1970. Will sell complete or in one year units. Best offer. You pay shipping. W8WUM, Bill Meier, 400 E. Elm St., Mason, MI 48854

CENTRAL Electronics 20A with VOX mint condition \$66; Ameco TX-62 never used, excellent condition \$65; Ameco CN-144 34mc converter factory wired with p.s. \$25; BC-342N \$10. Tom Eager, 63 Ferndale Dr., Hastings-on-Hudson, NY 10706, WB2CQK (914)-478-1217

PHILADELPHIA apartment: hi-rise near City Lane, two bedrooms, TB6DXX up 200 feet. No TVI running my 1.4R. Take over lease under \$300 month. Jerry Emdur, 215 HO 7 2411

NCX-500 mint original owner \$250 or best. Bob Hylka, 6029 56 Dr., Maspeth, NY 11378

DUNDUPEX Key (1909). Swap for 1916 QST. Royal Mumford, W3CU, Route 1, Box 397, Annapolis, MD 21401

JOHNSON Thunderbolt linear amp, excellent cond. \$250. Will trade for vhf linear amp. Bob Delaney, Box 3446, Ellsworth AFB, SD 57706

SALE: Drake 2-C, \$175 and Drake 2-NT, \$110 each with instruction manual. Both excellent condition. Fred Hammersand, 6980 Leebl Rd., East Petersburg, PA 17520

FOR SALE: TR-4 complete with ac, dc power supplies and mobile mounting kit. Excellent condition. \$600. K9EMV, Dennis Walton, RR1 Keota, IA 52248

FCG "Tests-Ancwers" ... Original exam manual for FCG First and Second Class Licenses plus "Self-Study Ability Test." Provent satisfaction guaranteed. Command, Box 26344-T, San Francisco 94126

WANTED: Collins S-line-KWM2 accessories. Units. No junk. Only clean gear. Reasonable. For cash. F. E. Coble, 251 Collier Ave., Nashville, TN 37211

NEWSPAPER of Amateur Radio: Free sample copy. Worldradio, 2509 Donner, Sacramento, CA 95818

SALE: Heath SB200 linear amplifier as new with booklet. Moved up to SB220. Asking \$150. William W. Cridland, 22 Old Marlboro Rd., Maynard, MA 01754. WA1IIMW

SELL: Swan VFO 508 like new \$85; Ameco PT preamplifier \$35. WB6EUD, Ray, 871-B Park Dr., Mr. View, CA 94040

FOR SALE: HW 100 with HP 23 A power supply, factory assigned two hundred dollars. J. B. Roberts, 70 North 4th St., Bangor, PA 16013

TA-33 tri-band beam, \$50. Dick Verian, WB4UCS, 6709 Greendale Rd., Alexandria, VA 22310

DRAKE 2B full 10mtr and WWV xtal cab. Perfect cond. \$175. WA6IPD/6, 1622 1/4 Amacost, L.L.A. 90025. Tel: 813-826-1658

WANTED: Diversity receiving equipment for a-m or a-m and RTTY. What have you? All mail answered. Write W. Pilon, 1 Hemans Ct., Worcester, MA 01605

WANTED: late models Yaesu FT-101 or SB6-34. Write Tom Kirkpatrick, 728 Rhode Island No., Mpls., MN 55427

FOR SALE: 2 - new Elmac 3-500 Z \$60/pair plus postage. W1AGA

FUTURE YL studying alone, desperately needs manuals, call books, junk parts, magazines. Can only pay postage and thanks. Marianne Eppley, 4634 Field, Arvada, CO 80022

ESTATE of K2YFM: Hallicrafters HT-37, \$170 modified for semi break-in cw. SX-101 \$150, SX-62A, \$125. Colin Tull, 90 Midwood Ave., Altendale, NY 07401

EICO 753, 751. New finals, solid state VFO. Heath calibrator. Write: WB4IUX, 130 Mountain View Ln., Clemson, SC 29631

WANTED: Collins 30S1 amplifier. Herschel P. McCollough, WB5EUN, Dallas, TX 75225, 214-691-3338

FOR SALE: Drake MN4 \$55; RV4 \$75; Bud low pass tunable filter model LF601 \$9. H. F. Cushing, W6LXZ, 5224 Bobbie Ave., San Jose, CA 95130

COMPLETE station. Drake TR4, R4B, AC3, MS4, W4. Hallicrafters SR-42A, TR-44 rotor, 40' Roho pg crankup. California. Mike Smith. Excellent condition. \$1000 takes all. WB2FTZ, 516-423-1878

FOR SALE: Drake R4 and homemade matching speaker. Mint condition. \$250. A. Guimarães, 199 Park Av., Trenton, NJ 08690. (609-5873648)

REALISTIC Astronaut 8 rxvr \$75. HO-15 patch \$19.95; Knight C-30 grid dip \$19.95. Wanted: Valiant mechanical full automatic key. (WB6RQZ) 1330 Curtiss, Berkeley, CA 94702. (415) 597-7345

