March 1968
75 Cents

QST

devoted entirely to

amateur radio

OFFICIAL JOURNAL OF THE ARRL

10 reasons to buy Hallicrafters' new SR-400 Cyclone

FEATURE	Hallicrafters SR-400	Collins* KWM-2	Drake* TR-4
Power Input	SSB=400 watts CW=360 watts	SSB=175 watts CW=180 watts	SSB=300 watts CW=260 watts
Accessory "dual receive" VFO available	**Yes**	No	No
Noise Blanker	**Yes**	$135.00 Accessory	No
Receiver Incremental Tuning	**Yes**	No	No
Built-in notch Filter	**Yes**	No	No
Sharp CW Filter	**Yes** 200 cycles	No	No
Sensitivity	.3 uv for 10 db S/N	.5 uv for 10 db S/N	.5 uv for 10 db S/N
1 kHz dial readout	**Yes**	Yes	No
Carrier Suppression	60 db	50 db	50 db
Unit Price	**$799.95**	**$1,150.00**	**$599.95**

*Data from published specifications.

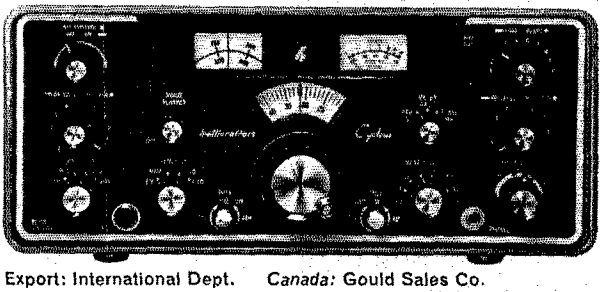
Now: can you think of one reason why you shouldn't?

Superb sensitivity, 400 watts RF, 200 cycle CW selectivity, receiver incremental tuning, 1 kHz readout, amplified automatic level control, exclusive notch filter! There's even the HA-20 dual receive VFO for sensational, award winning DX operation. No matter what specifications or features you choose as a standard of comparison, the exciting new SR-400 fixed/mobile transceiver is unsurpassed. Unsurpassed feature for feature. Unsurpassed for rugged dependable performance in all environments. Unsurpassed in value and versatility. Prove it to yourself. Write for complete specifications in a four page brochure. See your Hallicrafters' distributor today.

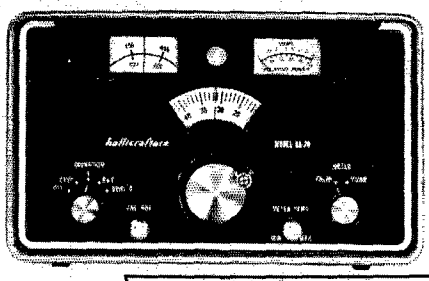
hallicrafters

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

SR-400 Cyclone Transceiver



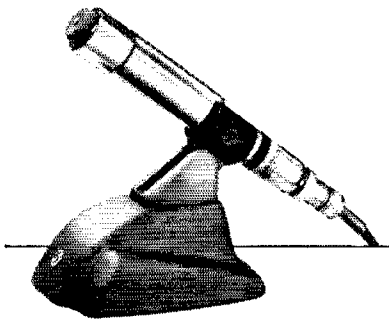
HA-20 VFO



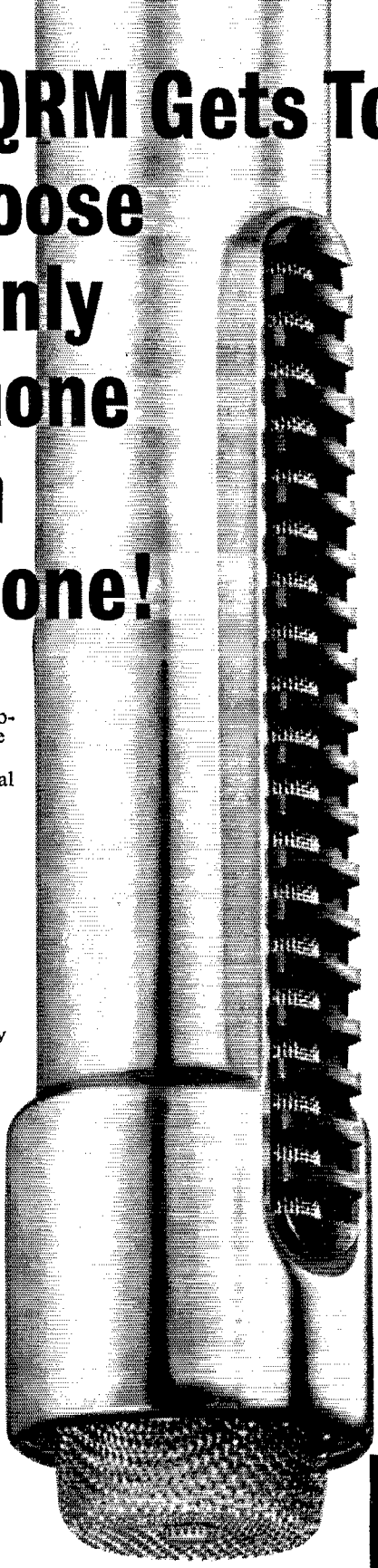
Export: International Dept. *Canada:* Gould Sales Co.

See us at the Sideband Show, March 19, New York City, N.Y.

When QRM Gets Tough Choose The Only Microphone With Backbone!



ELECTRO-VOICE
MODEL 676
DYNAMIC CARDIOID



The backbone of the Electro-Voice Model 676 is no mere decoration. It's visible proof of the most exciting idea in directional microphones—Continuously Variable-D (CV-D)™.

Here's how it works. We attach a very special tapered tube to the back of the microphone element. This tube automatically varies in effective length with frequency. It's a long tube for lows—a short tube for highs. All this with no moving parts! The tube is always optimum length to most effectively cancel sound arriving from the back of the microphone, regardless of frequency.

This ingenious solution* is years ahead of the common fixed-path design found in most cardioid microphones. It means you pick up less noise and room reverberation, ensuring a crisp signal and optimum vox performance. It also is less sensitive to wind and shock—ideal for field days! There is almost no "proximity effect"... no boosted bass when you must operate extra close.

Long life and peak-free response are guaranteed by the exclusive E-V Acoustalloy® diaphragm. And the 676 has unusually high output for a microphone so small. Of course you get both 150-ohm and Hi-Z outputs, plus high efficiency dust, pop, and magnetic filters—indeed, all of the hallmarks of Electro-Voice design that have made E-V a leader for years.

But that's not all. The 676 has an exclusive bass control switch built in. Choose flat response (from 40 to 15,000 cps) or tilt off bass 5 or 10 db at 100 cps to eliminate power-robbing lows that reduce efficiency and lower intelligibility. You'll be amazed at the reports of improved audio you'll get when you switch to the E-V676.

Visit your E-V distributor to see this remarkable new microphone today. And when difficult QRM must be faced squarely, stand up and fight back with the microphone with a backbone (and CV-D)—the new Electro-Voice Model 676 dynamic cardioid!

Model 676 Satin Chrome or TV grey, $60.00 amateur net; in Gold, $66.00 net. Shown on Model 420 Desk Stand, $12.00 amateur net. Model 674 identical except stud-mounted with On-Off switch, $60.00 amateur net.

ELECTRO-VOICE, INC.
Dept. 382Q, 631 Cecil Street
Buchanan, Michigan 49107

Electro-Voice®
A SUBSIDIARY OF GULTON INDUSTRIES, INC.

*Pat. No. 3,115,207

The Best Endure

A classic is a work of enduring excellence. That's why the 32S-3 Transmitter is a classic in amateur radio. The 32S-3 offers USB, LSB and CW versatility, transceiver operation with S/Line receiver, mechanical filter sideband generation, permeability-tuned VFO, crystal-controlled HF oscillator, RF inverse feedback and automatic load control. Stop in at your Collins distributor and browse through the S/Line classics.

COLLINS

QST

MARCH 1968

VOLUME LII NUMBER 3

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

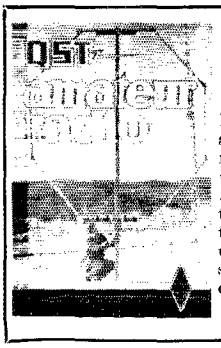
OFFICES

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

Subscription rate $7.50 per year postpaid, U.S. funds, in Canada and U.S.; $8 elsewhere. ARRL Membership, including *QST*, available only to individuals with a bona fide interest in amateur radio: $6.50 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.

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



OUR COVER

Here's W1CER adjusting the matching network on the Army Loop Antenna. For details on this unusual antenna see the analysis on page 17.

—CONTENTS—

Don't gamble on your future

FIELD ENGINEERS... there's a good deal for you at Raytheon Service Company

Pick your specialty from Raytheon's wide variety of career assignments. Raytheon's broad-based company activities are growing and expanding throughout the world. To qualified field engineers, the Raytheon Service Company offers immediate openings ranging from permanent and travel assignments within the U.S., to travel assignments world-wide.

Career opportunities are now available at all levels of technical capability for experienced personnel acquainted with operation • maintenance • installation • training • and publication of handbooks and operating manuals.

HEAVY GROUND RADAR • MICROWAVE • SONAR • FIRE CONTROL • DIGITAL • COMMUNICATIONS

Raytheon's comprehensive benefits program includes hospitalization, surgical, major medical, life, disability, travel and accident insurances, company-sponsored education opportunities, and other allowances and benefits.

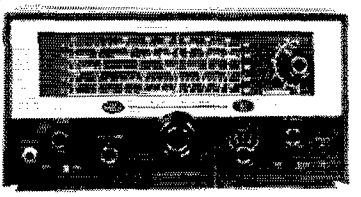
Total compensation includes attractive starting salaries, overseas and overtime bonus, and per diem as applicable.

To arrange a convenient interview, send resume to, or call collect, Kenneth H. Slovin, Employment Manager, Raytheon Service Company, Dept. 12, Second Ave., Burlington, Massachusetts 01803. Telephone: (617) 272-9300, Ext. 209.

RAYTHEON

EXCELLENCE IN ELECTRONICS

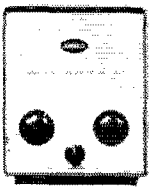
An Equal Opportunity Employer



MODEL R-5 ALLWAVE RECEIVER

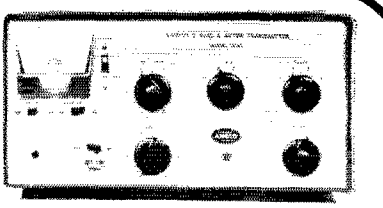
An exceptionally fine receiver for the short wave listener and beginning amateur operator. Fully transistorized—solid state. Covers .54 through 54.0 Mc in five continuous bands. Includes standard broadcast band, all foreign broadcast bands, all amateur bands from 160 through 6 meters, all 27 Mc CB Channels, all 2-way radio frequencies from 30 to 50 Mc including many police and fire departments. Controls include Variable Beat Frequency Oscillator, Noise Limiter, Bandspread. Compare with tube-type units costing as much!

Kit **$64.95**
Wired and tested **79.95**



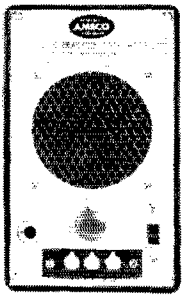
VFO-621

VFO for 6, 2 and 1 1/4 meters. Transistorized oscillator plus built-in zener diode regulated power supply gives highest stability. Ideal match for TX-62 and other VHF transmitters.
Wired and tested.... $59.95



TX-62 TRANSMITTER

In response to the demand for an inexpensive, compact VHF transmitter, Ameco has brought out its 2 and 6 meter transmitter. There's no other transmitter like it on the market. 75 watts input, phone and CW. Built-in solid state power supply. Broadbanded circuits make tuning easy. Uses inexpensive crystals or external VFO.
Wired and tested **$149.95**



MODEL OM

CODE PRACTICE OSCILLATOR AND MONITOR

A combination code practice oscillator and CW Monitor. (No connection to transmitter required.) Transistorized. Has built-in speaker, tone control and *headphone jack.*

Model OMK, Kit (less batteries) ..... **$ 9.95**
Model OM, wired and tested, (less batteries) **$15.20**

Similar unit, but without CW RF Monitor Feature.

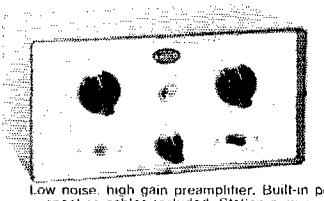
Model OCPK, Kit (less batteries) ..... **$ 7.95**
Model OCP, wired and tested, (less batteries) **$10.50**

AMECO

COMPLETE HAM RIGS

Receivers, transmitters, VFO, Pre-amplifiers, converters, code practice oscillators, code records, theory and license books.

160 THRU 6 METER TRANSCEIVER PRE-AMP



MODEL PT

Low noise, high gain preamplifier. Built-in power supply. Interconnecting cables included. Station power control center—one switch controls everything. Automatic changeover, transmit to receive. Feeds and mutes second receiver.
Wired and tested **$49.95**

PASS NEW ADVANCED AND EXTRA CLASS LICENSE EXAMS WITH NEW AMECO LICENSE GUIDES

New Ameco License Guides contain simple, detailed, easy-to-understand answers for FCC study questions, plus a sample FCC-type exam, using multiple choice questions.

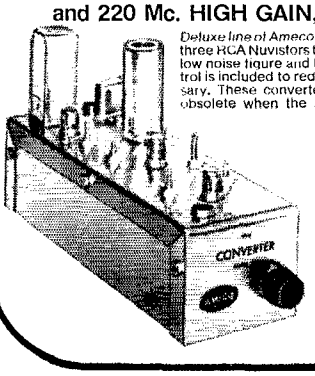
Advanced Class Guide #16-01 (32 pages)..... 50¢
Extra Class Guide #17-01 (48 pages)..... 75¢

AVAILABLE AT LEADING HAM DISTRIBUTORS
Information included in new catalog.

AMECO
Division of Aerotron, Inc.
P. O. Box 6527
Raleigh, N. C. 27608

Write for name of your local Ameco dealer and free catalog

NUVISTOR CONVERTERS FOR 50, 144 and 220 Mc. HIGH GAIN, LOW NOISE



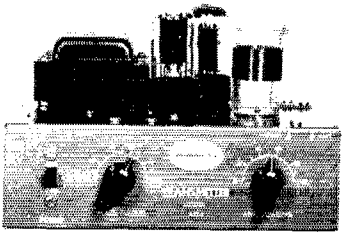
Deluxe line of Ameco VHF Converters uses three RCA Nuvistors to obtain an extremely low noise figure and high gain. A gain control is included to reduce the gain if necessary. These converters do NOT become obsolete when the receiver is changed.

Model CN-50W, CN-144W or CN220W wired, (specify IF)... $49.95

Model CN-50K, CN-144K or CN-220K in kit form, (specify IF) $34.95

PS-1 Power Supply, Wired and tested... $12.50

NOVICE TRANSMITTER KIT



MODEL AC-1

Ideal kit for the beginner who requires a reliable TVI-suppressed transmitter. Keying is clean and chirp-free. Kit is simple to build and easy to operate. Crystal Controlled, Pi-network Output. Includes AC Power Supply. For 40 and 80 meters CW. 15 Watts input.
Kit with coil for any 1 band, including tubes. **$21.95**
Extra coil kit for any 1 band, CK-1 ..... **$ 1.00**

CU AT THE SINGLE SIDEBAND SHOW, TUESDAY, MARCH 19 DURING IEEE WEEK.
STATLER-HILTON, NEW YORK CITY. STUART F. MEYER, W2GHK/4

Section Communications Managers of the ARRL Communications Department

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

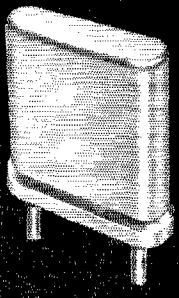
ATLANTIC DIVISION				
Delaware	K3NYG	John L. Penrod	RFD 1	Townsend 19734
Eastern Pennsylvania	W3ELI	George S. Van Dyke, Jr.	4607 Convent Lane	Philadelphia 19114
Maryland D. C.	K3JYZ	Carl E. Andersen	14601 Claude Lane	Silver Spring, Md. 20904
Southern New Jersey	W2ZI	Edward G. Raser	19 Blackwood Drive	Wilburta Gardens, Trenton 08628
Western New York	K2HUK	Charles T. Hansen	Warner Gulf Rd.	Holland 14080
Western Pennsylvania	W3NEM	Robert E. Gawryla	1463 N. Allen St.	State College 16801
CENTRAL DIVISION				
Illinois	W9PRN	Edmond A. Metzger	1520 South 4th St.	Springfield 62703
Indiana	W9BUQ	William C. Johnson,	2838 Hillside Ave.,	Indianapolis 46218
Wisconsin	K9GSC	Kenneth A. Ebneter	822 Wauona Trail	Portage 53901
DAKOTA DIVISION				
Minnesota	WØTCK	Herman R. Kopischke, Jr.	RFD 2	Janesville 56048
North Dakota	WØDM	Harold L. Sheets	21 Euclid Ave.	Grand Forks 58201
South Dakota	KØTXW	Seward P. Holt	Box 58	Clear Lake 57226
DELTA DIVISION				
Arkansas	W5DTR	Curtis R. Williams	10508 West 12th St.	Little Rock 72205
Louisiana	W5PM	J. Allen Swanson, Jr.	RFD 1, Box 354-E	Covington 70433
Mississippi	W5EMM	S. H. Hairston	1511-36th Ave.	Meridian 39301
Tennessee	K4RCT	Harry A. Phillips	5200 Oak Meadow Ave.	Memphis 38128
GREAT LAKES DIVISION				
Kentucky	WA4KFO	Lawrence F. Jeffrey	1635 Antler Ave.	Owensboro 42301
Michigan	W8FX	Ralph P. Thetreau	27209 W. Six Mile Road	Detroit 48240
Ohio	W8AL	Wilson E. Weckel	1317 Logan Ave., N.W.	Canton 44703
HUDSON DIVISION				
Eastern New York	W2EFU	George W. Tracy	1138 North Country Club Drive	Schenectady 12309
N. Y. C. & Long Island	K2IDB	Blaine S. Johnson	266 Cypress St.	Massapequa Park, L. I. 11762
Northern New Jersey	W2LQP	Louis J. Amoroso	180 Pleasant Ave.	Bergenfield 07621
MIDWEST DIVISION				
Iowa	WØBDZ	Owen G. Hill	RFD	Gilman 50106
Kansas	KØBXF	Robert M. Summers	3045 North 72nd	Kansas City 66109
Missouri	WØTPK	Alfred E. Schwaneke	Edgar Star Rte.	Rolla 65401
Nebraska*	KØOAL	V. A. Cashon,	334 Pine St., ox 488	Chadron 69337
NEW ENGLAND DIVISION				
Connecticut	W1GVF	John J. McNassor	218 Berlin Ave.	Southington 06489
Eastern Massachusetts	W1ALP	Frank L. Baker, Jr.	85 Solar Ave.	Braintree 02185
Maine	K1DYG	Herbert A. Davis	RFD 1	Franklin 04634
New Hampshire W1SWX/	K1DSA	Robert Mitchell	Box 137-A, RFD	Chester 03036
Rhode Island	K1AAV	John E. Johnson	30 Fruit St.	Pawtucket 02860
Vermont	K1MPN	E. Reginald Murray	3 Hillcrest Drive	Montpelier 05601
Western Massachusetts	W1STR	Norman P. Forest	36 Valley Rd.	Springfield 01119
NORTHWESTERN DIVISION				
Alaska*	KL7AEQ	Albert F. Weber	Box 735	College 99735
Idaho	W7ZNN	Donald A. Crisp	3408-8th St. F	Lewiston 83501
Montana	W7FYN	Joseph A. D'Arcy	1916 Baggin Ave.	Anaconda 59711
Oregon	K7WWR	Dale T. Justice	2741 Firwood Lane	Forest Grove 97116
Washington	K7JHA	William R. Watson	1005 E. 1st Ave.	Ellensburg 98926
PACIFIC DIVISION				
East Bay	K6LRN	Richard Wilson	107 Cordova Way	Concord 94521
Hawaii	KH6BZF	Lee R. Wical	45-601 Luluku Rd.	Kaneohe 96744
Nevada	W7PBV	Leonard M. Norman	652 Utah St.	Boulder City 89005
Sacramento Valley	WA6JDT	John F. Minke, III	6230 Rio Bonito Drive	Carmichael 95608
San Francisco	WA6AUD	Hugh Cassidy	77 Coleman Drive	San Rafael 94901
San Joaquin Valley	W6JPU	Ralph Saroyan	6204 E. Townsend Ave.	Fresno 93702
Santa Clara Valley*	WA6IZF	Edward A. Gribi	229 Vivian St.	King City 93930
ROANOKE DIVISION				
North Carolina	W4BNU	Barnett S. Dodd	420 West Franklin St.	Salisbury 28144
South Carolina	K4LNJ	Clark M. Hubbard	124 Fant Lane	Union 29379
Virginia	W4SHJ	H. J. Hopkins	8600 Hammett Ave.	Norfolk 23503
West Virginia	W8JM	Donald B. Morris	1136 Morningstar Lane	Fairmont 26554
ROCKY MOUNTAIN DIVISION				
Colorado	KØFDH	Richard Hoppe	Star Route	Idaho Springs 80452
New Mexico	W5WZK	Kenneth D. Mills	Rt. 1, Box 654 F	Albuquerque 87102
Utah	W7VSS	Gerald F. Warner	4765 South 275 West	Ogden 84401
Wyoming	W7CQL	Wayne M. Moore	142 South Montana Ave.	Casper 82601
SOUTHEASTERN DIVISION				
Alabama	K4WHW	Edward L. Stone	1806 Spring Ave., S.W.	Decatur 35601
Canal Zone	KZ5OB	Russell E. Oberholtzer,	P.O. Box 107	Margarita
Eastern Florida	W4MVB	Jesse H. Morris	P.O. Box 1241	Jacksonville Beach 32050
Georgia	W4RZL	Howard L. Schonher	P.O. Box 1902	Columbus 31902
West Indies (P.R.-V.I.)	KP4DV	Albert R. Crumley, Jr.	P.O. Box 10073	Caparra Heights San Juan, P.R 00922.
Western Florida	W4RKH	Frank M. Butler, Jr.	323 Elliott Rd., S.E.	Fort Walton Beach 32548
SOUTHWESTERN DIVISION				
Arizona	W7FKK	Floyd C. Colyar	3411 West Pierson St.	Phoenix 85017
Los Angeles	K6UMV	Donald R. Etheredge	12040 Redbank St.	Sun Valley 91352
Orange	W6DEY	Roy R. Maxson	1434 South Olive St.	Santa Ana 92707
San Diego	WB6GMM	James E. Emerson, Jr.	6561 Foyle Way	San Diego 92117
Santa Barbara	WA6OKN	Cecil D. Hinson	1933 Coventry Court	Thousand Oaks,91360
WEST GULF DIVISION				
Northern Texas	W5BNG	L. L. Harbin	4515 Calmount	Fort Worth 76107
Oklahoma	W5PML	Cecil C. Cash,	1802 Smith Ave.,	Lawton 73501
Southern Texas	W5AIR	G. D. Jerry Sears	5634 Eskridge St.	Houston 77023
CANADIAN DIVISION				
Alberta	VE6TG	Harry Harrold	1834-5th Ave., N.	Lethbridge, Alta.
British Columbia	VE7FB	H. E. Savage	4553 West 12th Ave.	Vancouver 8, B. C.
Manitoba	VE4JT	John Thomas Stacey	19 Cottonwood Cres.	Brandon
Maritime*	VE1NR	William Gillis	Rural Route 6, Shediac Rd.	Moncton, N. B.
Ontario	VE3BUX	Roy A. White,	5 Northwood Crescent,	Belleville
Quebec	VE2OJ	Jim Ibey	209 Brookdale Ave.	Dorval, P. Q.
Saskatchewan*	VE5HP	Gordon C. Pearce	1903 Connaught St.	Regina

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

NOW

A low cost Crystal for the Experimenter

International



type "EX"

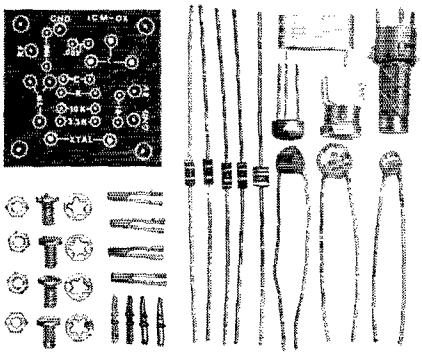
- LOW COST
- MINIMUM DELIVERY TIME

3,000 KHz to 60,000 KHz

$3.75 Postage Paid

SPECIFICATIONS: International Type "EX" Crystal is available from 3,000 KHz to 60,000 KHz. The "EX" Crystal is supplied only in the HC-6/U holder. Calibration is ± .02% when operated in International OX circuit or equivalent.

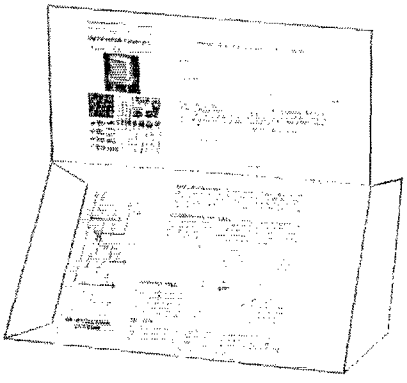
CONDITIONS OF SALE: All "EX" Crystals are sold on a cash basis, $3.75 each. Shipping and postage (inside U.S. and Canada only) will be prepaid by International. Crystals are guaranteed to operate only in the OX circuit or its equivalent.



COMPLETE OX OSCILLATOR KITS

Everything you need to build your own oscillator. Two kits available. "OX-L" kit 3,000 to 19,999 KHz. "OX-H" kit 20,000 to 60,000 KHz. Specify "OX-L" or "OX-H" when ordering. **$2.35** Postage Paid

MINIMUM DELIVERY TIME We guarantee fast processing of your order. Use special EX order card to speed delivery. You may order direct from ad. We will send you a supply of cards for future orders.



ORDERING INSTRUCTIONS

(1) Use **one** order card for each frequency. Fill out both sides of card.

(2) Enclose money order with order.

(3) Sold only under the conditions specified herein.

INTERNATIONAL

CRYSTAL MFG. CO., INC.

10 NO. LEE • OKLA. 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.

Past Presidents

HIRAM PERCY MAXIM, W1AW, 1914–1936
EUGENE C. WOODRUFF, W8CMP, 1936–1940
GEORGE W. BAILEY, W2KH, 1940–1952
GOODWIN L. DOSLAND, W0TSN, 1952–1962
HERBERT HOOVER, JR. W6ZH, 1962–1966

Officers

President . . . . . ROBERT W. DENNISTON, WØNWX
Box 73, Newton, Iowa 50208

First Vice-President . . . . WAYLAND M. GROVES, W5NW
1406 West 12th Street, Odessa, Texas 79760

Vice-Presidents . . . . . CHARLES G. COMPTON, WØBUO
GILBERT L. CROSSLEY, W3YA

Secretary . . . . . JOHN HUNTOON, W1LVQ

Treasurer . . . . . DAVID H. HOUGHTON
225 Main St., Newington, Connecticut 06111

• • • • •

Honorary Vice-President . . . . . FRANCIS E. HANDY, W1BDI

• • • • •

General Manager . . . . . JOHN HUNTOON, W1LVQ
Communications Manager . . . . . GEORGE HART, W1NJM
Technical Director . . . . . GEORGE GRAMMER, W1DF
Assistant General Manager . RICHARD L. BALDWIN, W1IKE
Assistant Secretaries . . . . . PERRY F. WILLIAMS, W1UED
WILLIAM I. DUNKERLEY, JR, WA2INB
225 Main St., Newington, Connecticut 06111

• • • • •

General Counsel . . . . . ROBERT M. BOOTH, JR., W3PS
1100 Vermont Avenue, N. W., Washington, D. C. 20005

Associate Counsel . . . . . ARTHUR K. MEEN, Q.C., VE3RX
Suite 2212, 44 King St. West, Toronto 1, Ont.

DIRECTORS

Canada

NOEL B. EATON VE3CJ
Box 660, Watertown, Ontario
Vice-Director: Colin C. Dumbrille VE2BK
116 Oak Ridge Drive, Baie d'Urfe, Quebec

Atlantic Division

GILBERT L. CROSSLEY W3YA
734 West Foster Avenue, State College, Pa. 16801
Vice-Director: Harry A. McConaghy W3EPC
8708 Fenway Dr. Potomac, Bethesda, Md. 20034

Central Division

PHILLIP E. HALLER W9HPG
6000 S. Tripp Ave., Chicago, Ill. 60629
Vice-Director: Edmond A. Metzger W9PRN
1520 South Fourth St., Springfield, Illinois 62703

Dakota Division

CHARLES G. COMPTON . . . . . WØBUO
Box 226A R.R. 1, South St. Paul, Minn. 55075
Vice-Director: John M. Maus . . . . . WØMBD
Oakdale Addition, St. Cloud, Minn. 56301

Delta Division

PHILIP P. SPENCER W5LDH/W5LXX
575 Amethyst St., New Orleans, La. 70124
Vice-Director: Max Arnold W4WHN
612 Hogan Road, Nashville, Tenn. 37220

Great Lakes Division

ALBAN A. MICHEL W8WC
359 Bonham Rd., Cincinnati, Ohio 45215
Vice-Director: Charles C. Miller W8JSU
4872 Calvin Drive, Columbus, Ohio 43227

Hudson Division

HARRY J. DANNALS W2TUK
RFD 1, Arthur Lane, Dix Hills, Huntington, N.Y. 11743
Vice-Director: Stan Zak K2SJO
13 Jennifer Lane, Port Chester, New York 10573

Midwest Division

SUMNER H. FOSTER . . . . . WØGQ
2110 Goblin's Gully Dr., S.E., Cedar Rapids, Iowa 52403
Vice-Director: Ralph V. Anderson . . . . . KØNL
528 Montana Ave., Holton, Kansas 66435

New England Division

ROBERT YORK CHAPMAN W1QV
28 South Road, Groton, Conn. 06340
Vice-Director: Bigelow Green W1EAE
11 Law's Brook Rd., South Acton, Mass. 01771

Northwestern Division

ROBERT B. THURSTON W7PGY
7700 31st Ave., N.E., Seattle, Wash. 98115
Vice-Director: R. Rex Roberts W7CPY
837 Park Hill Drive, Billings, Mont. 59102

Pacific Division

J. A. DOC GMELIN W6ZRJ
10835 Willowbrook Way, Cupertino, Calif. 95014
Vice-Director: G. Donald Eberlein W6YHM
P. O. Box 475, Palo Alto, Calif. 94302

Roanoke Division

VICTOR C. CLARK W4KFC
12927 Popes Head Road, Clifton, Va. 22024
Vice-Director: L. Phil Wicker W4ACY
4821 Hill Top Road, Greensboro, N.C. 27407

Rocky Mountain Division

CARL L. SMITH . . . . . WØBWJ
1070 Locust St., Denver, Colo. 80220
Vice-Director: John H. Sampson, Jr. W7OCX
3618 Mount Ogden Drive, Ogden, Utah 84403

Southeastern Division

CHARLES J. BOLVIN W4LVV
2210 S.W 27th Lane, Miami, Fla. 33133
Vice-Director: Albert L. Hamel K4SJI
220 N.E. 25th Street, Pompano Beach, Fla. 33064

Southwestern Division

JOHN R. GRIGGS W6KW
11422 Zelzah Ave., Grenada Hills, Calif. 91344
Vice-Director: Thomas J. Cunningham W6PIF
1105 East Acadia St., El Segundo, Calif. 90245

West Gulf Division

ROEMER O. BEST W5QKF
P.O. Box 1656, Corpus Christi, Texas 78403
Vice-Director: Ray K. Bryan W5UYQ
2117 S.W. 61st Terrace, Oklahoma City, Okla. 73159

"It Seems to Us..."

Second of a series

ARRL AND THE DEMOCRATIC PROCESS

Democracy, according to one authoritative dictionary, is "a theory of government which, in its purest form, holds that the state should be controlled by all the people, each sharing equally in privileges, duties and responsibilities and each participating in person in the government, as in the city-states of ancient Greece. In practice, control is vested in elective officers as representatives who may be upheld or removed by the people."

Not stated, but implicit in this definition, is the essential difference between democracy and other forms of organization or government. It is that the power, the sovereignty, the "ownership" of a democratic institution is vested in its members or citizens. They may be apathetic or indifferent in the exercise of that power, but it is always there. Those who are elected or appointed to run the organization do so quite literally at the pleasure of the members.

No elected official or representative can allow himself to forget this basic fact of life very often or for very long. If he is to be truly effective, he must do three things well: reflect assiduously what his constituents conceive to be their best interests, represent the best immediate and long-term interests of the organization or society as a whole (which are not always the same thing), and, finally, sustain the confidence of his constituents that he is doing both.

These are not easy to do. There are always conflicts of interest and differing points of view to be reconciled, and misinformation and misunderstandings with which to contend. The ideal democratic representative is a veritable paragon of wisdom and balanced judgment, and he is a rare bird indeed.

So it is with the League. We elect our Board of Directors which has overall responsibility for managing our affairs as an organization. The Board functions through an Executive Committee, a group of officers and a headquarters staff — all of whom are responsible to the Board. Few of us as League members are completely in accord all the time with everything our management does. And at times some of us are in rather violent disagreement.

However, because our Board members are elected from each of sixteen divisions and serve for two-year terms, we have an exceptionally sensitive kind of democracy. It takes only ten members in any division to initiate a change by nominating a replacement director. By and large, for fifty years we amateurs have functioned very effectively through this our organization. As in any democracy, we will continue to be effective only to the extent that each of us concerns himself directly in the affairs of the League and exercises his opportunity and responsibility as a member to elect the best qualified representatives, to keep himself as accurately and fully informed as possible, and — most important — to be committed, not apathetic. QST

Even more than our correspondence, the continuing heavy purchase of License Manuals indicates a substantial back-to-the-books movement in preparation for higher-grade tickets. Early applicants confirm that mere memory won't suffice; you have to "know your stuff." To provide an additional working tool for the individual as well as class instruction, we commence this month (page 64) a six-part series by W1DF organized as a course of study in logical progression, with Handbook and other outside references. (Note to already-Extras: as we've found--to our chagrin on one question!--it is mighty useful as a refresher.)

Speaking date? Talks on amateur radio have great appeal to local Rotary, Lions, PTA, women's clubs, high schools and other community groups--great for your club, too. Hq. can help with material--films, suggested talk for modification to your style, etc.

Year-end League membership figures have changed only in fractions of a percent the past several years, and 1967 was again practically a standoff, with only a 0.2% domestic (Canada/U.S.) membership increase. Not as much as we'd all like to see, but not bad in view of a dues rise and a decline in total licensees.

You 25-year Extra Class types worried about loss of DXCC or other award credit when changing to 2-letter calls should cool it. There's no problem. By the way, we'd like to run a listing in QST of old 3-letter and new 2-letter calls; please send us yours--separately from any other correspondence. A postcard will be fine.

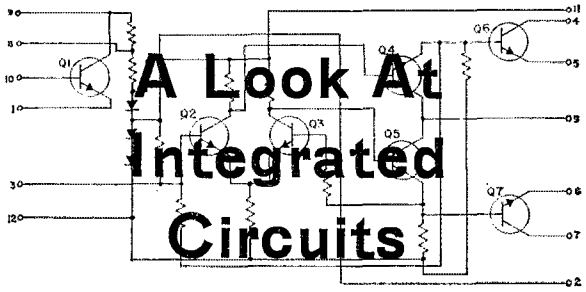
Seen the new ARRL bulletin prepared especially for affiliated clubs? If not, get your club secretary to pass it around at the next meeting. It's intended as a news and idea medium for members as well as officers.

FCC is now monitoring some CB channels 24 hours a day to search for violations. A couple of ham frequencies with idiotic goings-on could use the same surveillance.

It Hertz, but with FCC and the military now also deserting the reactionary ranks, we're saying "uncle" and will gradually be shifting to the new frequency term.

Overleaf (as the Gs say), our editorial treats the principles of the democratic process in the League. It is timely to mention the practical application as well, for the annual Board of Directors meeting is in early May, and thus now is not too soon to convey to your ARRL representative your views on topics and problems of the day.

Citizens Band clubs responding to our recent survey were unanimous in wanting to know more about amateur radio. This points up an opportunity to invite interested CBers to amateur radio club meetings and license classes, or volunteer to put on a program on ham radio at a CB club meeting. Check the ARRL Training Aids list for appropriate films. Many clubs report successful recruitment of CBers into amateur ranks--and they make good hams, too.



A Look At Integrated Circuits

What Are They? How Can They Be Used in Ham Radio?

BY DOUG DeMAW,* W1CER

ARTICLES like this could become obsolete before having a chance to reach the printing presses. With the giant strides being taken each day in the solid-state field, it is conceivable that such a thing could happen. However, it should be quite some time before the topics discussed here become relegated to the archives of ancient practices. Therefore, it is hoped that this presentation will not only be timely, but that it will help the reader to understand integrated circuits and their potential uses.

The IC Device

An in-depth discussion concerning the actual mechanics of IC (integrated circuit) fabrication will not be given here, but it is important that the reader know what is contained in the basic module, and how ICs differ from other solid-state components. As the term "integrated" implies, many components are incorporated into a larger unit, or formed into a whole, when an IC module is manufactured. For the purpose of simplification let's regard an IC as a collection of diodes, transistors, resistors, and capacitors, all built up on a single piece of semiconductor material, or "substrate." The exact number of individual items represented on a single piece of material, or "chip," is dependent upon the intended application. In other words, a particular integrated circuit might have but one diode and two transistors on its chip, or it could have as many as 15 transistors, 20 resistors, 8 diodes, and 11 capacitors (hypothetical) contained thereon.

The basic IC chip is a single crystal, or wafer, of n- or p-type silicon. Through a complex manufacturing process, impurities are introduced (diffusion process) into different areas of the basic silicon wafer. By introducing n- or p-type materials in this manner, diodes and transistors are formed. Resistors are formed by making ohmic contacts to certain sections of the basic semiconductor chip. A coating of insulating oxide is added to the chip after the diodes and transistor elements are formed. This coating is used as the dielectric material when the capacitors, if required, are formed on the wafer. The basic structure of a simple integrated-circuit device is shown in cross-sectional form in Fig. 1. A detailed description of the manufacturing process and the philosophy used in IC fabrication is treated in *RCA Linear Integrated Circuits*.[1] The book contains a wealth of information concerning IC techniques.

ICs are packaged in two basic styles of container, each requiring a different mounting technique when installed in the circuit. Many integrated circuits are housed in standard TO-5 transistor cases, using as many as 10 or more leads for circuit connections. Other IC modules are housed in flat-pack style packages, some with 14 or more connecting leads.

Electrical Properties

At this time, most ICs contain bipolar transistors, though some companies have begun to

[1] Tech. Series IC-41, available for $2.00 from most electronics supply houses.

There's a lot of talk these days about integrated circuits. Many regard ICs as the electronic building blocks of this era. Here's a look at what integrated circuits are, what's involved in using them, and how they might be used in some typical radio circuits. We'll let you, the reader, draw your own conclusions regarding their usefulness in amateur applications.

* Assistant Technical Editor, *QST*.