HAM with general class license, high school graduate minimum. To teach radio to campers at outstanding co-ed camp. Write for application blank to New Jersey YMHA-YWHA Camps, 589 Central Ave., East Orange, NJ 07017. Phone: 201-878-7070

FREQUENCY lists. Long or shortwave. Any service. ITU socket. World Radio Handbook. Catalog. Gilfer, Box 239, Park Ridge, NJ 07656

HOOSIER Electronics Your ham headquarters in the heart of the Midwest where only the finest amateur equipment is sold. Authorized dealers for Drake, Ix-Gain, Regency, Ten-Tec, Galaxy, Electro-Voice, and Shure. All equipment new and fully guaranteed. Write today for our low quote and try our personal friendly Hoosier service. Hoosier Electronics, Dept. C, R.R. 25, Box 403, Terre Haute, IN 47802

IMC station 2 to 32 Mcs. GPR90 rxvr, MSR4 sbb adapt, SB2Z xetler, A1 350R linear, all modes, 40' x 40' rack \$2000. A Bruno, 24 Buttner Dr., New City, NY 10956

WANTED: SX100, RME69/70, Bob Forman, W9RJH, Monmouth, IL 61462

COLLINS 6181 \$600. Perfect condx. Ted Zillox, 4471 Pleasant, Hamilton, OH 45015

WANTED: Collins X455KQ200, 312B-5, DX engineering KWM-2 processor. Sell: F456FA05 filter. K1VTM

POLYCOMM2B, compact 2M transceiver, triple conversion superhet, VFO 17W, internal 117VAC, 12VDC supplies, meter, speaker, \$110 plus postage. K1JWX, Goldberg, 323 Four Brooks Rd., Stamford, CT 06903

DRAKE TR-4; MS-4; Heath SB-610; CODE rotor; Minibeam. All for \$520, or separate. Minibeam, K7EPD, 1538 E. Solano Dr., Phoenix 85014, 602-266-8057

FOR SALE: All copies of QST, CQ 1955-1969. Some copies 1946-1954. All in excellent condition. Carriage extra. Bids may be sent to E. Harvey, 517 Hill Ave., Pittsburg, PA

YOUR call letters engraved in white on attractive laminated plastic. Complete with stand. Black or grained walnut background. Specify size and color. 2"x4" \$1.50; 2"x8" \$2.25 ppd. Order now!! Educational Resources, Box 8053, Dept. Q, Erie, PA 16505

FOR best reasonable offer: Clegg 22er, never used; NCX 3, NCX-A, fact. realigned; Hammarlund 170-C realigned. L. L. Baumgartner, Croton Falls, NY 10519

SALE: HRO Sixty, triode front end, Collins mechanical filter, product detector and audio AF, Gais A, B, C, D, AC, AD, E, F, G, H with instruction book. Used to work 299 Countryside, \$250. FOB. Bryan Hall, W5RLM, Box 186, Dekalb, TX 75659

DRAKE 2NT xmtr. Mint cond. 3 xtals, manual, orig. shipping container. \$115. FOB WA6MWP, PO 325, Capitola, CA 95010

FOR SALE: HRO 50, HRO 60, Hammarlund SP600JK17. Heathkit Seneca and DK40, Lafayette HE45A-make offers. John W. Richards, Jr., (Hammie) W2WYI, Route 46, Great Meadows, NJ 07838 201-637-4107

FOR SALE: RME-45, Panadapter PCA 27-200, Vibroplex in case Webster Chicago Wire recorder model 78. Make offer. Edward D. Meeker, W2EKF, Office-Route 46, Great Meadows, NJ, 201-637-4107, Home 201-398-4600

FOR SALE: HRO-50T1 receiver with 5 coils, XTL cab, speaker & manual \$150. Three 10-foot sections Roho Triangle tower with C.D. rotor. \$70. Small prop pitch motor with power supply and control complete \$65. Prefer local sale. Harold E. Sacke, 4624 W 63 St., Los Angeles, CA 90043. Tel: 213-294-5760

CRYSTALS aimed: Novice FT-243, active accurate. Mention this QST advertisement for New Year January/February "super special" Five or more (over that band) 40M-15M only 99c each. 80M \$1.59. (Band mix OK.). Less than five 40M-15M \$1.50, 80M \$1.75. Add postage - 41mmal 12c/crystal, Int.-8c. General purpose FT-243 01%: 3500 - 8600 Kilocycles \$1.90. (Five \$1.75 each). (Nets. less than frequency \$1.45.). 1700 - 3499 \$2.95. 100% add 50c/crystal. MARS. 10c etc. Add postage. Five general purpose crystal listings. Crystals since 1933. Bob Woods, W6LPS, C-W Crystals, Marshfield, MO 65706