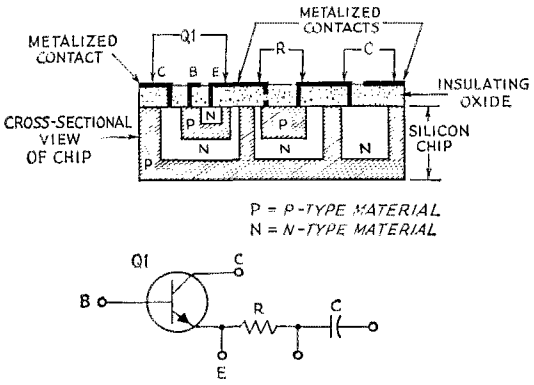


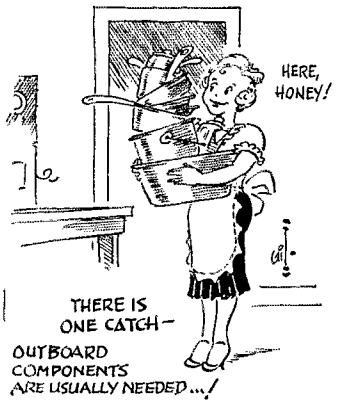
Fig. 1—Pictorial and schematic diagrams of a typical integrated-circuit module. The metalized contacts connect the different parts of the IC together to form the hookup shown in the schematic.

use FETs in some of their models. A significant feature of having two or more transistors on a common chip — the same benefit applies to diodes on a common wafer — is that they exhibit similar characteristics. That is to say, they are closely matched units by virtue of their being formed at the same time, under the same conditions, and on a uniform single crystal of silicon. When discrete (individual) diodes or transistors are used in a circuit which requires close matching of characteristics (such as in balanced-modulator circuits, discriminators, cascode amplifiers, and similar), it is a difficult task to find *like* semiconductors. The same situation exists when it comes to IC resistance and capacitance elements. When considering their absolute values, the tolerance range may be quite wide, but the resistors or capacitors on a specific IC substrate will be closely matched to one another in characteristics, a vital consideration in circuits requiring precise electrical balance. Additionally, with all components on the same wafer any changes in characteristics which are brought about by temperature variations will usually cause all values to change by equal amounts, or nearly so. This makes it less difficult to maintain circuit balance, a requirement that is hard to realize when using discrete resistors, capacitors, diodes, or transistors.

In some instances the overall cost of a piece of equipment can be reduced by the use of integrated circuits. This of course depends upon the number of outboard components that are needed to complete a particular circuit. Ordinarily, bypass and decoupling capacitors must be added externally to an IC stage. The built-in capacitors are necessarily of the low-capacitance type because of limitations imposed by the smallness of the silicon chip. For this reason, large values of capacitance — in the μf. and upper pf. range — must be added externally. The same holds true where high values of d.c. resistance are concerned, or where power-handling resistors are needed. In r.f. and audio circuits, input and output transformers must also be added as outboard components. Therefore, there can be instances when it costs no more to use discrete components for, say, an i.f. amplifier stage requiring a specified power gain, than it would were an IC put to work in the same kind of circuit.

Physically, and in terms of man hours, the IC's advantages may outweigh any small increase in cost over a discrete-component circuit. Because of the modular format, servicing is more rapid when ICs are used. Construction time is greatly reduced in comparison to that which is possible with conventional parts. Schematic diagrams are easier to follow, especially by beginners, when IC symbols are used. Circuits can be repeated with greater reliability when integrated circuits are used. The foregoing features are especially useful where club projects or other group efforts are concerned.

There are some minor disadvantages connected with the use of integrated circuits, especially when one attempts to use the IC for some purpose other than its intended one — specifically, if one uses an IC in such a way as to utilize its components as discrete elements. An example of such a circuit is given in Fig. 3E where an i.f. amplifier module is treated like a collection of separate components and made to serve as a crystal-controlled converter. In this instance, because all of the solid-state components are on the same chip, isolation between the oscillator and the rest of the circuit is rather poor. This means that oscillator harmonics are difficult to isolate — a circuit complication when it comes to image rejection and the reduction of spurious responses. Improvisation of other circuits, where the IC elements are used as discrete units, can lead to similar problems unless the builder is careful in his design work. These words of warning are not given to discourage the reader from trying new ideas with ICs, for there are a vast number of possibilities when it comes to using some ICs for unintended applications. The field is actually wide open as far as ham projects are concerned.



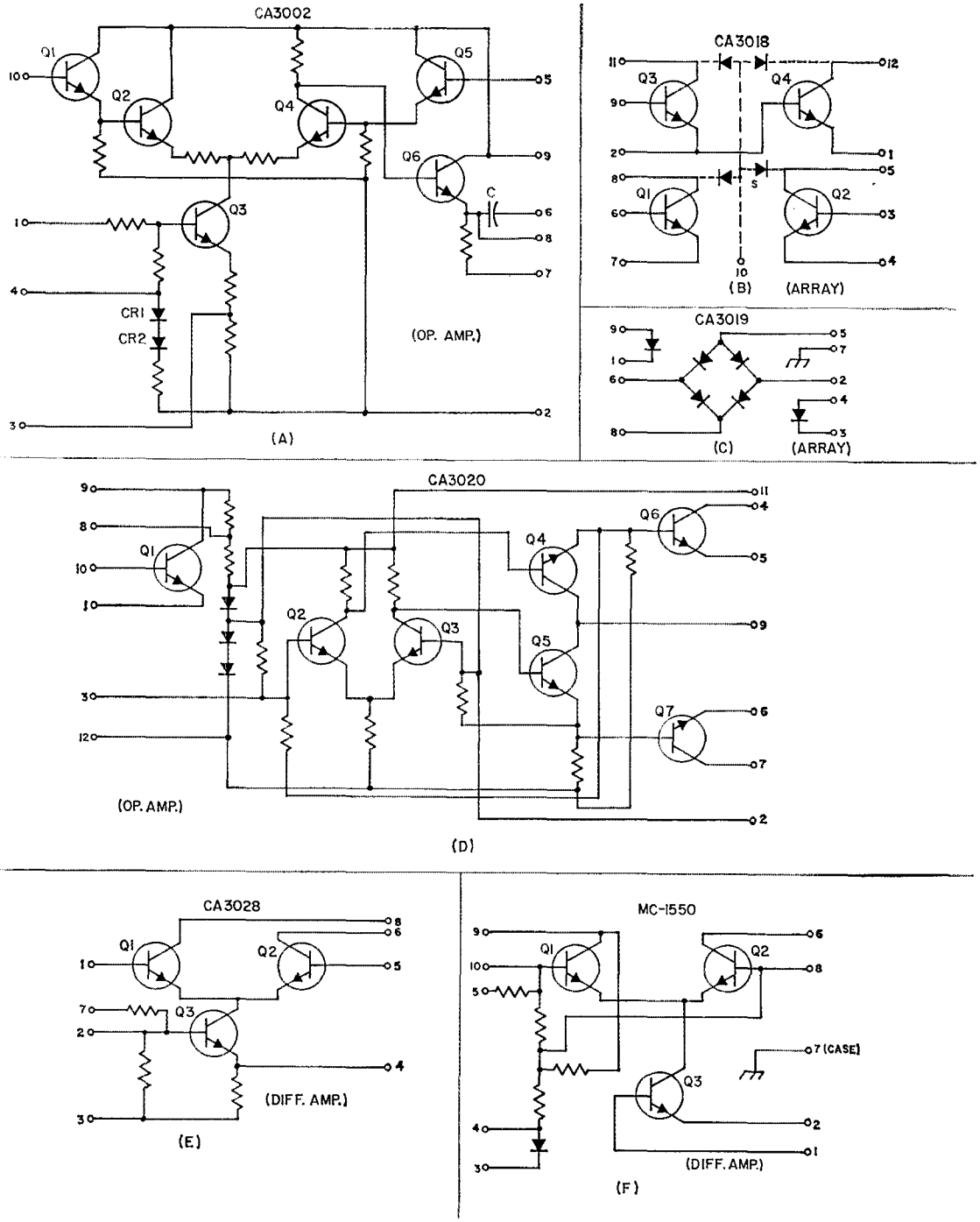
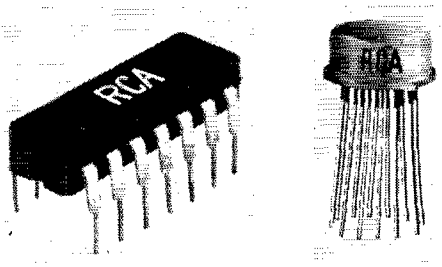


Fig. 2—Representative schematic diagrams of a few IC types which are useful in amateur radio work. The CA3002 at A can be used as a product detector, a.m. detector, or i.f. amplifier up to 11 Mc. At B, an IC which can be used as a cascode r.f. or i.f. amplifier up to 100 Mc., as a video amplifier, or as a 40-mw. class-B audio amplifier. Diodes shown in dashed lines are "bonus" elements (see text) which must be considered during circuit design work. A diode array, CA3019, is shown at C, and is useful as a balanced modulator or mixer. A complex operational-amplifier IC (CA3020) is shown at D. It is useful as an audio amplifier or driver (500 mw.) and is useful to 6 Mc. Differential-amplifier ICs are shown at E and F. Both are good as i.f. or r.f. amplifiers into the v.h.f. region.

Another matter which must be taken into account when using integrated circuits for unorthodox applications is the existence of diode junctions and additional capacitances (Fig. 2B) which exist but are not shown on the manufacturer's data sheet in schematic form. These "bonus" components are not troublesome when an IC is used as intended. They must be taken into account, however, when designing unusual circuits in which the IC's elements are used as separate transistors, diodes, resistors, and capacitors.



Typical integrated circuits (*courtesy of RCA*)

Some Common Terms

Integrated-circuit amplifiers fall into two general categories. The basic configuration is known as the "differential amplifier." A typical circuit for this type of IC is given in Fig. 2 at E and F. The term "differential" indicates that the amplifier is one which has two similar input circuits, connected so as to respond to the difference between two voltages or currents. Such an amplifier will effectively suppress *like* voltages or currents. In general terms one can regard a differential amplifier as a push-pull amplifier. In Fig. 2E the differential pair of transistors, Q_1 and Q_2, must have a combined total emitter current that is equal to the total amount of current supplied to Q_3, the constant-current sink.[2] Q_3 is used in place of a resistor — which could be used in such an application — because it provides a useful control circuit for the differential pair, Q_1 and Q_2. By taking advantage of the properties of Q_3, temperature compensation can be effected, or it can function as a gain control, as a squelch control, or to provide a switch action. These features cannot be realized when using a resistor current sink in place of Q_3. The balanced input terminals are numbered 1 and 5. Balanced collector output can be taken from terminals 6 and 8, or single-ended output can be taken from pin 6, with the supply voltage connected to pin 8.

The current sink, Q_3, can be made to control the differential pair of the IC by applying forward bias at terminal 7. Terminals 2 and 4 provide greater design flexibility as far as the operation of Q_3 is concerned, permitting the user to bypass the base and emitter with a suitable capacitor, or to connect external bias resistors to that part of the circuit.

"Operational amplifiers," as they are called, consist for the most part of cascaded differential amplifiers of the type just described. In simple terms, the operational amplifier is a very-high-gain direct-coupled amplifier. Its response characteristics are established through the application of external feedback. Because of its characteristics, the "op amp" is particularly useful in broad-band amplifier circuits. It can be used to provide shaped response curves — flat, broad, or peaked. These features make the operational-amplifier IC especially useful in i.f., video, and audio amplifier circuits. It is also used in the mathematical circuits of computers for differentiation, integration, and analog comparisons. An operational amplifier is more complex than a differential amplifier as can be seen in the representative circuits of Figs. 2A and D.

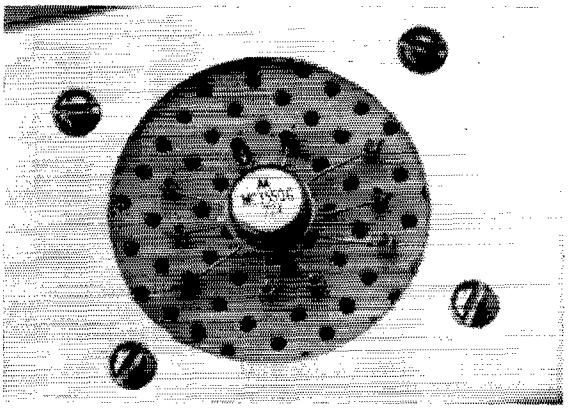
Many other circuits are available in integrated-circuit form. Among the available types are diode arrays, flip-flops, transistor arrays,[3] Darlington arrays, and many others.

Some Mechanical Considerations

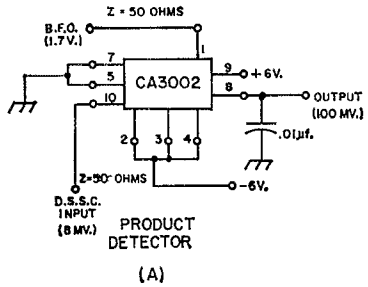
Integrated circuits are available in two general package styles — the multi-lead TO-5 transistor case, and the dual in-line plastic "flat-pack" enclosure. With either type the mattter of mounting can be solved in several ways; by using perforated board and push-in terminals, etched-circuit boards, or sockets that are designed expressly for ICs. The latter, unfortunately, are extremely expensive at this time, costing several dollars each in single-lot quantity. Just recently, Cinch-Jones Co. has released some 6-, 8-, and 10-terminal sockets for TO-5 style ICs. These sockets sell for less than one

[2] A "sink" is defined as a place where energy from several sources is collected or drained away.

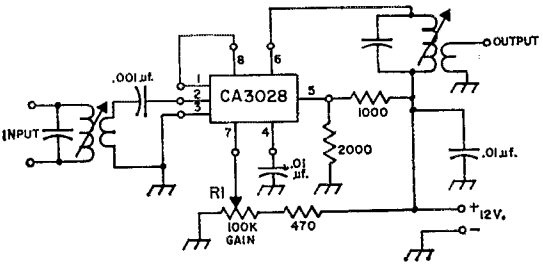
[3] An "array" is a group of many similar integrated devices without separate enclosures. Each has at least one of its electrodes connected to a common conductor.



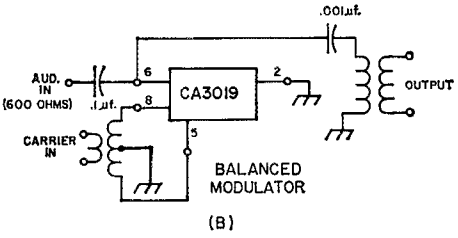
Simple mounting techniques for IC can be worked out. Here a TO-5 type IC is connected to a perforated board by means of 10 push-in terminals. Circuit connections are made on the opposite side of the board.



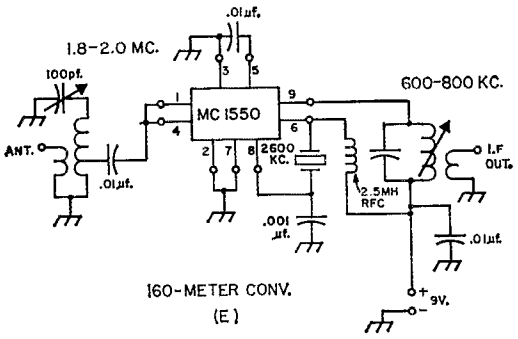
(A)



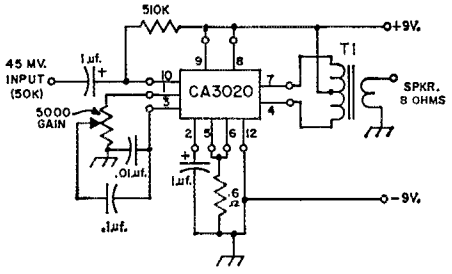
(D)



(B)



(E)



(C)

Fig. 3—Block representations of integrated circuits with the additional components required shown in schematic form. At A, a typical hookup for an IC product detector. The circuit at B shows a basic arrangement for using a CA3019 as a balanced modulator. The null controls have not been added, simplifying the illustration. A typical audio amplifier arrangement for a CA3020 is shown at C. T_1 can be a 500-ohm center-tapped primary to 8-ohm secondary transformer. Up to one watt of output is possible, but with some distortion at the higher levels. An i.f. or r.f. amplifier can be built by using the circuit at D. A manual gain control, R_1, establishes operating bias for the CA3028, thus controlling the overall gain of the stage. A.g.c. can be used at terminal 7 instead, if desired. The circuit at E shows how an IC can be treated as a group of discrete components to form a special hookup. In this instance a Motorola MC1550 functions as a 160-meter crystal-controlled converter.

dollar each and are numbered 6-ICS, 8-ICS, and 10-ICS, respectively.

When installing ICs in circuits where plug-in techniques aren't used, it is important that care be given to the matter of soldering. As with other semiconductor devices, excessive heat can cause damage. Always use a light-duty soldering iron and employ a heat sink on each IC lead when soldering it into the circuit.

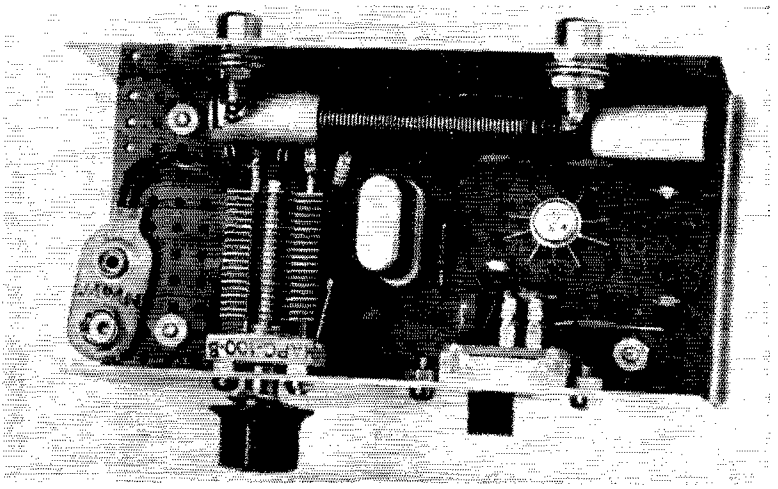
Amateur Applications

Actually, there are few ham radio circuits in which ICs could not find practical application. For example, ICs are available for use in cascode v.h.f. and h.f. amplifiers, for r.f. and i.f. circuits, a.m. and product detectors, video amplifiers, audio amplifiers, balanced modulators, and multivibrators. This list barely scratches the surface when it comes to naming possible uses. A complete list is far beyond the scope of this article. Some typical circuits which are designed around RCA and Motorola integrated-circuit modules are given in Fig. 3. Representative circuit diagrams of the individual ICs are given in Fig. 2 so that the reader can better understand the concept of integrated circuits, and so that a comparison can be made between the block and schematic illustrations of each type.

Some Experiments

The circuits of Fig. 3 represent some common uses for ICs. The i.f. amplifier at D has a manual gain control, R_1, for setting the level of output. A.g.c. could be applied to terminal 7, rather than a manually-set bias voltage, if automatic gain control provisions are desired. A similar circuit, using a Motorola MC-1550G IC, was used in the i.f. stage of the 144-Mc. converter which was described in September 1967 *QST*, page 11.

Treating the elements of a MC1550G as discrete units, the 160-meter converter circuit of Fig. 3E was worked out. It performed well, but required a high-Q input circuit to minimize image



A view of the IC converter circuit of Fig. 3E. The input tuned circuit is wound on a ferrite rod to provide high Q —an aid to image rejection.

responses caused by oscillator harmonics, a condition discussed earlier in this article. A photo of the converter is shown. Other ICs should lend themselves to discrete-circuit adaptations too. The main limiting factor here is the designer's imagination.

An excellent example of how flip-flop ICs can be put to good use can be seen in The Micro-TO Keyer circuit (*QST*, August 1967, page 17).

In Conclusion

Examples of IC applications have been given in thumb-nail-sketch form in this article. The possibilities are practically without limit. A full description of any given integrated-circuit device can of course be found in the manufacturer's data sheets and application notes. Such considerations as frequency limits, temperature ranges, gain figures, distortion percentages, operating voltages and currents, and recommended signal-voltage levels will be listed there. It is a good idea to consult the data sheets before launching into a new project.