HEATHKITS: SB-300, SB-400, SB-600, DX-60, HG-10 VFO. Mohawk, Johnson Invader, TA-33r/rotor. Offers? Doug Murdock, 477 Mercer Hall, U.W., Seattle, WA 98195

COLLINS 75S-3B, \$550, 32S-3 and 516-F2, \$675, 30L-1, \$350. Excellent condition. Package deal \$1400. William Osborne, Route 1, Box 1004, Eau Gallie, Fl, 32935. Phone 305-254-3597

SELL: Drake TR-4 transceiver with AC-4 power supply and MS-4 speaker \$485, R-4 receiver \$250. Excellent condition. Manuals & shipping cartons. Tel: W2EC, 3 Nathan Hale Dr., Setauket, L.I., NY 11783. Tel: (516) 751 0473

WANTED: F400DX receiver. Trade or sell Gonset 6M Sidewinder w/ac supply \$185; T-175 6M amp/rtr \$75; Gonset 2M Sidewinder transceiver w/ac supply \$195; 2M 225W amplifier \$95; 2M 600W amplifier \$225, W4AFI, Box 4095, Arlington, VA 22204

WANTED: Johnson Matchbox antenna tuner or other coupler. Send QSL card with price and information to Jim, W4URT, 608 Magnolia Rd. N.W., Roanoke, VA 24019

SELL: Collins 30S1 linear \$90.00, 5181 continuous coverage receiver \$90.00. Both in mint condition, manuals. W9MJH, 3700 Van Buren St., Gary, IN 46408

AZIMUTHAL Equidistant World Map. Custom computer drawn for your QTH. \$20. Gives beam heading and distance to anywhere in world. S.A.S.E. for sample. Arcot, Lakeside Officepark, Wakefield, MA 01880

MASTER Mobiles or components, any band, wanted for cash. For sale: MTRAC, late model, 40 watt, 4 channel, with preamp, elements, and 94/94, 84/76, and 88/88 crystals, \$375. 17A3 Surveillance receiver, 30-260 MHz, 3 IFs, 6 detectors, 6 dB noise figure, panadapter, \$5500 new. \$750. Extender 250-900 MHz, \$200. Ampex VR-6000 video recorder, excellent, new head, belts, & tapes, \$550. H-P 540A transfer oscillator, \$180. 6N2 transmitter, \$40. Kay 2405 Noise meter, \$80. PRD 650A power meter, \$30. TS-419 900-2100 MHz generator, \$200. K4GYO, 430 Island Beach Blvd., Merritt Island, FL 32952

QST wanted. Will pay cash. Need April 1928, June 1931, April 1947. Must be in good cond. with original covers. Write giving price and telephone. Also interested in QST 1925 and earlier years, in full year sets only. Write K2RKC, Ed Schneider, P.O. Box "C," Brooklyn, NY 11204

NCX-5 with ac supply, also Heath HW-12. Both in excellent condition. Best offers, Scott Ulmer, K3FXB, 310 Walnut Pl., Syracuse, NY 13210, Tel: 315-478-9850

SELL 75A-2, excellent \$160. Wagner Xfmy 3610-0-3600 I amp \$25, 1.7 amp \$40 with 120/240 pri. All fob. W0AII, 814 4th St. S, Virginia, MN 55792

FOR SALE: Swan 500C, 117XC power supply, D104 mike, mint condition, used 9 hrs, \$495. Cash, no trades, price firm. U par shipping. Perkins, 2025 Lakewood Dr., St. Albans, WV 25177

FOR SALE: Hallcrafters HT-32 transmitter and Drake 2-B receiver. Both like new. You ship. Best offer. Fred Stucklen, 60 Munising St., Ludlow, MA 01056

DRAKE 2NT & 2c with 15 xtals - \$275. DX-60A & HG10B - \$75. Guy Shipley, W0PFLR, 2617A, Summit Rd., Columbia, MO 65201. 314-445-4545

COPYING cw 13, 20, 25 wpm difficult for you? Why? For your briefly written answer and two dollars to the copyright 1971 books of forty seven pages designed to overcome your difficulties, will be postpaid to you. Call letters and zip code necessary. Without statement \$2.95. Effective Preparation, P.O. Box 10125, St. Petersburg, FL 33733

COLLINS 75A2A receiver - mech. - filter, product detector, crystal calibrator; good condition, no speaker, \$125 or best offer, will ship. Jim Weaver, K4KZ, 309 Third Ave., Melbourne-Beach, FL 32951

COLLINS 5144, \$425; 75S3C, \$375; 312B3, \$20; SM2 mike (new) \$37.50; Antenna, \$10; SX110, \$70; DX 60, \$50. K0ARV, 2925 Wildwood Ct. N.E., Cedar Rapids, IA 52402

FOR SALE: R-390, cabinet, manual, \$450. Gonset 3 - 6M, 3065 linear, \$100. Paul Haczela (K2BQO), 8 Yale Pl., Armonk, NY 10504. 914-273-9067