Here at least are some of the facts concerning ICs. The decision whether or not to try some IC design work will of course be up to the reader. It is hoped that some of the IC mysteries which may have existed in the reader's mind have been solved here. It is safe to proclaim, for sure, that ICs are here to stay. They will play an ever-increasing role of importance in amateur equipment design in the years to come. QST

NEW BOOKS

RCA Transistor Manual, Technical Series SC-13, published by Radio Corporation of America, Electronic Components and Devices, Harrison, New Jersey. 544 pages, 5¼ x 8 inches, paper cover. Price, $2.00.

A primary purpose of a book like the *RCA Transistor Manual* is to provide technical data on the manufacturer's products — a most useful function, and one of unquestionable value to anyone engrossed in circuit applications of those products. Such technical data interests the amateur, too, but probably of equal interest is the fact that the Manual is growing into a most useful exposition of fundamentals and practical applications of semiconductors. The purchaser of this new edition gets what amounts to a 160-page textbook which not only treats transistors, diodes and thyristors from a device standpoint but also runs in much down-to-earth how-to-use-it information that too often doesn't get into books. Chapters on the MOSFET and thyristors have been added in this new edition, in addition to expansion of the earlier subjects to bring them into line with current technology.

As icing on the cake, there is a 74-page section of circuits — circuits for broadcast and f.m. receivers, high-and low-power hi-fi amplifiers, power supplies, battery chargers, controllers for speed and heat, and (of special interest to the amateur) transmitters, miscellaneous small pieces of equipment, and an electronic keyer. A most welcome feature of this section is that each circuit is accompanied by a discussion of its operation.

The data section covers more than 400 active transistor types in detail and lists capsule data on some additional hundreds now discontinued (the mortality is high in the semiconductor field!) with, in many cases, recommended replacement types. There is also data on thyristors, silicon diodes, and tunnel diodes. A helpful chart for selecting particular types for particular purposes is included. — *W1DF*

Contact at Sea, by Peter B. Schroeder. Published by the Gregg Press, 171 E. Ridgewood Ave., Ridgewood, N. J. 154 pages, including bibliography and index, 5½ × 8½, 36 illustrations, hard cover. $9.95.

The first practical use of wireless was in the maritime service. Where better, then, for ardent radio historian (and amateur — W1PNY) Schroeder to turn his current attention than to the early days of drama on the high seas? A professor of history at the University of Connecticut, with a consuming interest in radio regulation, he pinpoints early problems and their solutions, as background to an appraisal of present-day marine communications. International radio conferences get substantial treatment. For the layman, the text makes engrossing reading; for the serious student, appendices and an extensive bibliography round out the volume.

The Army Loop in Ham Communication

Tests in Comparison with Other Antenna Types

BY LEWIS G. McCOY,* W1ICP

A recent article in *Electronics*[1] described a military antenna that has created considerable interest in amateur circles, both in on-the-air comments and in mail to Headquarters. The antenna, a vertical loop designed for use in the 2.5- to 5-Mc. range, is said to have very high efficiency for its small size. The antenna is in the form of an octagon with five-foot sides, and is approximately 12 feet in width. In normal operation the antenna is set up with the base four feet above the ground, making the top about 16 feet high.

The antenna was designed for quick portability for use in Vietnam. The aim was to design an antenna that could be quickly dismantled or assembled, would pack into a small space, and would be an efficient performer. It was stated in the article that the antenna performed as well, or better than, a full-size dipole 40 feet in the air. No wonder amateurs are interested!

The photographs show our version of the antenna, built up to see how well it would perform in tests against various 80-meter antennas. Figs. 1A and 1B show the schematic of the antenna and matching network.

In any antenna that is physically small for the frequency, the radiation resistance will also be smaller than a full-size antenna. As the antenna is reduced in size, the radiation resistance also gets smaller and smaller. According to the formulas for small loop antennas, the radiation resistance of this loop is on the order of 0.5 ohm or less. In order for such an antenna to work at reasonable efficiency, the ohmic losses must be kept as low as possible. This means large conductors, low resistance joints and connections, and any other precautions that can be employed to reduce ohmic resistance.

In our model, 1½-inch-diameter aluminum tubing, the same as in the military version, was used for the loop. For connections at the joints, the tubing was flattened, filed smooth, and the pieces then bolted together at each joint with three ¼-inch-diameter aluminum nuts and bolts, as in Fig. 3.

In order to reduce losses, the military antenna used the matching circuit shown at Fig. 1B. This is a completely capacitive network; a network with inductances would have added to the

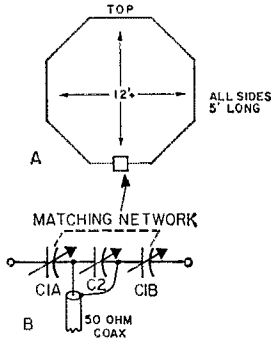


Fig. 1—A—Drawing of the octagonal loop; B—The matching network. In matching, a 50-ohm s.w.r. bridge is inserted in the coaxial line and the network adjusted to a 1-to-1 match.

C_{1A}, C_{1B}—Approximately 650 pf. per section, each section consisting of two 325 pf. variables in parallel.

C_2—Approximately 500 pf., two 250 pf. variables in parallel.

The interest aroused by a loop antenna described in Electronics *a few months ago sparked a trial by ARRL HQ of a home-built version. The proof of an antenna is in the communication it produces, so several commonly-used 80-meter antenna types were compared with the loop in direct A-B tests. Here is a report on the results.*

* Technical Department, *QST*.

[1] Patterson, "Down-to-Earth Army Antenna," *Electronics*, August 21, 1967.

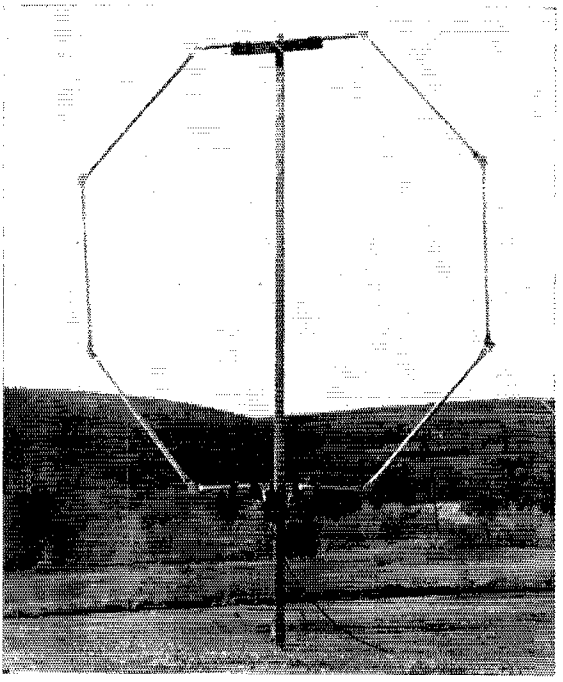


Fig. 2—The loop mounted on a guyed 2 x 3. The sides of the loop also were guyed as the antenna tended to be "floppy," in even light winds.

losses. Although a combination of fixed mica and air-spaced variable capacitors was used in the military version, it was discovered in our setup that the mica capacitors available to us heated up considerably at a power level of 150 watts. Air variables therefore were used throughout.

Testing the Loop

Our loop was set up exactly as described in the *Electronics* article, with the bottom four feet above ground. The antenna was matched to 50 ohms at 3980 kc. Three other antennas were used for comparison. The first was a full-size dipole, fed with 6-inch open-wire feeders, with the antenna about 60 feet in the air. The second antenna was an inverted V 100 feet long overall, center-fed with open-wire line. The top of the inverted V was deliberately installed at the same height as the top of the loop, 16 feet above ground, and the ends were brought down to four feet, the same as the bottom of the loop. One other antenna was used, a 30-foot high, base-loaded vertical, fed with 50-ohm coaxial line. All antennas were very carefully matched to 50 ohms at 3980 kc. A four-position coaxial switch was used so that switching could be accomplished instantly.

Several hundred tests were made, both listening and transmitting, over a four-week period. In no instance did the loop outperform the 60-foot high dipole. In listening tests the difference was of the order of three S units. This difference also showed up on transmitting — in fact, several stations accused us of turning on a linear when we switched to the dipole!

The difference between the loop and the inverted V was not so marked, but in most instances the V outperformed the loop by about one S unit. Usual transmitting reports were S6 on the loop, S7 on the V, and S9 or more on the big dipole.

The vertical produced some very interesting results. During the daytime the vertical was very poor compared to the other three antennas. In fact, in some instances, with S6 to S9 reports on the other three antennas, we weren't even heard on the vertical. However, after dark it was another story. Signal strength on the vertical came up to a par with the full-size dipole, actually surpassing it on some long-range (over 1000 miles) contacts.

Because the *Electronics* article had emphasized that the loop did a better job than a full-size dipole, we did considerable head scratching. Finally, we called Kenneth Patterson, designer of the loop, a call which brought forth some very interesting information. Mr. Patterson quickly pointed out that our problem was most likely in the ohmic losses in the joint connections. In the military version, special sleeve clamps are used over each joint to insure adequate "skin" contact. In addition, the joints are gold-plated! The gold plating reduces deterioration of the connection and provides excellent contact. This could very well be the difference between the performance of our unit and the military version.[2] Also, for the mica capacitors used in

(Continued on page 150)

[2] The joint resistance could be eliminated entirely if a single section of tubing, of the same overall length, could be bent in a circle, since in the amateur case it would be unnecessary to provide for rapid assembly and disassembly.

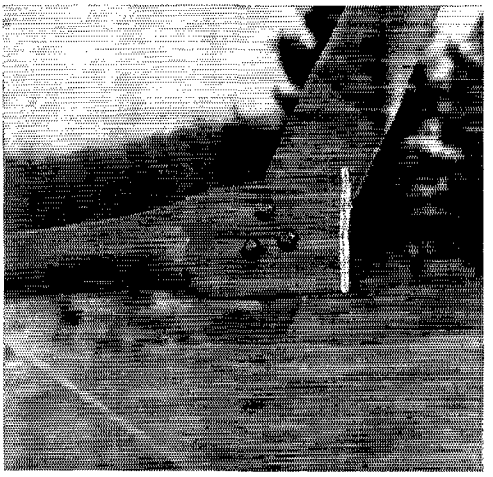


Fig. 3—This view shows the joint connections. In the military version, 45-degree elbows are used and the elbows and joints are gold plated.

Interpreting 50-Mc. M.U.F. Tendencies in the Current Sunspot Cycle

Required Reading For H.F. DXers, Too

BY ROBERT B. COOPER, JR.,* K6EDX/W5KHT

THE first solid *F*-layer 50-Mc. DX of the current sunspot cycle occurred over the four-day period December 31, 1967 to January 3, 1968. With this rise in the maximum usable frequency (m.u.f.) to or above 50 Mc., an entire new generation of 6-meter enthusiasts discovered the wonders of a form of radio propagation that has been largely missing from the v.h.f. scene for eight years or more.

Discussions on the air that followed these openings convinced this observer that most of the newer 50-Mc. operators have not taken the time to bone up on what makes F_2 tick, and there were indications that even some of the more experienced may be rusty on 50-Mc. propagation tricks. Since at best, 50-Mc. openings are short-lived, and spread far apart on the calendar, you don't have to miss very many to be left out in the cold completely.

On the further observation that all too often many 50-Mc. stations are not on the air when they should be (i.e., when the band *is* open), this report is presented in the hope that more will be on hand when the band shows promise during the current cycle.

There are really only two relevant questions the avid 6-meter operator wants answered:

1) When will the band be open?

2) In which direction will it be open?

The answer to the first is in three parts.

A) Certain types of openings tend to be recurring in nature. They repeat themselves in a regular fashion, with a predictable format, as long as certain influences on the *F* layer continue to exist.

B) The influences which cause the unusually high m.u.f. can be detected before they result in 50-Mc. band openings. If you are not fortunate to detect their presence in advance of the first opening, you can certainly detect their continued presence after, and accurately surmise whether the band will continue to be open for a day or two more. (In this manner, you can safely ascertain whether or not an unusual opening, occurring on a Tuesday, for example, will repeat itself on Wednesday. This should trigger a reflex instinct telling you to do what you can to be absent from work on Wednesday!)

C) Certain conditions that trigger 50-Mc. openings via the *F* layer are likely to repeat themselves 27 to 28 days after their initial appearance. So the mere fact that you missed a rare opening to the Caribbean and Hawaii on January 1 should not cause you to lose hope. There is a better-than-even chance the condition will repeat itself January 28–29, and at the end of February. More about this shortly.

The answer to the direction question is not so simple. But if it's a fact that you have reason to believe that an opening is likely, and have made arrangements to be near the rig, your being on tap at the right time is usually the most important factor of all.

Certain influences that are known to induce reactions in the *F* layer, resulting in an unusually high m.u.f., are more likely to cause openings over certain radio paths (i.e., North America to South America) than over other radio paths.

And, because the *F* region of the ionosphere exhibits different characteristics in the northern hemisphere during the fall than the spring, or in the winter than the summer, we can reasonably expect openings of a different nature in the fall than in the spring, etc. The influences we have mentioned may occur at any time of the year. But the reactions such influences cause will differ for North American observers as the time of year varies.

ESSA Charts, Sunspot Counts, and All That Jazz

For more years than I can recall, the Central Radio Propagation Laboratory (now the Environmental Science Services Administration) has published a fine set of monthly charts in booklet form, predicting the m.u.f. for virtually every part of the world, as a function of time of day, for three months in advance. These consist of a set of maps showing continental outlines and major island groups, overprinted with sets of squiggly lines. The lines are numbered and purport to show the highest frequency that the *F* layer will reflect back to earth for that point above the globe, for that time of day. As nice as these charts are, they have no real practical value to the 50-Mc. enthusiast who is endeavor-

*3918 East Pico, Fresno, California 93726.

ing to determine if the band will open a week from next Tuesday. Primarily, they are prepared for the commercial h.f. radio circuit user, who must have virtually 100-percent reliable communications between two distinct points on the globe. The charts make no allowance for the unusual influences which cause the 50-Mc. band to open briefly, and that is all that we are concerned with here.[1]

Everyone on 6 kicks the phrase "sunspot count" around quite glibly. But what does it mean? And how high must the count be before the 50-Mc. band opens? Let me put it this way. The count is made daily, and averaged (for the month) at the end of each calendar month. The daily count itself has no direct bearing on 6-meter conditions. If someone advises you that an observatory counted 200 sunspots this morning, don't break a toe running for the 6-meter rig. It probably doesn't mean a thing. Next week the count may drop to 35 for a day or two. The count is important only when it is in proper perspective, and that is when it is taken as a long-term 13-month average. Here is how it works.

At the end of each month the daily observed (i.e., visually counted) sunspots are averaged together. The sunspot *cycle* is based upon the smoothed sunspot numbers. A smoothed number is an average of the observed monthly numbers over a 13-month period. Since the smoothed average is always centered on the middle month of the 13-month period, the true count (the smoothed average) is always behind the current month by at least 6 to 7 months.

Solar observers also release a smoothed sunspot number forecast. The forecast is centered on the current month; taking the six months' actual count just past, and *predicting* what the count will be for the six months to come. This forecast number is the one we hear kicked around most often; it is a combination of the past, present and future. And even the best of us have trouble with the future. So the sunspot count is probably not a very good method of telling us what to expect. At least not tomorrow, or the next day. Or next week. Is it useless?

No, not at all. Keep in mind that ionization of the *F* layers is a cumulative thing. It builds up day by day, sort of like a trickle charge on a battery. As long as the average number of sunspots observed continues to climb, the trickle charge builds the ionization higher and higher, until something comes along to short-circuit the charge, such as a solar flare and following magnetic disturbance. Then the ionization process is degraded for as long as the disturbance lasts. When the disturbance dissipates, the ionization process begins anew, usually starting near the point where it left off before the disturbance occurred.

As a matter of purely academic interest, 6-meter operators during the 1956-60 peak of the last solar cycle observed that the *smoothed sunspot* count had to be 120 or above for the 50-Mc. band to propagate on a regular basis (i.e., at times other than when there was a disturbance imminent or in progress) 6-meter signals between such regular points as the East Coast and Europe, East and West coasts of North America, or West Coast and Hawaii-Japan.

Since there is serious question as to whether the smoothed sunspot count will ever get that high during the current cycle, we must rely on the so-called disturbed conditions to influence the 50-Mc. band. And that brings us to our true topic.

Observe–Analyze–Operate

When the sunspot count is above 120, it doesn't take an analyst to "predict" that the band will open. Simply being around every so often is sufficient; the band will probably be open, at least for a limited time, almost daily.

This is not true during the pre-120 count period, however. At the present time, 50 Mc. opens only when some form of catalyst disrupts the normal course of events in the *F* region. This may occur once a month, or perhaps just a half dozen times during the remainder of the entire cycle. We have no accurate way of knowing. But we do know that if (A) happens, (B) is sure to follow. (A) in this case is a solar flare, or magnetic disturbance. And (B) is an open band on 50 Mc.

Check WWV-WWVH

In addition to broadcasting highly-accurate time signals, ESSA stations WWV and WWVH transmit regular reports of observed solar activity. Through an interconnected network of h.f. radio circuits, solar observatories all over the globe share their information. WWV also reports to its listeners the current observed radio propagation conditions: more about this shortly. Of the two services, the solar *observations* are the more important because they give you the first warning that something unusual is going to happen to our ionosphere. Such warnings run from 12 to 24 hours ahead of the actual occurrence-adequate warning in most instances.

This service is given over WWV at 19 minutes past each hour, and WWVH at 49 minutes past each hour, on A2 code, at about 7 words per minute. Table 1 lists the symbols that may be included, in groups, in a report at 19 and 49 minutes after the hour, and further explains the sequence transmitted for your interpolation.

Let's assume that you tune in WWV at 19 minutes after the hour, or WWVH at 49 minutes past, and hear this message sequence, always transmitted ahead of the regular time and voice identification, which are given just before 20 minutes after or 50 minutes after:

GEO DDD EEE EEE UT 2AD ØSØ

What does it mean? First of all (see Table I) GEO announces that what follows is a geo alert.

[1] Rule-of-thumb for use with ESSA Predictions: If the m.u.f. indicated for a given month is 44 Mc. or higher, the peak days of that month are worth watching for 50 Mc. DX. — *Editor*

TABLE I

WWV-WWVH Geo-Alert Symbols and Meanings

There are three sets of meaningful symbols. First symbol after the identification, GEO. This letter is repeated three times.

E — No alert — nothing unusual expected.
I — Flare expected — general type.
S — Proton flare expected — more severe type.
T — Magnetic storm expected, usually following an observed flare.
U — Flares *and* magnetic storm expected. Usually one flare has already occurred, which will cause a disturbance, and another flare is expected.
V — Proton flare and magnetic storm expected — same as U.
H — Strat warming.
D — Strat warming and flares expected.
B — Strat warming and proton flare expected.
M — Strat warning and magnetic storm expected.

Second symbol transmitted, repeated three times. (Report on an actual observed flare event.)

M — Event began between 00 and 06 UT the day before issue of alert (all days UT).
T — Event began between 06 and 12 UT.
H — Event began between 12 and 18 UT.
S — Event began between 18 and 24 UT.
I — Event began between 00 and 04 on day of alert.
E — No alert (no observed event).

Third symbol transmitted, repeated three times. (Report of an observed disturbance, such as follows an event as reported first symbol.)

U — Event began day before alert, 00–06 UT.
A — Event began 06–12 UT.
B — Event began 12–18 UT.
D — Event began 18–24 UT.
N — Event began 00–04 day of alert.
E — No alert (no observed event).

A typical report is GEO DDD EEE EEE UT 2 AD 080. Of this, only GEO D (DD) E (EE) E (EE) has any bearing on solar activity and disturbance reports. See text.