CLEGG 22 in excellent original condition with manual \$120. Ken Wallace, W1DAO, 5 Dryden Ave., Nashua, NH 03060

NATIONAL, modified NC183D receivers, as is, make an offer. Shipped REA collect, subject to prior sale. P. R. Harper, 38 Diane Ave., Old Bridge, NJ 08857

SB200 Heathkit kilowatt \$150. 415-593-7369. W6KJG, 1120 Furlong, Belmont, CA 94012

ANTIQUe radio tubes per 1930s, many never used. In original cartons. Send \$1 for list, refundable. First order. S. Kurtzman, 49194 Gloria Ave., Encino, CA 91316

"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 HT-2A, two meter FM transmitter, 15 watts, immediate shipment, amateur net, \$229; Gonset GSB-201 Mark IV linear, reg. \$525, cash \$389; New Drake, Galaxy, National, and Robyn "500" Digital, in stock; New Rohm 50 ft. foldover tower, prepaid \$235; New Mosley Classic 33 and Demo Ham-M rotor, \$209; Used equipment: 325-1, \$369; Drake 2A, \$155; T-2XB, \$365; TR-4, \$419; Ham-M \$89. Moory Electronics Co., P.O. Box 506, DeWitt, AR 72042. Tel: 501-946-2820

KWM-2 with 516F2 power supply, mike and speaker, \$650. Johnson Ranger II with mike, \$175. W1QV, R. Y. Chapman, 8 South Rd., Groton, CT 06340

RADIO Adventure! Thrill in the amateur radio adventures of Tommy Rockford, K6ATX, in *SOS at Midnight*, *Q Ghost Ship*, *DJ Brings Danger* - all time favorite novels by Walker Tompkins in colorful new editions. Order individually at \$2.45 plus 25¢ postage and handling, or all three for only \$7.00 postpaid. Utah and California residents add sales tax. Send check or money order to Peregrine Publishers Inc., Dept. QST, Box 30655, Santa Barbara, CA 93105

YAESU FRdx400 receiver with four mechanical filters and vhf converters, \$305. Varitorons IC-2F fm frvx in sealed carton. \$210. Frank Connelly, WATGWL/1, 2100 Stanley St., Apr. 411, New Britain, CT 06053

TO SELL: Model 28RO teletype. Good condition. Best offer over \$125. SCRA Radio Club, c/o Jeff DeTray, 109 Gamer Hall, Champaign, IL 61820

HR10B, xtal cal, Q mult. \$80. Jim, WN8LBI, 553 Purdue Ave., Elyria, OH 44035

TELETYPE machine WU model 103 1919 make offer. Linear homebrew 500 watts RTTY sbs \$75. WR2KMU, 85 E. Cypress Ln., Westbury, NY 11590. 516-333-7623

SWAN 270 mint, built-in dc, \$350 or best offer; Hustler RM-405 resonator unused \$10. Tatar, 1625 North Park, Cleveland Heights, OH 44106

COLLINS 75A4, Ser 1503, A1 condx. Spinner dial, one filter and all new tubes \$315. Burt Weidenhamer, 3761 18th Ave., N. St. Petersburg, FL 33713. Phone: 813-896-9229

OIL filled plate transformer 6336 VCT at 500 MA CCS. 110/220 primary. 1x11x5 inches, 110 pounds, \$40 FOB. James Jochenbus, K7RAD, 1936 South 424 East, Orem, UT 84057. 1-801-225-5464

DRAKE TR-4, AC-3, access, \$450. Clegg 22er \$150, SX100 \$100. AN/ART-13, with ps \$100. RTTY equip. Call or write for details. Larry Finch, K2DAC, 18 Linden Blvd., Great Neck, NY 11021. 516-249-1414, 9-5 (Office phone)

WANTED: SR150 Vesto or wind mill tower over 25 ft. Write W4ZO 32682

SELL immaculate Heath SB-500 never used \$140. COD no trades. K9DHD, 1006 Wilson, Wheaton, IL 60187

NEARLY new 140 ft. communications tower in 7-20ft sections. D. K. Perwien, 9425 W. 14th St., St. Louis Park, MN 55426

WANTED: F sections for the model 500 Jantz tower. Richard Berg, 201 Pemberton Rd., Rochester, NY 14622

VALIANT II, good condition, with companion home-brew 6 meter transmitter, \$190; also HQ-180AC, A-1 condition, \$300. Geoff Allsup, 36 Beechwood Ave., Pawtucket, RI 02860

FOR SALE: KWM-1, 516E-1, 516F-1, 351D-1, \$350. SX-115, spkr, \$250. HP-185A (best offer), HA-460, \$65. 6ber, \$125. Eldon EBA-1, \$50. Eldon EBA-2, \$50. 51J4, \$500. Wanted: Latest KWM-2-2A, 75S3C/3A/3B, 312B-4, 30S-1 Collins 662-0157-00 (T-504 for KWS-1), James Craig, 29 Sherburne Ave., Portsmouth, NH 03801. (603) 436-9062