Since each letter symbol is transmitted three times, what we really have is:

GEO D E E UT 2AD ØSØ

The "D" is the first symbol. Using Table I, we see that it indicates there is stratospheric warming (start warming), and that flares are expected. The "E" is the second symbol, here indicating that no actual observed flare has been reported. The second "E" is the third symbol, also indicating no observation; in this case, no observed distrubance. The "UT 2AD ØSØ" has no bearing on propagation or solar conditions. This refers to UT time correction, so can be forgotten in our situation.

In this particular report, we have knowledge that a flare is probable. Apparently solar observers are witnessing a sunspot or complex of spots which are similar to others in the past which have produced flares. And since any type of flare will probably cause the *F* layer to do erratic and unusual things within a period of from 24 to 48 hours from the time it occurs, you should be on your toes.

Once you have your first warning that a flare *has* occurred, then what? At this point you should begin checking WWV as often as possible for the regular propagation reports given every five minutes, and continue to check on the 19- or 49-minute-after geo alerts.

Soon after the flare actually occurs the symbols transmitted will change, to

GEO T I E

for example. This indicates that a magnetic disturbance is expected (T); the flare that can be expected to cause the magnetic disturbance occurred between 00 and 04 UT of the day that you are hearing the report (I); but that magnetic activity is normal at that point (E).

As soon as energy from the flare reaches earth (from 12 to 24 hours after the flare), radio conditions will become disturbed. The *F* layer will begin to gyrate wildly, oscillating or pulsating up and down. This will cause the familiar flutter fading on signals propagated via the *F* layer, especially the North Atlantic path signals which pass fairly close to the magnetic north pole.

WWV responds by alerting its listeners with reports every five minutes of the observed radio conditions on the North Atlantic path. These are transmitted on A2 code just ahead of the voice announcements at each five-minute mark period.

As Table II indicates, the warning usually consists of one of two letters, followed by a number. *N* stands for normal (i.e., no disturbance); *U* for unsettled (i.e., disturbance present). The following number indicates the relative quality of the North Atlantic path, 1 being terrible and 9 being excellent. When this report switches from *N* to *U*, most of us hope the number following the *U* will sink as low as 3. A *U3* indicates a pretty severe disturbance. The more severe the disturbance, the wilder the oscillations in the *F* layer, and the better the chances for a high m.u.f. as the disturbance subsides.

Usually WWV must still be sending *U4*, *5* or *6* for the 6-meter band to open under disturbed conditions. If the disturbance is short-lived and conditions rapidly return to normal (i.e., *N5*, *N6*, *N7*) 50 Mc. probably will not be widely affected.

So with WWV sending *U* something, what next? The first impact of the solar flare energy may be an auroral display and disturbance,

upsetting as this energy is to our magnetic balance around the magnetic north pole. More northerly stations should experience a 50- or 144-Mc. auroral opening. If the disturbance is especially severe, the auroral conditions will be noticed at more southerly latitudes. Of course, this is also a tip-off as to the severity of the F_2 unbalance for the following day.

So much for the disturbance itself. Now what directions will the band open? It was a common rule of thumb during the 1946–49 and 1956–60 cycle peaks that a disturbance would result in South American openings for U. S. 50-Mc. stations, following the break-up of the disturbance. Since our 50-Mc. experience extended back only to 1946, we naturally expected more of the same in the current cycle. While we are just barely into the present cycle, as far as 50-Mc. openings go, it may be that this rule is due for some modification.

For example, a minor disturbance reported November 18–19 resulted in driving the transcontinental m.u.f. from around 40 Mc. peak daily average to between 43 and 45 Mc. This condition lasted until November 30. A repeat disturbance of a minor nature December 20 again drove the m.u.f. up on east-west paths, again from an average of 40 to a peak of 45 Mc. following the disturbance.

The major disturbance between December 30 and January 3 drove the m.u.f. up again from an average of around 40 Mc. to above 50. Typical paths worked were: December 31 — W5 to KP4; W1, 2, 3, 4, 8 to VP2, PJ2. January 1 — W6, 7 to W1, 2, 3, 4; W6-7 to KH6. January 2 — W4, 5, 6, 7 to KH6. January 3 — W3, 4, VP7 to W6; TI to W6; TI to KH6; W5, 6, 7 to KH6.

These are basically east-west paths with the exception of the very first day after the storm when the southern Caribbean area was worked from W1-4, 8. At the same time, however, KP4 was being worked by western W5, which is an east-west path. So, clearly, there is no pat answer to the direction question. If you have reason to expect disturbed conditions, listen often, call CQ often, and use Table III for generalized beam headings, if you are new to the game.

TABLE II

WWV Radio Condition Report

N — Normal, settled conditions.
U — Unstable, unsettled conditions (disturbance present).
1 — Very poor, unusable conditions.
5 — Average conditions.
9 — Extraordinary conditions.
Numbers between 1 and 5 are from below average to average; numbers from 6 to 9 are above average.

TABLE III

Generalized Beam Headings — U. S. and Canadian 50-Mc. Stations. All Times Local.

Oct. 15-Feb. 15 (No allowance for *E*-layer propagation)
0700–0900: Northeast-east-southeast.
0900–1000: East-southeast.
1000–1100: Southeast-south.
1100–1300: Southeast-south-southwest-west.
1300–1500: Southwest-northwest.
1500–1700: Southwest-northwest.
Feb. 15-May 15 (No allowance for *E*-layer propagation)
0700–1100: Southeast-south-southwest.
1100–1300: Southeast-south-southwest.
1300–1500: Southwest.
1500–1900: South-southeast (*TE* plus F_2).

27-28-Day Repeat

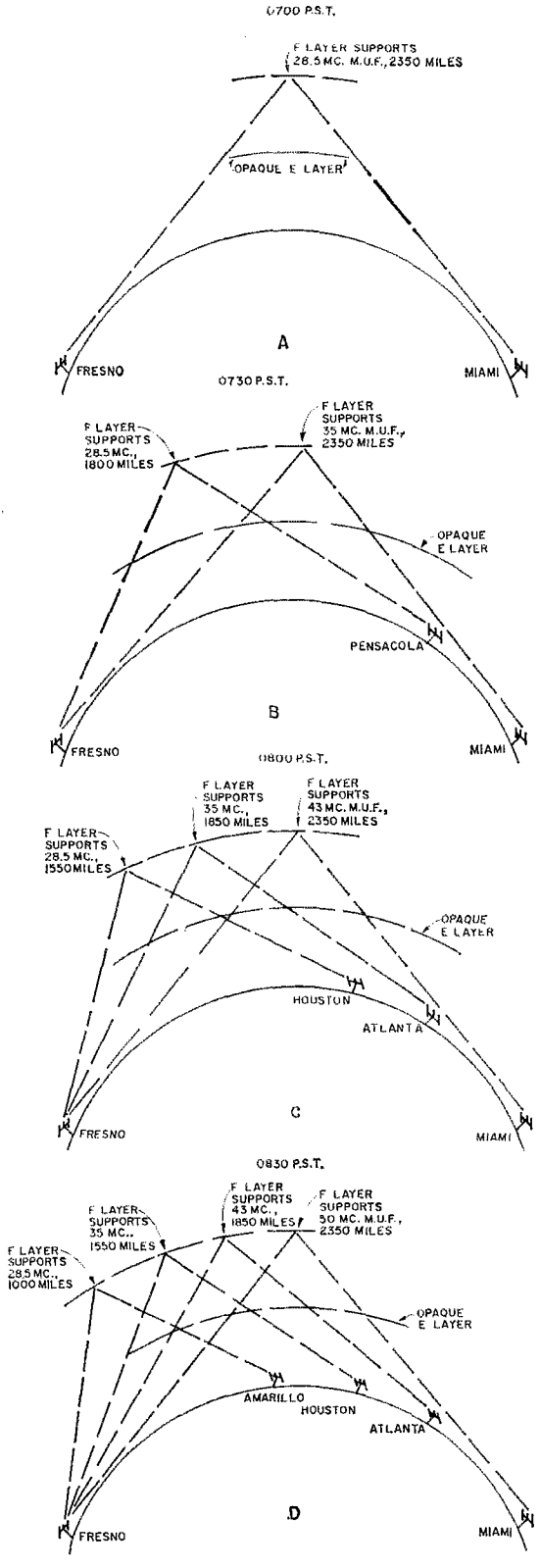
The sun rotates to its axis once every 27 days, approximately. A particular sunspot or complex of spots which faced the earth on, say, January 1, will again face the earth on January 28–29, provided the spots still exist. Thus it is always wise to mark your calendar around 27–28 days after an observed event, to remind you to check for a recurrence.

Use the 10-Meter Band

Many old-timers on 6 listen or operate a great deal on 10, also. The two bands are not dissimilar; 10 meters is simply open more often! You can often spot a 6-meter opening in the making by observing what is coming through on 10 meters. As ionization becomes more intense, 28-Mc. skip shortens and the m.u.f. moves upward in frequency. Reference is made to drawings on the facing page. For simplicity, this uses two points separated by approximately 2300 miles on the globe: Fresno and Miami.

At 0700, I can hear 10-meter signals coming through from Miami. This tells me the m.u.f. from Fresno to Miami is 28.5 Mc. or more at this time, on this 2300-mile ratio path (A). At 0730 PST I am hearing 10-meter signals from Pensacola, Fla., 1800 miles, and on my SP-600 I can detect signals at 35 Mc. from the Miami area (B). At 0800 PST 10-meter signals from Houston are coming through, 1550 miles. On 35 Mc., Atlanta, 1850 miles, is coming through, and I am hearing Miami-area stations as high as 43 Mc. (C). At 0830 PST, 10-meter signals are heard from Amarillo, 1000 miles, 35-Mc. signals are in from Houston, 43-Mc. signals are from Atlanta — and low and behold, 50 Mc. is open to southern Florida!

Now what transpired in that 90 minutes? The m.u.f. between Fresno and Miami rose from 28.5 Mc. to over 50 Mc. Had I been listening for



the entire period on 10 meters, I would have followed the skip in, closer to me, from Miami to Amarillo. Listening only on 35 Mc., I would have detected Miami-area signals at 0730, the skip shortening up to Houston by 0830. And had I been monitoring only 43 Mc., the Miami signals would have appeared at 0800, and by 0830 skip would have shortened up to Atlanta. This is very useful information.

In the case of transcontinental *F*-layer work on 50 Mc., we know from experience that the openings are centered around 0900–0915 PST, or 1200–1215 EST. If the opening has not occurred by 0915, the band probably will not open that day. The m.u.f. may stop at 43–45 Mc., and stay there for an hour or two. In short, there is an optimum time for 50-Mc. openings over any given path. If the optimum time comes and goes without an opening, you can usually go about your business for the day.

There are two excellent spot frequencies which every died-in-the-wool 6-meter man should be able to monitor in his shack: 35.58 and 43.58 Mc., where radio paging services operate 24 hours a day with moderately high power. Nearly all of these pagers run a series of voice announcements (". . . 201 call your office, 445 call Dr. Jones, 632 contact Tom Smith . . .") followed by voice announcement of their call letters *and* location. Message sequences are short, and voice identifications regular and as close together as every 30 seconds, making for quick and easy identification. Of the two, 43.58 is obviously the better, but both are useful.

If you live in an area where you have local occupancy on these channels you might try 35.22 or 43.22, also paging channels. You certainly don't need a special receiver to listen in on these frequencies. There are many low-cost printed-circuit 6-meter converters, and simple 6-meter converter circuits, which will operate fine in this range, feeding into your receiver as an i.f., by simply plugging in an appropriate crystal and grid dipping the r.f. coils and i.f. output coil to the proper frequencies. By monitoring 43.58 in particular, you can almost always be 30 minutes or more ahead of a band opening on 6 meters or, negatively, tell yourself the band simply is not going to make it that day.

Some Generalities

If the present sunspot cycle reaches an honest smoothed count of 120 or more, we can probably expect reasonably regular transcontinental, KH6, JA, European and African openings on 6, without the aid of a disturbance, during the period November 1 to February 15.

Single-hop F_2 (2000–2500 miles) will normally peak on any given east-west path when the local time at the midpoint is between 10 and 11 a.m. Remember that some areas are close to either eastern or western edges of time zones, and allow accordingly.

(Continued on page 150)

[2]A secondary peak sometimes develops about 2 hours later, or about 11:15 local time.—EDITOR

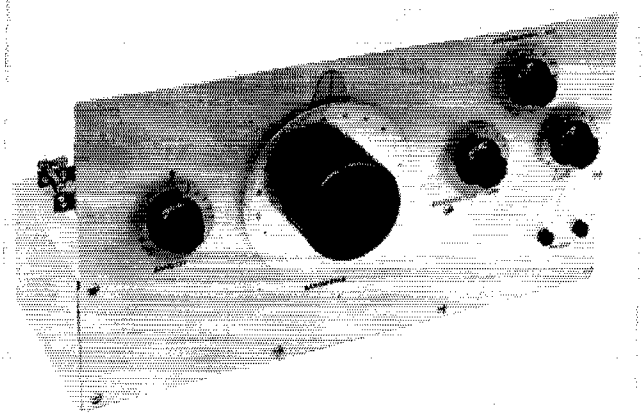


Fig. 1—Three-transistor regenerative receiver covering 1.65 to 30 Mc. Six self-contained 1.5-volt flashlight cells power it, with a current drain of less than 3 ma. The bandspread tuning dial is a Jackson Brothers type 4489.

A Three-Transistor Receiver

The FET as a Regenerative Detector

BY WALTER F. LANGE,* W1YDS

EVEN in this age of crowded bands and sophisticated communications systems, there is room for the lowly regenerative receiver. The unit shown in Figs. 1 through 6 is a simple receiver that should be easy for most anyone to build, regardless of his experience. Plug-in coils are employed, eliminating the complexities of wiring a band switch. No test equipment is required, as nothing needs to be aligned; once the unit is constructed, it should work without any difficulty.

Self-contained flashlight cells are used, making the receiver immune to power blackouts. Since the supply voltage is only 9 volts, there is no shock hazard for the beginner to worry about. Being battery operated and entirely transistorized, the receiver has no power transformers or filaments to heat up and cause drift.

The receiver is more useful than a superhet for checking intruders that are supposedly in the ham bands, as the three-transistor unit has no converter stages to generate spurious signals that may give a false indication of the frequency of an incoming signal. Coverage of 160 meters is provided, a feature left out of many higher-priced commercial receivers. Sensitivity of the receiver is such that a.m., c.w. and s.s.b. signals of 0.1 μv. or greater are audible in the headset. All-in-all, the receiver does a surprisingly good job for the small amount of circuitry involved. It doesn't have the selectivity or signal handling capability of a good superhet, but after all, you usually get what you pay for.

Referring to Fig. 2, the components between points A and B form a filter to attenuate broadcast-band signals. This filter greatly reduces the chances of front end overload by nearby broadcast stations. In locations where there are no powerful broadcast signals, the filter may be left out. Points A and B should then be connected together.

A field-effect transistor (FET), which has high input impedance, is used as the regenerative detector, Q_1. With suitable circuit modifications a conventional n-p-n transistor will work, but its low input impedance will load down the tuned circuit, resulting in some loss of selectivity, and the detector will tend to overload easier. The FET detector uses the Colpitts circuit, doing away with the need for winding a tickler coil or tapping the main inductor. The detector is tuned by bandspread capacitor C_5 and band-set capacitor C_6. One amateur band occurs in the frequency range of each plug-in coil. In each case capacitor C_4, in series with the bandspread capacitor, has been chosen so that the amateur band in question occupies the entire tuning range of the bandspread capacitor.

Regeneration is controlled by varying the source bias of Q_1. Although only one regeneration control is normally found in regenerative receivers, two controls are provided here to make

Although the superhet is by far the most popular receiver in use today, the regenerative receiver still has a place in the ham shack. Its simplicity makes it an ideal beginner's project as well as an easy-to-make standby unit for the advanced amateur.

*Assistant Technical Editor, *QST*.

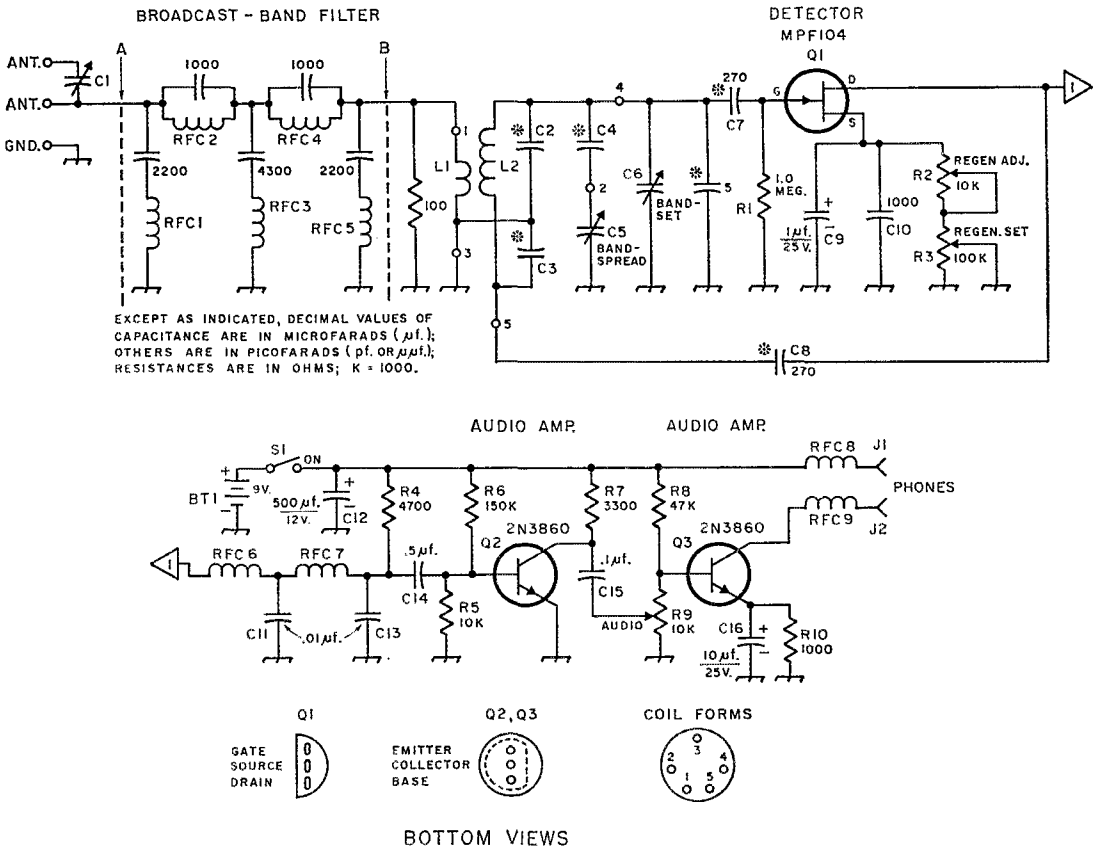


Fig. 2—Circuit diagram of three-transistor regenerative receiver. Fixed resistors are ½-watt composition. Capacitors marked with polarity are electrolytic; those marked with an asterisk are dipped silver mica; other fixed capacitors are disk ceramic. Components not listed below are numbered for reference.

BT_1—Six 1.5-volt flashlight cells (size D) in series.
C_1—9-180-pf. mica compression trimmer.
C_2, C_3, C_4—See Table I.
C_5—50-pf. variable (Millen 19050).
C_6—140-pf. variable (Millen 19140).
J_1, J_2—Insulated tip jacks.
L_1, L_2—See Table I.
Q_1—Field-effect transistor (Motorola MPF104).
Q_2, Q_3—N-p-n transistor (General Electric 2N3860, 2N2925, 2N3391A, 2N3403, or 2N3405).
R_2—10,000-ohm control, linear taper.
R_3—100,000-ohm control, linear taper.
R_9—10,000-ohm control, audio taper, with S_1 attached.
RFC_1, RFC_5—10 µh. (Millen 34300-10[1]).
RFC_2, RFC_4—33 µh. (Millen J300-33).
RFC_3—5 µh. (Millen 34300-5).
RFC_6, RFC_7—2.5 mh. (Millen 34300-2500).
RFC_8, RFC_9—68 µh. (Millen 34300-68).
S_1—S.p.s.t.

[1] James Millen Co. will sell direct if you cannot get the components from a distributor. Write to James Millen Co., Malden, Mass., Attn: Wade Cayewood.

adjustment easier. R_3 is for coarse adjustment and R_2, one-tenth the value of R_3, is for fine control. An electrolytic capacitor, C_9, bypasses both controls for audio; without it, the detector would be rather insensitive. RFC_6, C_{11}, RFC_7 and C_{13}, form an r.f. filter in the drain circuit of Q_1 to keep r.f. from reaching the base of the first audio amplifier, Q_2. A 4700-ohm resistor, R_4, is used as the detector load, rather than an expensive inductor or transformer. Volume control R_9 varies the amount of signal reaching the base of audio output stage Q_3. Q_3 should have a high-impedance headset (2000 ohms or more) as its collector load. The headset leads are kept from acting as antennas (creating hand-capacity effects on the higher bands) by being isolated from the power supply and Q_3 with r.f. chokes.

Construction

The receiver layout is uncritical and you can vary it considerably to suit your own requirements. However, don't alter the detector circuit too much, if you expect it to have the same band coverage as listed in Table I. If you are a new-

Table I

Coil and Capacitor Data

Capacitors are dipped silver mica (values are in picofarads) mounted in the coil form close to the base of the form. Coils are close-wound with enameled or Nylclad copper wire on 1-inch diameter 5-pin coil forms (Millen 45005). For winding details see Fig. 3.

Coil	*Range Mc.*	C_2	C_3	C_4	L_1 *turns*	L_2 *turns*	*Wire Size*	*Dimensions, inches* *A*	*B*	*C*
I	1.63–2.55	68	1800	short	4½	44¼	No. 26	⅜	½	1 5/16
II	2.45–5.6	—	1300	68	3½	35¼	No. 24	5/16	9/16	1⅜
III	4.90–10	—	680	22	2½	18¼	No. 20	11/32	19/32	1¼
IV	9.70–18	—	220	12	2½	9¼	No. 20	11/32	19/32	15/16
V	16–25.7	—	100	12	2½	6¼	No. 20	11/32	19/32	13/16
VI	20–30	—	68	18	2½	5¼	No. 20	11/32	19/32	23/32

comer to amateur radio, construct the receiver as shown in the photographs and become familiar with its operation. Once you have gained some experience, you will be in a better position to make changes, if you want to.

The receiver is built on a 13 × 5 × 3-inch aluminum chassis with a 13 × 7-inch aluminum plate serving as the front panel. If you don't have the tools to cut a piece of sheet aluminum to the specified size, a commercial bottom plate will serve nicely.

Referring to Fig. 4, center C_6's tuning shaft 2 inches from the right edge of the panel, and center C_5's tuning shaft 5½ inches from the same edge. Bolt the capacitors to both the panel and the chassis, being careful not to damage the plates at the front of the capacitors with mounting screws that may be too long. Attach two 1-inch ceramic pillars (Millen 31001) to a 5-contact tube socket (Amphenol 78RS5) and position this assembly half way between C_5 and C_6 so that pin 3 of the socket is closest to the front panel. Before bolting the pillars to the chassis, put a soldering lug (to be connected to pin 3) under the ceramic insulator nearest the front panel, and slide a flat washer under the other insulator. Space terminal strips TB_1 through TB_4 2½ inches apart, with the first mounting

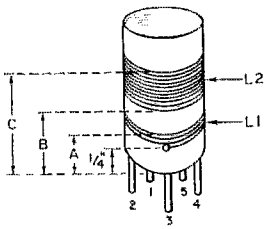


Fig. 3—Sketch of typical plug-in coil used in the regenerative receiver. L_1 and L_2 are wound in the same direction. The hole for each wire is drilled directly above the pin to which the wire is to be soldered. The bottom of L_1 goes to pin 3, the top of L_1 goes to pin 1, the bottom of L_2 goes to pin 5, and the top of L_2 goes to pin 4. For specific information on each coil see Table I.

hole 1 inch from the left edge of the chassis and ½ inch from the rear. Fasten these terminal strips and the battery holders to the chassis with the same screws.

Install C_5's dial mechanism on the front panel using two ¾-inch 6-32 threaded spacers. Attach C_6's dial so that it indicates 0 at maximum capacitance and 10 at minimum capacitance. All the dials except the one for C_5 are from Millen's 10005 series.

By close inspection of the photographs and the schematic diagram, it should be easy to wire the chassis. The circuit runs from left to right in the schematic and from approximately right to left in the rear view of the chassis. Using Fig. 6 as a guide, connect transistor sockets to the appropriate terminal strips. Solder the center lead of each socket directly to the terminal lug shown and use short lengths of wire between the remaining leads and lugs. Use a heat sink, such as an alligator clip, when soldering the last end of each wire to be secured, otherwise the lead may come undone from the first connection. Make all the remaining connections as short and direct as shown in the photographs.

Referring to Fig. 3 and Table I, begin constructing the coils by drilling four holes in each 5-prong form with a No. 50 drill. Each hole should be drilled above the prong to which the end of the coil will be terminated. Wind L_1 first and then L_2. Scrape the ends of the coils with a knife or razor blade, so that good electrical contact can be made to the prongs. It will be easier to get tight windings if the wire spools are held in a vise while the coils are being wound. Wind the coils at a distance from the vise, keeping the wire taut. After L_1 and L_2 have been put on the form, install C_2 (if applicable), C_4 or a short, and C_3 in that order. Push the capacitors down to the base of the coil form, keeping the connecting leads as short as possible. Carefully solder the coil prongs. Wipe away any rosin from the prongs with a cloth dipped in alcohol. To protect the coils, it may be desirable to spray them with clear lacquer or coat them with coil dope.

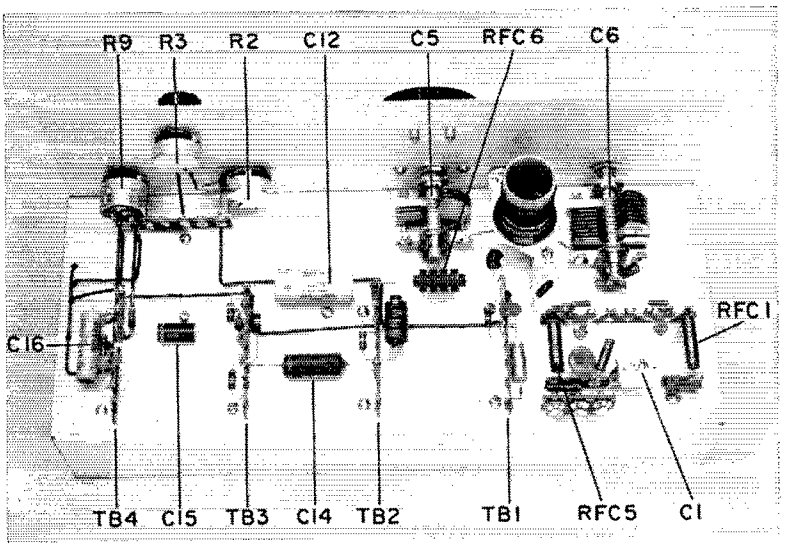


Fig. 4—Top view of the regenerative receiver. The two eight-lug terminal strips at the lower right support the components of a broadcast-band filter. Antenna and ground input terminals are located beside the filter at the edge of the chassis; the connector is a cut down screw-type terminal strip soldered to a standard lug-type tie-point. Of the four parallel terminal strips next to the filter, TB_1 and TB_2 support the regenerative detector, Q_1, TB_3 supports the first audio stage, Q_2, and TB_4 supports the output stage, Q_3.

Before turning the set on, check the wiring carefully with the schematic diagram and the photographs. Be especially careful that the batteries and transistors are installed correctly; note that the negative side of the supply is connected to the chassis.

Use

The audio output stage works best with high-impedance headphones (connected to J_1 and J_2) although lower-impedance phones will work, at reduced output. To check out the receiver, connect an antenna to either antenna terminal and run a ground lead to the set. Plug coil II in the receiver and set the 0 to 10 band-set capacitor dial at 7.5. With C_6 at this setting, the bandspread capacitor should tune from approximately 3.5 to 4 Mc. Turn the audio gain control full on. With the fine regeneration control, R_2, at about midrange, advance the coarse regeneration control, R_3, until the receiver starts to oscillate. The point at which the detector begins to oscillate is easy to recognize, as a thumping sound is heard and the background noise increases. Then by tuning the bandspread capacitor it should be possible to hear signals.

It will be necessary to vary the regeneration controls for optimum reception of different signal types (a.m., c.w. and s.s.b.), strengths and frequencies. For a.m. reception, advance the regeneration controls to the point just before where the detector oscillates. This is the most sensitive operating point for a.m. signals, and the selectivity of the circuit is better than at lower settings of the regeneration controls. Very strong signals, which may cause "blocking," may be reduced by backing off either R_2 or R_3 or both or by reducing the antenna coupling by connecting the antenna to the receiver through C_1 and opening up the plates of the capacitor as much as required.

The most sensitive setting of the detector for code reception is with the regeneration controls advanced just beyond the point of oscillation. However, very strong signals may overload the detector and become impossible to tune in at low beat notes. This can be overcome by further advancing the regeneration controls or by reducing the antenna coupling as described above. Note that if the regeneration is pushed too far, a point may be reached where an audio squeal will be heard. For satisfactory operation of the receiver, be sure the regeneration controls are set below this point.

S.s.b. is tuned in with the regeneration controls set at the same point as for c.w. The bandspread capacitor should be tuned very slowly through

Fig. 5—Interior view of the chassis. Three double battery holders (Keystone type 176) support the receiver power supply. The two r.f. chokes at the upper right are RFC_8 and RFC_9.

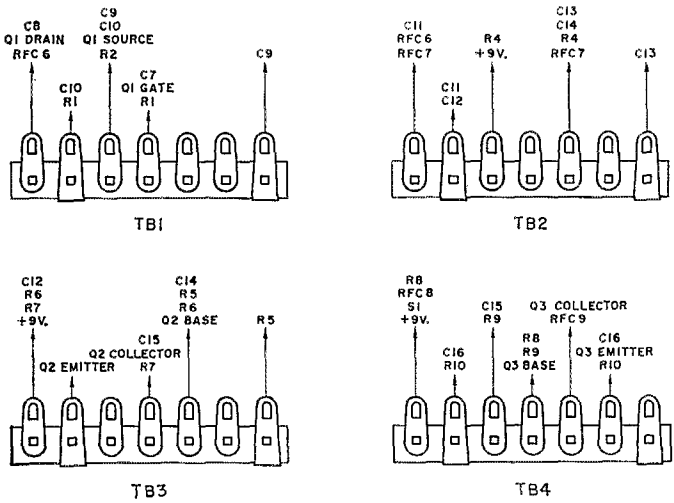


Fig. 6—Connections to the four terminal strips, TB_1 through TB_4. The left edge of each terminal strip is closest to the front panel.

the signal until the voice becomes intelligible. Overloading is conquered in the same manner as for code reception.

Best use of the two regeneration controls will be obtained by following this procedure: Set the band-set capacitor, C_6, for the desired band coverage. Turn C_5 and R_2 to midrange. Set R_3 at the point where the detector just starts to oscillate. Tune C_5 and adjust R_2 as required. In some cases the fine regeneration control may run out of range; it will then be necessary to readjust R_3 to bring it back in the ballpark.

Two undesirable effects may be noticed with this receiver, especially at the higher frequencies. If an inadequate ground system is used, the receiver will exhibit hand-capacitance effects. Also, as with any regenerative set, an antenna blowing in the wind can cause the frequency to change. If the latter difficulty becomes serious, an indoor antenna might be called for. Lighter antenna coupling and coaxial feed will also reduce the effects of antenna movement on the detector.

The bandspread system used in this receiver was set up with the amateur bands in mind. Other bands are spread out to a lesser or greater degree. Table II shows the approximate settings of the band-set capacitor, C_6, for spreading each high-frequency ham band over the tuning range of the bandspread tuning capacitor, C_5. How accurate each setting is, of course, depends on how closely the coils are duplicated.

Possible Modifications

In order to keep costs down, no cabinet was used to house the receiver. The set should perform well in most locations without one. However, in some spots, a.c. pickup may be a problem. By using a metal cabinet, there won't be any need to worry about hum, and the set will look more attractive. A cabinet having a hinged cover is the most desirable, as it will facilitate coil changing.

If additional coverage is desired, more coils can be constructed. In order to cover the broadcast band, three plug-in coils will likely be required because of the small size of C_6. In addition, it will be necessary to disconnect the b.c. filter to prevent severe attenuation of the broadcast signals. It may be possible to tune the 6-meter band if an appropriate coil is constructed; however, performance will probably not be too satisfactory at v.h.f.

In order to achieve optimum Q with easy-to-make closewound coils, three sizes of wire had to be used. However, if you don't mind the slightly more difficult job of space winding the coils, you can save yourself the cost of two spools of wire. Using the same dimensions and turns count given in Table I, wind coils II through VI with No. 26 wire, being careful to equally space the turns.

Table II

Coil	*Band*	*C_6 Setting*
I	160	4.5
II	80	7.5
III	40	7.5
IV	20	8.0
V	15	8.0
VI	10	9.5

If you are a Novice and want more bandspread for the Novice frequencies, use a smaller value of capacitance at C_4 than that listed in Table I. Try a 10-pf. capacitor in coil II and 8-pf. capacitors (3- and 5-pf. units in parallel) in coils III and V. If this change is made, the setting of the band-set capacitor for the amateur band in question will be different than that listed in Table II.

Since the current drain of the receiver is less than 3 ma., just about any size of 9-volt battery can be used to power the set. However, the author prefers a bank of ordinary flashlight cells, as they are available at more stores than any other type, and will last a long, long time in this receiver. QST

—·—·—

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.

Novice or General—TVI Can Be Tough!

BY LEWIS G. McCOY,* W1ICP

With the upswing in the sunspot cycle the 15- and 10-meter bands are seeing more and more activity. Many General Class hams — and, of course, Novices — haven't been around long enough to "discover" these bands under their wide-open conditions. When we approach the height of a sunspot cycle these bands open up for worldwide communication, and therefore attract many amateurs who otherwise would work only the lower frequencies.

All this is great, and there's lots of fun to be had. Unfortunately, there can be some bitter along with the sweet — TVI. The harmonics from a transmitter usually get weaker as the harmonic number increases: for example, the 2nd harmonic would be strongest, the 3rd slightly weaker, the 4th weaker still, and so on. In 160-, 80-, or 40-meter operation it is actually difficult to find a harmonic strong enough to cause television interference because the harmonics are high-numbered. On the other hand, the low-numbered harmonics from 20, 15 or 10 meters can easily be strong enough to cause quite severe interference. What this means is that when you operate on these higher bands in an area that has TV Channels 2, 3, 4 or 6, you must make sure that there is no harmonic "leakage" from your station.

Fundamental Overloading

In dealing with TVI there are two basic problems, your equipment's faults and the television receiver's weaknesses. Let's discuss the TV set first.

When a TV receiver is operated near a transmitting antenna — by "near" we mean within a few hundred feet — it is possible for the fundamental signal from the transmitter to overload the r.f. stage of the TV set. Your fundamental signal — the one you're using for communication — is on a frequency completely different from the TV channel frequencies, but if the r.f. stage of the TV set is overloaded by this signal, the stage actually generates many spurious signals which can cause TVI. The TVI may take the form of crosshatching in the picture, audio interference, or both. Usually, so many spurious signals will be generated that interference will appear in *all* channels. Incidentally, when interference is present in all channels, or in channels that are not harmonically related to your fundamental, it is a good indication that the TV set itself is at fault, or at least partially so.

To overcome fundamental overloading, the front end of the TV set must be made more selective so it will reject undesired signals, or at least attenuate them to the point where they cannot cause TVI. Bear in mind that such interference is not the fault of the transmitter. It is true that if you don't go on the air there will be no TVI, but curing fundamental overloading is the responsibility of the set owner. You have to use the utmost tact in dealing with set owners to convince them of this, since a TVI situation can quickly get out of hand.

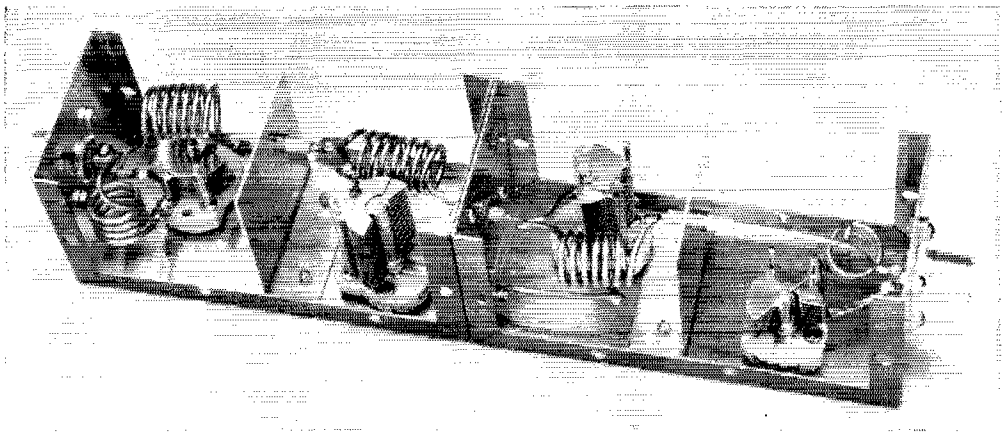
The cure for the trouble is the installation of a high-pass filter on the TV set. A high-pass filter is a combination of coils and capacitors that will permit signals *above* its "cutoff" frequency to pass through but will attenuate any signals *below* the cutoff frequency. When used with a TV receiver the filter is installed between the antenna leads and the TV tuner, directly at the tuner. TV signals can get through the filter without being attenuated, but any signals below Channel 2 are stopped.

Harmonics or Spurious Signals

One thing the high-pass filter won't do is to stop a signal that is *above* the filter cutoff frequency. If your transmitter has harmonics actually in one or more TV channels they will go through the filter and cause TVI. To attenuate harmonics coming from your rig you need a low-pass filter. Like the high-pass, the low-pass filter is a combination of coils and capacitors, but it passes signals *below* its cutoff frequency. Fig. 1 and the photographs show a low-pass filter that is easy to build, as described a little later on.

Many of the teeth of the old TVI dragon have been pulled since those days when practically every TV receiver was in a fringe area. But he's not impotent by a long shot! With the sunspot cycle opening up the 10-meter band some precautionary measures are called for if your operating is moving up along with the m.u.f.

*Novice Editor.



This is the inside of the low-pass filter. Either feedthrough insulators or rubber grommets can be used for the connections between the shields. *(Built by W1NPG.)*

For a low-pass filter to be effective, *all* of the signals coming from your rig must be fed through the filter, *not around it*. This means that the rig must be in an r.f.-tight enclosure, with good shielding techniques used wherever there is any chance of harmonic leakage. In the process of generating a desired output frequency, a whole family of undesired frequencies also is generated in the transmitter, usually. We only want *one* frequency, but it is the nature of the beast to produce many undesired ones, referred to as "spurious" signals. If we don't bottle up all these signals so that the only path for r.f. to leave the transmitter is via the low-pass filter, we can run into TVI problems.

How Much Shielding?

The "tightness" of the shielding required in a transmitter depends primarily on the strength of the TV signal at the receiver's antenna terminals. It is possible that a radiated harmonic won't cause TVI, simply because the TV signal is so strong that it isn't bothered. However, because you never can quite depend on what a neighbor has for a set or antenna system, it pays to have your equipment "clean."

One mistaken assumption that many Novices and Generals make is that commercially-built transmitters they may own will have adequate shielding. As a matter of fact, very few commercial rigs have what we would call really harmonic-proof shielding. While most gear these days is in metal enclosures, this in itself is no guarantee of good shielding. For good shielding, all r.f. stages, particularly the final amplifier, must be completely enclosed in metal. The enclosure can be made of perforated metal to allow ventilation, but when we say *completely* enclosed, we mean just that.