TRADE: Drake TR6, AC4, MS4, noise blanger, a-m filter, for Yesu KT101 and low bands ant. WA2VZG, J. Gaglio, 845 Pecan St., Ronkonkoma, NY 11779

HT-46 xmtr, \$160; NC-300 revr, \$95; Hy-Gain TH-3jr, 50' coax, \$60; AR-22 rotor, rotor control, 50' control cable, \$25. WA7IMJ, Dale Stuewe, Rt. 3, Box 405, Corvallis, OR 97330

SELL: Polycorn 6C six meter transmitter in mint condition. Cost \$310 new sell for \$100. Contact George Hawley, WB2GWU, P.O. Box 568, Jamaica, NY 11424. Phone: AU 212-277-4001

SELL: Hallcrafters SX-100. Matching speaker. Excellent condition. \$130. No shipping. K3AAH, 423 Phine Rd., Glen Burnie, MD 21061

TRADE: my mint Valiant and HW-32A for your mint SB-300. W4RAT 312-756-3693

LAFAYETTE HA-750 6M xcvr with ac supply \$75; Heath SB-600 spkr, \$12; WB4PUE, 4855-B Hickman Dr., Charleston, SC 29405

HALLICRAFTERS amphter HT-41 in very good condition \$140. K1PNL

FOR SALE: Hallcrafters HT-37, SX-101, Matchbox, Heath HW-12 with ac power supp, Teletype Mod, 28, 19, 14 type, rotor, 14 T, 201, 276-2055, WA2YMQ, Haberman, 122 Gallows Hill Rd., Cranford, NJ 07016

GONSET 6 meter G-50, good, clean condition \$150; variable low-pass filter; antenna coupler with B & W coils 10 thru 160 meters; all band dipole antenna with 600 ohm line porcelain insulators and insulator xtals FT-243 holders 1940, 3552-5, 3873, 4690, 3854, 3887, 3987, 5310, 7013, 13610. Make offers. W3QLW, 1328 Hillside Ave., Honesdale, PA 18431

QSTs for sale: June 1917, July 1917, June 1919 with covers. Many others, including Radio magazine. Will sell as one lot only. Sase for list. Collins 3251, 316F2 supp, \$325; Central Electronics 20A and 48B VFO, \$100; Johnson Viking 500 & p.m., \$175; lenses: two 16 mm "c" mount, both adjustable 3.3 to 22m, 8 ft. to 600 ft infin., 1.5 to 16M, 4 ft. to 50 ft. infin. George H. Rancourt, 78 Williston Ave., Easthampton, MA 01027. K1ANX

PRIVATE Collector wants early wireless and wire communications gear: Test coils, books, magazines, etc. Quote mini price. Will Nangle, 761 North 29th St., Milwaukee, WI 53208

MUST sell: Drake TR-3/RV-3/p.s., phone patch, SWR \$375. Thunderbird 10-40M beam, tower, rotor, accessories \$125. All priced. Will sell separately. Alan Schneyer, 7454 Ruskin Rd., Phila, PA 19151. GR-72333

BEST offer, Viking Valiant, NC 125, Viking kW Matchbox with reflected power and SWR meter; all excellent condition, ship collect. R. Dellinger, 806 St. Marys Ave., Apt. D, Sidney, OH 45365

RECEIVER - Hallcrafters - SX-111 excellent condition, \$100. Call WA2LTV after 6. 1801 Tomhinson Ave., 10461. Bx. NY (212) 823-8163

WANTED: Good cw transmitter, 100W output. F. Martin, 202 Kenny, Fayetteville, NY 13066

HAMMARLUND HQ110A \$125 for sale. Excellent condition. Sry, no shipping. Rable, 5 Blue Grass Ct., Huntington, NY 11743. 516-427-4566

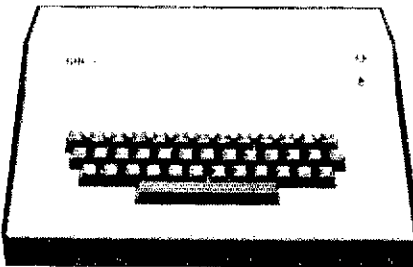
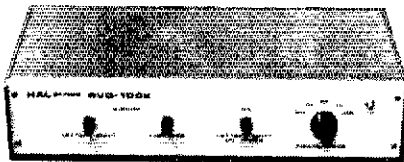
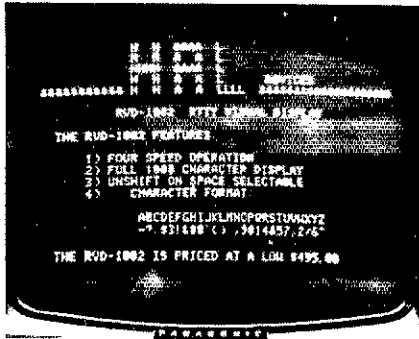
WANTED: Lafayette HA-410, 10 meter xcver. Rd 2, Box 283, Boye Hagerty, Honesdale, PA 18431