There are certain things to look for that will tell you whether the shielding is adequate. For example, if a perforated metal box is installed around the amplifier, are all corners and the top and bottom clean of paint? For the enclosure to be r.f. tight you cannot have paint on the surfaces in contact. The top, bottom and sides of the enclosure must have clean metal-to-metal bonds, with any holding screws no more than a few inches apart.

Aside from the shielding, are all the leads coming into or going out of such enclosures shielded and bypassed? Is there a bottom plate on the chassis? And does the bottom plate have clean metal-to-metal contact? Are the leads to the meter or meters shielded and bypassed? These questions give you a few of the things to look for.

One of the best methods to check for harmonic leakage is with your own TV set. First, make sure that you have a properly-installed high-pass filter on the set. By "properly" we mean installed as close to the tuner as you can mount the filter. If you mount the filter on the back of the set at the antenna terminals it is possible that there will be sufficient antenna lead length between the filter and the tuner for this lead to pick up your fundamental.

The next step is to check the harmonic leakage from the rig. Connect the transmitter to a dummy load — one of the shielded variety, not a lamp load, unless the lamp is in a shielded box. The transmitter and TV set should be near each other, preferably in the same room. Load up the rig into the dummy and then check the harmonically-related channels on the TV set. If even a slight trace of interference shows up you will have some work to do on the rig. The first step is to install a low-pass filter between the transmitter and the dummy antenna. This may clean up the interference when using the dummy load, but even if it does it is still a good idea to check the rig for weak spots or harmonic leakage.

A good testing instrument is the TV receiver itself. Solder the ends of a 1-inch diameter loop of insulated wire to the conductors at one end of a piece of 300-ohm Twin-Lead long enough to reach from the set to the rig. Connect the other end to the receiver, along with the regular

antenna. You may find that the TV picture is weakened appreciably; if so, shorten or lengthen the test lead by about 12 inches.

With the transmitter running into the shielded dummy load, move the test loop around the rig, checking such spots as meter openings, a.c. leads, knob shafts, and so on. If any spots have appreciable leakage, as shown by the TV screen, additional shielding or lead filtering will be required to stop it. The BCI-TVI chapter of the *Handbook* describes various techniques of lead filtering.

Making Your Own Low-Pass Filter

You can either buy or build your low-pass filter. For those interested in building their own, the unit shown in Fig. 1 and the photographs can be put together in an hour or so.[1] Two $2\frac{1}{4} \times 2\frac{1}{4} \times 5$-inch aluminum Miniboxes are used to house the filter. The boxes are mounted end-to-end as shown in the photograph.

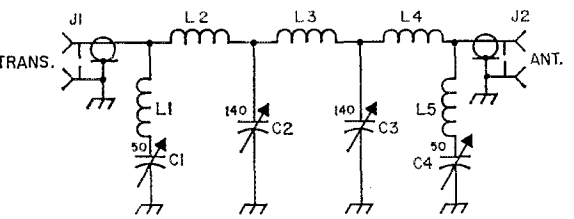


Fig. 1—Circuit diagram of the low-pass filter.
C_1, C_4—50-pf. variable (Hammarlund APC-50 or similar).
C_2, C_3—140-pf. variable (Hammarlund APC-140 or similar).
J_1, J_2—Coax chassis fitting, type SO-239.
L_1, L_5—4 turns.
L_2, L_4—7 turns.
L_3—8 turns.
All coils are ½-inch inside diameter, 8 turns per inch, No. 12 or 14 solid wire.

The coils are all wound with either No. 12 or No. 14 solid wire and they all have an inside diameter of ½ inch. A wooden dowel or a drill bit can be used as a form for winding the coils.

The filter should be adjusted by means of an accurately calibrated grid-dip meter. Wire up the filter except for L_2 and L_4. Short the inner conductor pin on J_1 to chassis at its inside with a metal clip; then couple the grid-dip meter to L_1 and adjust C_1 for a dip at 54 Mc. Do the same thing at the L_5 end of the circuit. Next, couple the grid-dip meter to L_3, set C_2 and C_4 at maximum capacitance (plates fully meshed) and vary the turn spacing on L_3 until the circuit is resonated at 29 Mc. You may have to reduce the amount of capacitance slightly on both C_2 and C_3 to hit 29 Mc. Next, remove L_3 and install L_2 and L_4. Without the short on J_1, and without touching the capacitors, adjust L_2 by varying the turn spacing to resonate at 37.5 Mc. This is the circuit formed by C_1, L_1, L_2, and C_2. Make the same adjustment at the L_4 end of the circuit. Now replace L_3, and a distinct resonance should be found at any coil at approximately 41 Mc., which is the cutoff frequency of the filter. This filter should handle the legal limit of power in a matched coaxial line (s.w.r. of 1 to 1). Variables with larger plate spacing could be used for greater arc-over protection. In such case a larger enclosure would probably be required.

Other Considerations

If you have carefully gone over your rig and stopped any harmonic leakage, the low-pass filter should take care of any harmonics in the line from the transmitter. Then with a properly installed high-pass filter on the TV set you shouldn't have any TVI. Unfortunately, however, there is one other cause of TVI that is tough to clean up, particularly in a weak TV signal area. This is harmonic generation due to a rectifying contact between two conductors in the area of the transmitter or nearby TV set.

Any corroded or poorly-connected metal surfaces can act as a rectifier — for example, loose or corroded connections in your antenna system. Whenever a strong r.f. field causes a voltage to exist at such a connection, the r.f. will be rectified and harmonics of the fundamental signal will be generated. These harmonics can be radiated in sufficient amplitude to cause TVI. It is a simple enough matter to go over all your antenna connections or the connections in the TV antenna system. However, such bad connections can exist in house wiring, plumbing, or anywhere that two metals are in contact. An article some years back[2] treated this type of TVI in great detail, covering methods of locating and curing the trouble, and it is recommended reading for anyone with such a problem. QST

[1] The filter described here is based on the image-parameter method of design. For one adapted particularly to 10-meter operation, with rejection points at the second and third harmonics, see Wetherhold, "A Ten-Meter Harmonic Filter," *QST*, September, 1967. It is based on modern filter design methods.

[2] Seybold, "Harmonic Radiation from External Nonlinear Systems," *QST*, January 1953.

INTERDIGITAL BANDPASS FILTERS FOR AMATEUR V.H.F./U.H.F. APPLICATIONS

High-Q Filter Construction Made Easy

BY REED E. FISHER W2CQH,* ex-W3VSB

THE v.h.f. enthusiast often uses a high-Q coaxial filter ahead of his converter, to prevent blocking and crosstalk from nearby TV or f.m. stations. Another v.h.f. man may want a similar filter to "remove the garbage" from his homebrew 2-meter s.s.b. exciter. These single or multiple-section filters are usually laboriously fabricated using conventional circular coaxial construction, and may give questionable results, since the optimum degree of coupling at input and output, and between filters, is usually arrived at by tedious experiment.

The strip-line interdigital [1] filter, designed by modern filter theory, eliminates most of the above trials and tribulations. Multiple-section filters are easily constructed in a few hours, and will work the first time with little or no adjustment. Their low midband insertion loss is comparable with the best circular coaxial filter and their out-of-band attenuation properties are just what theory predicts.

This article will not discuss the design of these filters since this has already been elegantly covered in the literature.[2] Instead, two basic models will be described which, when scaled to other frequencies, will satisfy the filtering requirements of most v.h.f. men. Both filters are constructed of stock size brass and aluminum which can be purchased at most supply houses. No milling is required, although a small lathe is convenient for squaring the resonator ends.

The first filter, Fig. 1, is a four-resonator model centered near 432 Mc., with a 3-db. bandwidth of 2 per cent. The measured insertion loss vs. frequency in a 50-ohm system is shown in Fig. 2.

* 2 Forum Court, Morris Plains, N.J. 07950.

[1] Webster: "Interdigitate — To interlock, as with the fingers of folded hands."

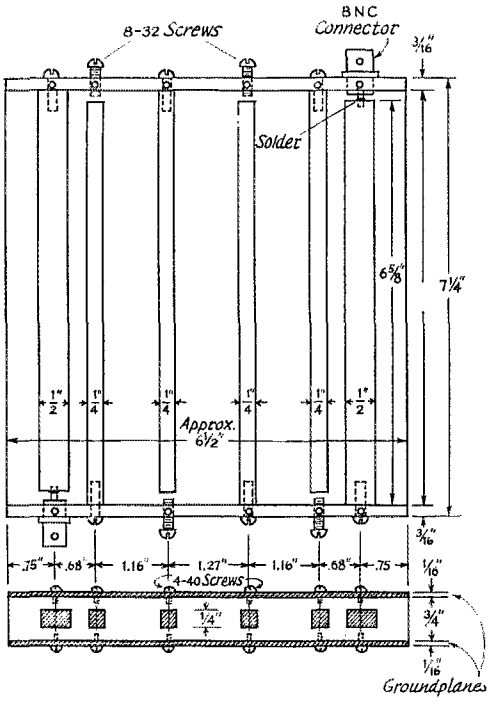


Fig. 1—Mechanical details of the 432-Mc. bandpass filter.

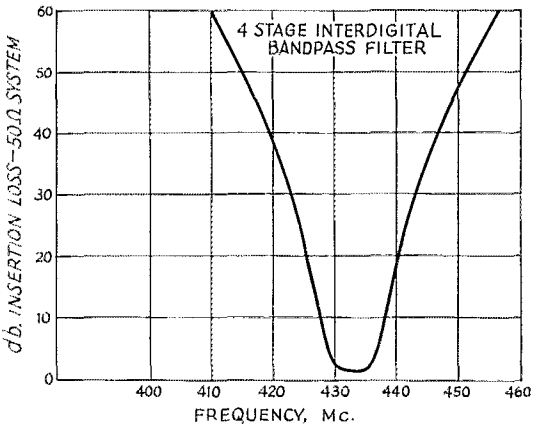


Fig. 2—Bandwidth and insertion loss with the 432-Mc. filter.

The filter has a "maximally flat" or Butterworth response, which means that there are no loss ripples in the passband. It was used to reject the oscillator and image frequencies of the author's s.s.b. upconverter for 28 to 432 Mc.

The filter consists of six interdigitated rectangular rods centrally located between two ground planes. The four ¼-inch square open ended rods

[2] G. L. Matthaei, "Interdigital Band-Pass Filters", *IRE Trans. on Microwave Theory and Techniques*, vol. MTT-10, Nov. 1962, pp. 479-491. Also, W. S. Metcalf, "Graphs Speed Design of Interdigital Filters," *Microwaves*, Feb. 1967, pp. 91-95.

approximately ¼ wavelength long constitute the high-Q resonators. The two larger rods, whose open ends are soldered to BNC coaxial connectors, are low-Q coupling sections. One end of each rod is drilled and tapped for an 8-32 machine screw so that it may be securely attached to an end wall. The top and bottom ground planes are 1/16" brass or aluminum, fastened to the drilled and tapped end walls by several 4-40 or 6-32 machine screws. It is important that a ground-plane screw be located near the center-line of each rod, since large r.f. currents are flowing in this region. Note that no "side walls" are required. The ground planes overlap the coupling rods by an amount sufficient to prevent any radiation loss.

In the first model built, the rods were plain

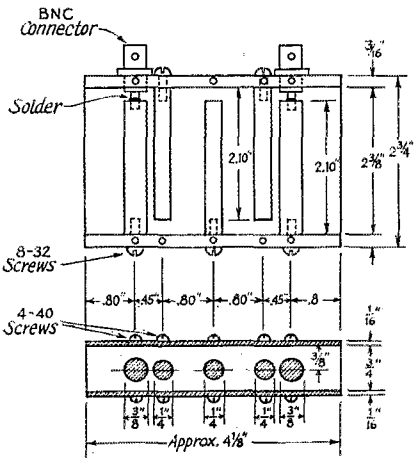


Fig. 3—Structural details of the 1296-Mc. filter are similar to those of the 432-Mc. model, except that three circuits and cylindrical conductors are used.

stock brass and the ground planes were 1/16 inch thick aluminum. This gave a 1.4-db. midband (432 Mc.) insertion loss. A second model, constructed by W2CCY, with silver-plated brass rods and ground planes exhibited a 0.5-db. insertion loss. Tuning screws were included in the first model, but it was later found that if all four resonators were made precisely the same length subsequent tuning was unnecessary.

The filter can be scaled to any other frequency by changing the rod length, but keeping the center-to-center and ground plane spacings the same. For example, the rods would be approximately 20 inches long in a filter tuned for 144 Mc. The 3-db. bandwidth would remain at 2 percent, i.e. 2.9 Mc.

Since the resonators open ends are loaded by "fringing capacitance", their lengths are always slightly less than one quarter wavelength. It is difficult to compute this capacitance and hence accurately predict what the reduction of rod length will be. However since the resonators are easily removed, they can be pruned to the correct length after the filter is initially tested.

When the 3-db. bandwidth of a filter is made

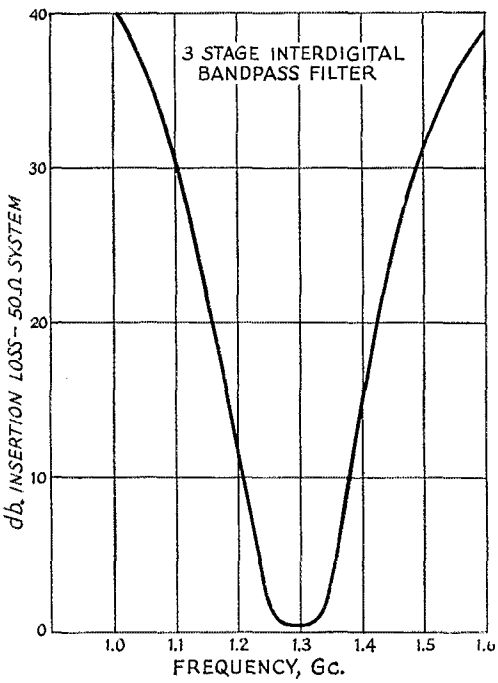
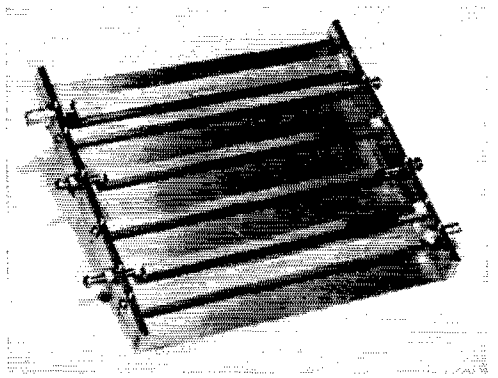


Fig. 4—Performance characteristics of the 1296-Mc. filter

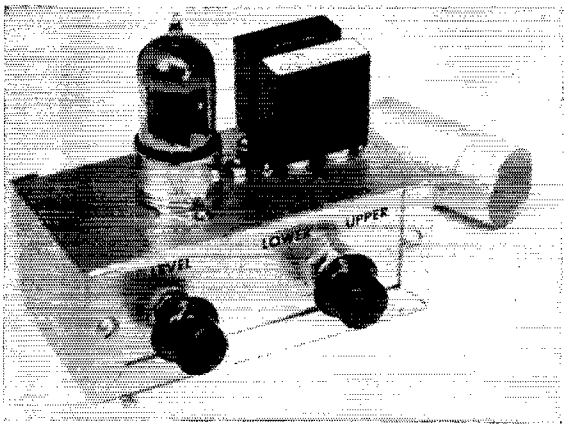
larger, the midband insertion loss will decrease. A three-resonator filter centered near 1296 Mc., with an 8.5 per cent 3-db. bandwidth, is shown in Figs. 3 and 4. This filter gives a 0.4 db. insertion loss, using plain brass round rod construction. It is placed at the output of a 2C39 tripler to remove the 432-Mc. feedthrough. This was a "four-hour special" that worked the first time with no tuning.

It is hoped that this article will remove most of the heartaches usually associated with the construction of v.h.f. and u.h.f. bandpass filters. QST



Interior view of the 432-Mc. filter, with the top cover removed. Four square brass rods, grounded at alternate ends, comprise the tuned circuits. Larger rectangular rods at each end are the input and output coupling devices, connected to BNC fittings. End plates are 3/16-inch brass. Top and bottom covers are 1/16-inch. Sides are left open.

A Stable Outboard B.F.O.



An exterior view of the outboard b.f.o. assembly. A small Minibox serves as a chassis. The output jack and power cable are located on the rear of the box.

PROPER b.f.o. performance is essential for good c.w. and s.s.b. reception. Some receivers have b.f.o. circuits that are unstable, both electrically and mechanically. Another b.f.o. fault that is sometimes encountered is that of insufficient output. A third bugaboo, and one that is annoying to beginners, to say the least, is the matter of proper b.f.o. adjustment with respect to the i.f. passband of the receiver. Some receivers do not have any markings on the front-panel b.f.o. control to tell where to set it for upper- or lower-sideband reception. That is to say, the operator has to experiment with the settings of the control in order to find the right relationship to "zero" for satisfactory reception . . . often time consuming and frustrating.

By using a crystal-controlled beat oscillator, it is possible to correct the ills mentioned in the foregoing paragraph. A working example of such a circuit is given in Fig. 1. The unit is built to operate "outboard" and can be powered from the receiver's accessory socket. If the receiver does not have one, it should be a simple matter to add an outlet.

Two crystals are used, Y_1 and Y_2, permitting upper- or lower-sideband reception by merely switching one of two crystals into the circuit by means of S_1. A level control, R_1, enables the operator to vary the b.f.o. injection to the second detector of the receiver so that the desired ratio between i.f. and b.f.o. signals can be obtained. A s.p.s.t. switch, S_2, is part of the R_1 assembly and is used to place the b.f.o. in standby when it is not being used.

This circuit was designed for use at 455 kc. It could be used at higher i.f.s., but C_1 would have to be made smaller in capacitance to provide the proper feedback for the oscillator. Oscillator V_{1A} is a standard Pierce type, is easy to get operating, and should work well at higher crystal frequencies, too.

There is nothing stringent to observe as far as layout and wiring rules are concerned. Any small Minibox or similar container can be used to house the circuit. If desired, it can be built into the receiver — space permitting — to become a permanent part of the equipment.

The LEVEL and LOWER-UPPER SIDEBAND controls are mounted on the front of the b.f.o. chassis for easy accessibility. J_1, the output jack, is located on the rear wall of the box. A ⅜-inch diameter rubber grommet is also on the rear of the case and is used as an outlet for the power cable which connects the b.f.o. to the receiver's accessory outlet.

Using The B.F.O.

The proper crystals for the b.f.o. will have to be chosen according to the actual i.f. of the receiver. Some receivers use a 455 kc. center frequency, while others call for 456 kc. Actually, there isn't much difference when it comes to selecting Y_1 and Y_2. The receiver can always be realigned to match up with the b.f.o. crystals, provided they're not too far removed in frequency. War-surplus type FT-241A crystals were used in this model. If the receiver calls for a 455-kc. i.f., order a crystal for 456 kc., and another for 454 kc. In other words, pick a crystal that is one kilocycle higher than the i.f., and another that is one kilocycle lower than the i.f. This will be satisfactory for most applications. If a

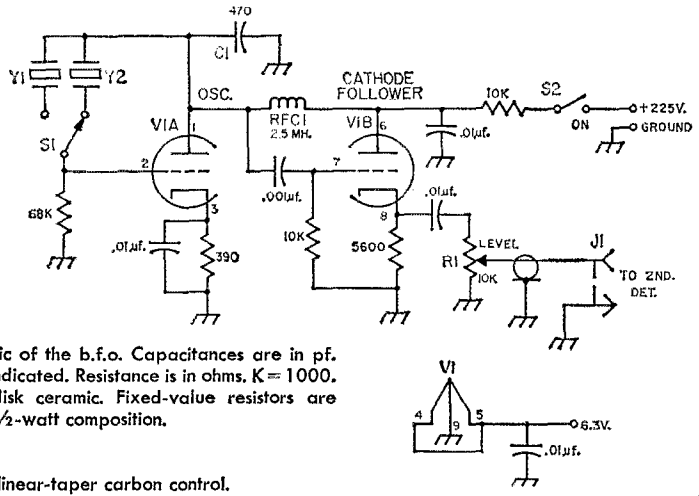


Fig. 1— Schematic of the b.f.o. Capacitances are in pf. unless otherwise indicated. Resistance is in ohms. K = 1000. Capacitors are disk ceramic. Fixed-value resistors are ½-watt composition.