WANTED - For personal collection. The Radio Amateur's License Manual, Edition 12. WICUT, 18 Mohawk Dr., Uptonville CT 06085

CLEANING shack - sell extra electronic parts at give a way prices. W2EZM, P.O. Box 323, Maple Shade, NJ 08052

WANTED: socket and air chimney for PL5D22. K6HM

# HAL DEVICES ANNOUNCING



### The HAL DEVICES RVD-1002

A revolutionary approach to amateur radio teletype. The RVD-1002 provides:

- Display of 60, 66, 75, and 100 WPM 5 level TTY
- 1000 character display in 20 lines of 50 characters per line
- Selectable letters shift on space
- Manual control of line feed and letters shift.
- Standard CCIR video output for use with modified TV receiver
- Noiseless operation with solid state reliability

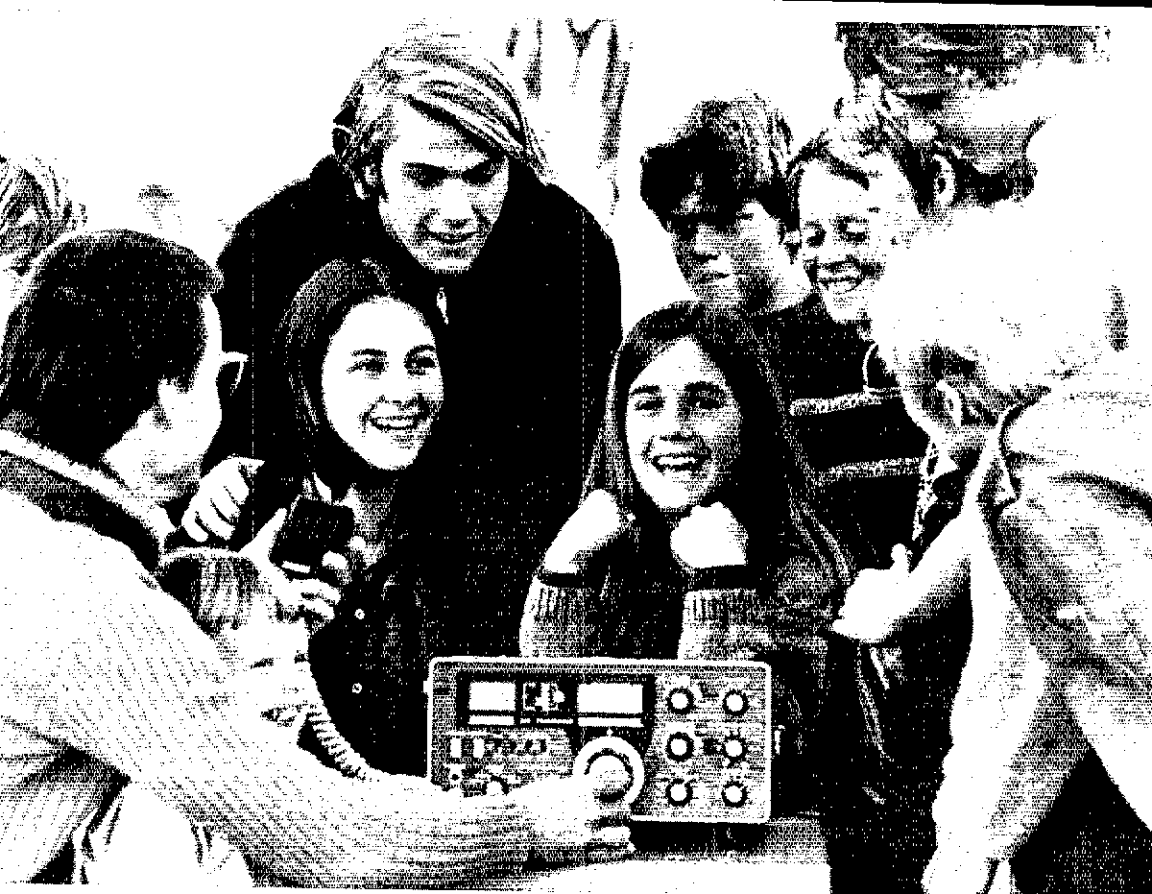
RVD-1002 (assembled).....	\$495
RVD-1002R (rack mount).....	\$495
ST-6 (assembled).....	\$280
ST-6/AK-1 (assembled).....	\$320
TTY KEYBOARD.....	available soon

Modified solid state TV receivers will be available. Write for details.

**HAL DEVICES, Box 365 A Urbana, IL 61801**  
Phone 217-359-7373

Alltronics-Howard Co. ....	142
Amateur Electronic Supply .....	118,119
Amateur License Instruction .....	148
American Radio Relay League	
<i>Antenna Book</i> .....	144
<i>Binders</i> .....	147
<i>Calculators</i> .....	146
<i>League Emblem</i> .....	150
<i>License Manual</i> .....	120
<i>Membership</i> .....	141
<i>Publications</i> .....	140
U.A.R. ....	149
V.H.F. ....	134
Antec Company, Inc. ....	151
Barry Electronics .....	138
Bauman Sales, Inc. ....	151
Collins Radio Co. ....	3
Computer Measurements .....	127
CU Associates .....	136
Cubex Co. ....	139
Curtis Electro Devices .....	145,151
Cush Craft .....	122
Dames Co., The Ted .....	138
Deane, William .....	142
Di-Key .....	136
Drake Co., R.L. ....	137
Ehrhorn Tech. Operations, Inc. ....	140
ELMAC, A Division of Varian .....	Cov.IV
Electronic Distributors .....	147
Electro-Voice, Inc. ....	123
Fair Radio Sales .....	142
Gotham .....	131
Greene Insulator .....	138
HAL Devices .....	128,158
Hallicrafters Co., The .....	1
Ham Radio Center .....	149
Harrison Radio .....	160
Heath Co., The .....	110,111
Henry Radio Stores .....	5
Hi-Par Products .....	145
Hy-Gain Electronics .....	117
International Crystal Mfg. Co., The .....	7
IAN Crystals .....	138
KW Electronics .....	148
Lattin Radio Laboratories .....	149
Micro-Z Company .....	149
Millen Mfg. Co., The James .....	116
J.W. Miller Company .....	147
Milliwatt, The .....	148
Mini-Products, Inc. ....	124
National Radio Institute .....	143
Palomar Engineers .....	130
Payne Radio .....	145
Pearce-Simpson .....	133
Pennwood Numechron .....	136
Pickering Radio Co. ....	145
Poly Paks .....	126
Radio Amateur Callbook, Inc. ....	114
Rectifier Components Corp. ....	130
R F Electronics, Inc. ....	139
Savoy Electronics, Inc. ....	4
Scott's QSL Service .....	142
Shure Brothers Inc. ....	129
Simon Side Band Company .....	142
Skylane Products .....	151
Spectronics .....	159,Cov.III
Standard Communications Corp. ....	125
Star-Tronics .....	145
Swan Electronics .....	Cov.II,112,113,115
Ten-Tec, Inc. ....	121
Top Band System .....	148
Trigger Electronics .....	152
Unadilla Radiation Products .....	141
Unique Products .....	143
Vanguard Engineering .....	136
Van Sickle Radio Supply .....	142
Van's W2DLT .....	151
VHF Associates .....	148
Vibroplex Co., Inc. ....	136
Weinschenker, K3DP1, M. ....	132
World QSL Bureau .....	145





## The crowd pleaser

Working portable is never more enjoyable than when you're working with Yaesu's incomparable FT-101. It's a 30-pound power package, with 260 watts PEP SSB, 180 watts CW and 80 watts AM input power. Plus 0.3 microvolts receiving sensitivity, with a 10 db signal-to noise ratio.

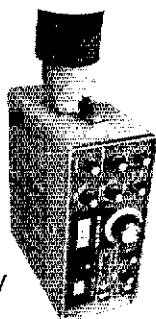
The FT-101 includes a noise blanker. And built-in 117 VAC, 12 VDC power supplies. As well as built-in VOX, 25 KHz and 100 KHz calibrators, the WWV 10 MHz band and a high-Q permeability tuned RF stage. Plus a  $\pm 5$  KHz clarifier.

The FT-101 is all solid-state, except for finals and driver. It's equally at home

in your shack or on a mountain-top. Or on a Sunday afternoon outing.

We'll be glad to send you a detailed brochure on the FT-101. Or, for only \$559.95, we'll send you the rig.

You'll have a crowd pleaser on your hands. Including the crowd of hams out there who'll copy you loud and clear.



Please send detailed information on all Yaesu products.

Enclosed find \$ \_\_\_\_\_

Please send model(s) \_\_\_\_\_

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

All prices F.O.B. Signal Hill, Ca.  
Master Charge and BankAmericard accepted.

### SPECTRONICS WEST

Dept. Q, 1491 E. 28th, Signal Hill, Ca. 90806 / (213) 436-2593

### SPECTRONICS EAST

Dept. Q, Box 1457, Stow, Ohio 44224 / (216) 923-4567

# DRAKE

*is Great!*

*and*






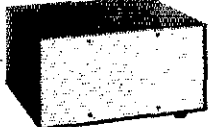





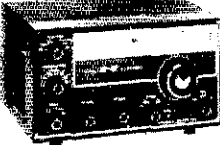

# Harrison

*is where it's at!*

For well-engineered, solidly constructed, high QSO scoring equipment, Drake is your most logical greater-value-per-dollar choice.

Worth more at trade-in time than any kits or import orphans—so, it really costs you less per year to enjoy Drake dependability and superior performance.

For competent assistance by knowledgeable hams, — for quickest delivery of factory-fresh, latest production equipment—for top trade-in deals—for greatest satisfaction and pleasure—your most logical more-for-your-money choice is HARRISON!

 R-4B RECEIVER	 C-4 STATION CONSOLE	 T-4XB TRANSMITTER	 L-4B 2KW LINEAR
 TR-4 TRANSCEIVER	 RV-4 REMOTE VFO	 MS-4 SPEAKER	 MN-2000 ANTENNA MATCHER
 TR-22 2 METER FM TRANSCEIVER	 ML-2 2 METER FM TRANSCEIVER	 TC-2 2 METER XMTR CONVERTER	 TR-6 6 METER TRANSCEIVER
 SPR-4 SOLID STATE RECEIVER	 SW-4A SWL RECEIVER	 2-C RECEIVER	 2NT CW AND NOVICE TRANSMITTER

**CHARGE IT!** On your Master Charge, Bank Americard or Uni-Card. Spread payments up to two years.

### PROMPT ORDER DEPT.

We carefully pack and ship ham gear, accessories and parts to most any part of the world.

Address your orders to:

20 SMITH STREET  
Farmingdale, N. Y. 11735

Or - Phone your orders to  
(516) 293-7990



# Harrison

"Ham Headquarters, U.S.A."®

FARMINGDALE, L.I.

2265 ROUTE 110  
2 miles south of LIE exit 49S  
(516) 293-7990

NEW YORK CITY

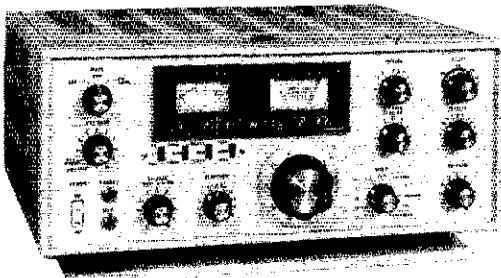
8 BARCLAY STREET  
Near City Hall  
BARclay 7-7922

**ORDER NOW!**  
Or, ask for literature.



## Is the FTdx 570's noise blanker reason enough to spend \$550 for this new rig?

You bet it is. Here's a complete rig, including a noise blanker — on other rigs you pay about \$100 extra for the blanker alone. On other rigs, you read the glowing specs and they sound fine. Of course, to get them on the air you pay extra for such essentials as a power supply.



Well, the FTdx 570 includes a built-in power supply and 25 and 100 KHz calibrator. And built-in VOX. Plus a special WWV receive band on 10 — 10.5 MHz. And a clarifer — a receiver-offset tuning feature that lets you move  $\pm 5$  KHz from a preset transmitter frequency. There's even a built-in cooling fan and a built-in speaker.

Last but certainly not least is the

power: 560 watts PEP SSB, 500 watts CW input power.

The whole transceiver is guaranteed for one year. No other rig, preassembled or kit, gives you anywhere near the value or performance you get in the FTdx 570.

We have a brochure on the 570 that really gets down to the nitty-gritty on the subject. Send for it. Better yet, send for the rig itself. Don't you owe yourself a bargain?

### SPECTRONICS WEST

Dept. Q, 1491 E. 28th, Signal Hill, Ca. 90806 / (213) 426-2593

### SPECTRONICS EAST

Dept. Q, Box 1457, Stow, Ohio 44224 / (216) 923-4567

Please send detailed information on all Yaesu products.

Enclosed find \$\_\_\_\_\_

Please send model(s) \_\_\_\_\_

Name \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

All prices F.O.B. Signal Hill, Ca.

Master Charge and BankAmericard accepted.

# You've come a long way baby.

Right on! Power tubes have come a long way since the nostalgic days of EIMAC's first triode, the 150T. All the way up to the giant X-2159 developmental tetrode having a plate dissipation of one and one-quarter megawatts.

The amazing X-2159 powerhouse can develop two megawatts of CW power up to 30 MHz or so with up to 17 decibels stage gain. It can also be used as a 60 kilovolt, 1,000 ampere switch tube, or as an extremely high power pulse modulator.

Two EIMAC X-2159s can be used in a 2.5 megawatt, 100% plate modulated medium or shortwave transmitter. At VLF, moreover, two X-2159s can develop 4 megawatts of CW power.

The X-2159 is a thought provoking example of EIMAC's capability to produce tomorrow's tube today.

For full specifications on EIMAC's new super power tetrode and other outstanding products write: EIMAC Division of Varian, 301 Industrial Way, San Carlos, California 94070. Or contact any of the more than 30 Varian/EIMAC Electron Tube and Device Group Sales Offices throughout the world.



**Eimac**  
division  
varian