C_1—See text.
J_1—Phono jack.
R_1—10,000-ohm linear-taper carbon control.
RFC_1—2.5-mh. r.f. choke, 50-ma. rating, or greater.
S_1—S.p.d.t. single-wafer phenolic rotary. (Slide or toggle switch suitable also.)
S_2—S.p.s.t. switch (part of R_1 assembly).
V_1—12AU7
Y_1, Y_2—See text.

455-kc. i.f. is being used (center frequency), it is helpful to have a 455-kc. crystal on hand for aligning the i.f. The crystal can be plugged into the b.f.o. and the i.f. transformers then aligned for peak response. Crystals in this range are available (±5 c.p.s. tolerance) for $1.75 each, ground to your specifications.[1]

To feed the b.f.o. signal into the station receiver, mount a phono connector on the rear apron of the receiver's chassis. Use a short piece of shielded audio cable, or miniature coax line, and route the b.f.o. signal to the secondary side of the last i.f. transformer. Using "gimmick" coupling, wrap two or three turns of the center conductor of the b.f.o. cable around the connecting lead which joins the i.f. transformer secondary to the detector tube's grid, or to the r.f. side of the detector diode. Make sure that the two wires are insulated from one another so that a short-circuit will not occur. Ground the shield braid of the b.f.o. cable where it enters the receiver and again at the end which is near the detector circuit. If more b.f.o. injection is needed, increase the number of wraps of the gimmick coupler until the desired performance is obtained. R_1 should be set somewhere near midrange during this adjustment.

This b.f.o. can also be used in s.s.b. exciters to serve as a carrier generator for upper and lower sideband operation. Crystals Y_1 and Y_2, however, would have to be chosen to match the passband characteristics of the crystal-lattice or mechanical filter being used. R_1 could be used as a carrier-insertion control if this were done, routing some of the b.f.o. signal around the filter and into the mixer for c.w. and a.m. operation, or for tuneup purposes when desired. — *W1CER*

[1] JAN Crystals, 2400 Crystal Drive, Fort Myers, Florida. Catalog available on request.

Strays

Feedback

The resistor to the oscillator base in W3MOO's transmitter ("An Unusual R.F. Amplifier Circuit," January *QST*, page 46) lost a K somewhere along the line. It should have been 100K instead of 100 ohms.

—•••—

This item should probably be headed "Feedback," but in this instance the story of the man sending in the correction is more interesting than the item itself. In connection with W3GKP's piece, "On Decibels and Noise," in January *QST*, p. 35, WB2FCX points out that in writing about "signal-plus-noise to noise" ratio, we should have expressed it as $(S + N)/N$, or $\frac{S + N}{N}$. True enough.

But who is WB2FCX? Thereby hangs a tale. He could be one of the world's first v.h.f. DX men. Operating under the self-assigned call W2, in Brussels, Belgium, Rudy put a 50-Mc. signal into Spain — *in 1925!* There's a story that could stand some retelling.

—•••—

When it comes to thinking up "different" things to do in ham radio, W3GKP takes a back seat to nobody. His latest effort has been to learn to copy code on a teletype machine. This is a good way to improve one's code copying ability and teletype keyboard skill, but Bill says progress is slow. His teletype-machine copy netted him a 10-w.p.m. ARRL Code Proficiency Certificate in October, and a 15-w.p.m. sticker in November. He had a 20-w.p.m. copy in the Hq c.p. file as this was written.

Being a skilled c.w. man for many years, his showing of the 10-w.p.m. wallpaper at a recent Rock Creek club meeting caused much amusement. (*From W3GKP OVS report, via W1HDQ*)

An Experimental All-Electronic VOX System for S.S.B.

Instant Voice Break-In Without Relays

BY H. ROMMEL HILDRETH, M.D.,* KØHZF

Instant c.w. break-in — the ability to hear signals in the spaces between dots and dashes — has been with us for some time. The only comparatively recent development has been the introduction of the t.r. switch, which permits the use of the same antenna, rather than separate antennas, for transmitting and receiving. However, KØHZF is the first, to our knowledge, to conceive the idea of applying the same principle to voice communication. Here, advantage is taken of the lapses inherent in speech waveform, just as the c.w. system makes use of spaces between characters. We've had an opportunity to listen to Rom in action, and can vouch for the effectiveness of the system.

An ideal VOX system would have the attributes of land-line telephone. That is, it would be possible for the listening operator to interrupt the transmitting operator while he is talking. This is not possible with the conventional system using a VOX relay. The transmitting operator cannot hear the breaking station unless he makes an abnormal pause in his speech.

If an oscilloscope tracing of continuous speech is observed, it will be seen that there are numerous valleys in the pattern. These valleys represent intervals during which the output from a modulated transmitter would be zero. During these intervals, it would be possible to hear snatches of a breaking operator's voice, if the various change-over operations could be performed in this brief space of time. Obviously, these periods are not long enough to permit a VOX relay to operate. This article discusses the essential points of an electronic system that is fast enough to take advantage of these lapses in speech, and provide s.s.b. phone operation closely approaching that of the home telephone.

* 18 Brighton Way, Clayton, Missouri 63105.

The Problem

The matter of antenna change-over is taken care of quite simply by the use of a t.r. switch, so that portion of the system will not be discussed. The remaining problems to be solved are those of muting the receiver during intervals when energy is being transmitted, and suppressing residual noise from the transmitter during intervals when no energy is being transmitted. The latter may have to include cutting off the audio and carrier generator, and suppressing "hash" from those stages generating diode noise, depending on details of the equipment used. Obviously, the switching must be done at points in the circuit that will permit practically instantaneous operation. Switching cannot always be done at the most logical points because of lag introduced by the time constants of capacitor/resistor combinations which are essential to the normal operation of the equipment and therefore cannot be eliminated.

In the author's case, Collins S-Line equipment was used as the guinea pig. Since it was desirable to avoid any disturbance of the original wiring, an arrangement was worked out whereby all modifications necessary to try out the system experimentally could be made either through external jacks that this equipment affords, or by means of tube "test" adapters. These adapters, sold by almost all of the mail-order electronics houses, are used by simply plugging the adapter into a tube socket and, in turn, plugging the tube into the adapter. The adapters come in two styles. One type has a simple exposed contact for each tube pin. In testing work. this type is designed to provide a means of measuring the voltage at any desired pin without digging under the chassis. But it also makes it possible to connect *any* external circuitry in parallel with any tube element. The second type is similar, except that the exposed terminals are in the form of miniature closed-circuit jacks. This type is intended to be used for making current measurements, since the jacks provide a means of inserting a meter in series with any tube element. In our application, it is useful for inserting circuitry in series with any element without disturbing the original wiring. The jack, or series, type can be used for a parallel connection as well as a series connection, of course, but it is a little more expensive than the parallel,

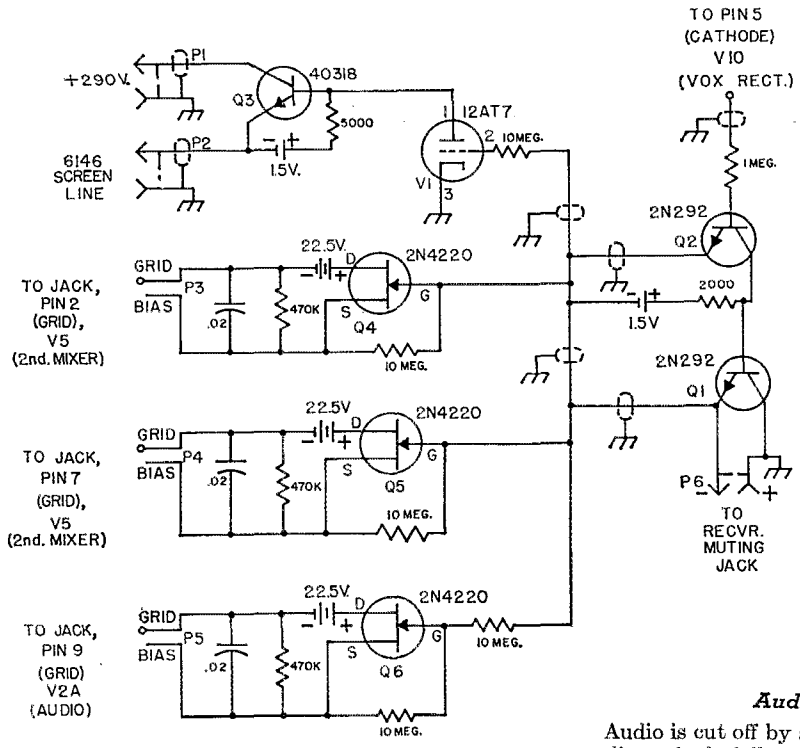


Fig. 1—Experimental circuitry used by the author in applying electronic VOX control to his Collins 32S-3 transmitter and 75S-3 receiver. Unless indicated otherwise, capacitances are in μf., and resistances are in ohms (K = 1000). Capacitors may be any type, 150 volts or more. Resistors are ½-watt. Shielded wire should be used where indicated. P_1, P_2 and P_6 are phono plugs. P_3, P_4 and P_5 are probes to be inserted in jacks of test adapters, as described in the text. Be sure to connect the probes as indicated. Vector test adapters T7MC7 and T9NC9 are suitable series, or jack, types for 7- and 9-pin sockets, respectively. The type T7M is suitable for making the connection to the 6AL5. Probes for the series adapters are type P2.

Transistors: 40138—RCA
2N292—GE
2N4220—MOT

or voltage-measurement, type. Miniature probes are available to fit the jacks of the series adapters.

Receiver Muting

In the 75S-3, muting is accomplished by biasing some of the tubes to cutoff. This is the "normal" or stand-by condition. Muting is removed by grounding a point on a voltage divider across the bias supply. This is done by turning the panel switch from STAND-BY to OPERATE or, remotely, by grounding a lead plugged into the muting jack at the rear of the receiver. When the 32S-3 and 75S-3 are used together normally, the VOX relay in the 32 controls the muting through a cable connecting the muting jack on the transmitter to the muting jack on the receiver. Muting and recovery in the 75S-3 is practically instantaneous if the a.g.c. is switched off.

In the electronic system, a transistor, Q_1, Fig. 1, is used as the switch across the receiver muting jack. Q_1 is driven by Q_2 which, in turn, is driven by a voltage taken from the cathode (Pin 5) of the 6AL5 VOX rectifier in the 32S-3. A voltage as high as +60 can be measured at this point, depending on the voice level and setting of the VOX gain control. Q_2 goes into saturation at 5 volts, so with even a small voice signal, the muting is positive and abrupt. The switching time of the muter is so short that one can hear the receiver in operation even between syllables.

The connection to the cathode does not require opening of the circuit, so the parallel type of adapter can be used in the 6AL5 socket in making the connection to Pin 5.

Audio Control

Audio is cut off by applying cutoff bias to the audio cathode follower, V_{2A}, in the 32S-3. The additional voltage is provided by a 22.5-volt battery which is switched across a resistor in series with the tube's normal bias. The switch, in this case, is a 2N4220 FET transistor[1], Q_6. When the muting switch of the 75S-3 is open, (receiver muted) — 23 volts normally appears across the muting jack. This voltage is applied as cutoff bias to the gate of Q_6 to open the FET switch. With the switch open, normal bias is fed to the grid of V_{2A} through the 470K resistor. When Q_1 switches the muting terminal to ground, the gate of Q_6 is also grounded, and the FET switch closes, placing the 22.5-volt battery across the 470K resistor, which cuts off V_{2A}.

The connection to Pin 9 of V_2 is made by use of a series adapter. Care should be used in making connections to the probe to make sure that the negative side of the 22.5-volt battery is connected to the side of the probe that goes to the grid of V_{2A}.

Carrier-Generator Control

Carrier generation is controlled by applying cutoff grid bias to Pins 2 and 7 of V_5, the second mixer in the 32S-3. The control-circuit arrangement is exactly the same as that used for the audio, with Q_4 and Q_5 as separate switches for the two grids. The connections to Pins 2 and 7 are made similarly, using a series adapter.

Hash Suppression

It took a good bit of work to untangle this problem. Bias control of the 6146s in the final

[1] Latest word from the author is that the cheaper MPF102 is equally satisfactory.

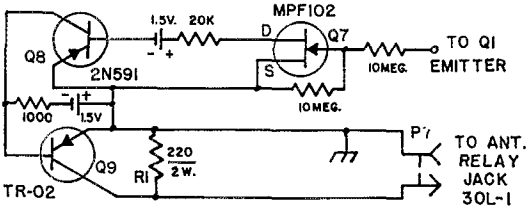


Fig. 2—Stand-by control for the 30L-1 linear. Unless indicated otherwise, resistances are in ohms (K = 1000), and resistors are ½-watt. P_1 is a phono plug.
Transistors: 2N591—RCA
MPF102—MOT
TR-02—INT

amplifier in the 32S-3 was tried first, but it proved to be unsatisfactory because of the long time constant introduced by capacitors and resistors in the existing circuitry, which could not be eliminated except by alteration of the original wiring. It was found that hash could be suppressed by reducing the screen voltage to a level that would assure plate and screen cutoff by the normal fixed bias supplied to this stage. So the problem was attacked from this angle.

Fortunately, the screens of the 6146s, and the screen supply voltage are brought out to separate jacks at the rear of the chassis. These two jacks are normally connected together internally with a jumper. The jumper is designed to be opened if the 32S-3 is used with the Collins 6- and 2-meter converter. Removing this jumper permits a switch to be inserted between the two jacks.

The screen switch, Q_3, is a 40318 transistor rated at 300 volts. Since the base of this transistor is nearly 300 volts above ground when the transistor is conducting, it is obvious that it cannot be connected directly to the control transistor, Q_1. The simplest form of isolation appeared to be a triode vacuum tube.

When the receiver is muted, −23 volts from the muter circuit biases V_1 to cutoff. The 1.5-volt battery then biases Q_3 into conduction, and screen voltage is applied to the 6146s. When Q_1 grounds the muting terminal, it also grounds the grid of V_1, and V_1 conducts. The increased voltage drop across the 5000-ohm base resistor drops the base voltage. Q_3 goes almost to cutoff, and the screen voltage drops to about 30 volts. At this voltage, the normal operating bias is sufficient to cut off 6146 screen and plate current. Connections between Q_3 and the screen and screen-supply jacks are made through phono plugs.

No switches are shown for the control batteries. The drain is so low that battery life will be close to shelf life, even if small-size cells are used.

Adjustment

The exciter should be tuned up on the desired band in the normal manner before connecting the control circuitry. The VOX relay should be closed permanently by inserting a shorted phono plug in the p.t.t. jack. The VOX time-constant control must be turned fully counterclockwise. If the Collins station-control box is in use, its function switch should be turned up to NORMAL. The VOX gain control should be advanced until the receiver S meter fluctuates when the operator speaks into the microphone at normal voice level. If the gain is turned up too high, acoustical background noise will keep the receiver muted. If it is not turned up sufficiently, the receiver will not mute. A bit of experience will guide the operator to an adjustment where signals may be heard between words, or even between syllables. The incoming signal must be strong enough, of course, to override the acoustical sound of the operator's own voice. If a click is heard as the receiver recovers, it can be minimized by adjustment of the ANTIVOX control.

If one wants to avoid disconnecting the control circuitry for initial tune-up, a series of switches can be used to restore normal operation. The author uses a d.p.d.t. switch in the Q_3 circuit, one pole to open the battery circuit while the other shorts the collector to the emitter. Simple s.p.s.t. switches are used in series with the batteries in the FET control circuits. A d.p.s.t. switch is used, one pole to open up the connection to the base of Q_2, while the other pole opens the heater circuit of V_1.

Conclusion

The system has worked well enough over a considerable length of time in this experimental setup to demonstrate that the principle is thoroughly practical and effective. Transceive operation has presented some problems that have not as yet been resolved. It is hoped that this article will inspire others toward efforts to help solve these problems, as well as toward simplification and improvement. The author feels sure that anyone who has once operated with a system of this type will never be satisfied again with push-to-talk, or conventional VOX operation.

The control system works equally well when the 30L-1 linear is added. In normal operation, the antenna-relay control places cut-off bias on the 811A grids on standby to avoid unnecessary plate dissipation. With electronic t.r. switching, this control is lost. The author solved this problem with the control circuit of Fig. 2. This circuit is actuated by Q_1 in Fig. 1. The switch transistor, Q_9, performs a function similar to that of the relay control in normal operation. A voice signal causes the switch to close, reducing the bias on the final-amplifier tubes from cutoff to the normal operating value. With no voice signal, cutoff bias is restored.

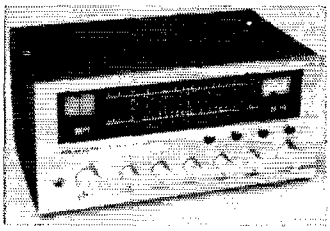
In the normal condition, approximately 120 volts is used as cut-off bias in the 30L-1. This is much more than is actually required to achieve cutoff. To reduce the voltage that the switching transistor must handle, the 220-ohm resistor, R_1, is shunted across the relay-control jack. This reduces the stand-by bias to about 16 volts,

(Continued on page 148)

Recent Equipment

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

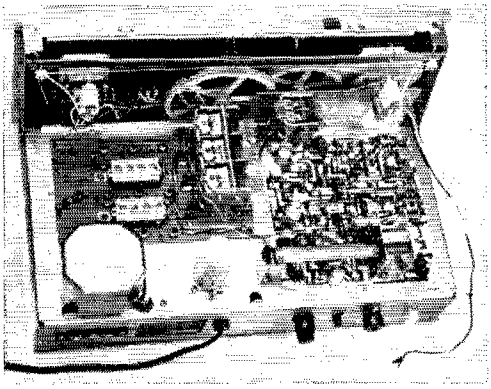
The Realistic DX-150



THE DX-150 is a solid-state receiver with continuous coverage from 535 kc. to 30 Mc. in four bands. Nineteen bipolar transistors and thirteen diodes are used in a single-conversion superheterodyne. Among the receiver's features are a product detector, an a.g.c. circuit with selectable time constants, an i.f. noise limiter, an a.f. noise limiter, and electrical bandspread. Included in the set are a b.f.o. pitch control, r.f. and audio gain controls, an antenna trimmer, an a.g.c. time-constant switch, a receive-standby switch, a loudspeaker, a headphone jack, and an S meter. The receiver can be operated from either 115 volts a.c. or 12 volts d.c.

Circuit Details

A block diagram of the DX-150 is shown in Fig. 1. Q_1 and Q_2 form a cascode r.f. amplifier. CR_1, a 1S73 diode across the base-to-emitter junction of Q_1, prevents the reverse emitter-to-base voltage rating of Q_1 from being exceeded if, for example, an overly large signal from an adjacent transmitter is developed across the receiver's input circuit. The 535-kc. to 30-Mc. output of Q_2 is fed to the mixer, Q_3, where it combines with the v.f.o. signal to produce an i.f. of 455 kc. A buffer amplifier, Q_7, is used to isolate the v.f.o., Q_6, from the mixer. Depending on the band in use, the v.f.o., a Hartley circuit, operates 455 kc. above or 455 kc. below the frequency of the signal to be received. CR_2 is used to stabilize the oscillator.



Top view of the receiver. The two wires at the right go to a small loudspeaker mounted on one of the sides of the cabinet.

The mixer is followed by two 455-kc. i.f. stages, Q_4 and Q_5. C_1, CR_3 and R_1 in the collector circuit of Q_5 (Fig. 2) form an i.f. noise limiter which is basically of the Bishop type,[1] although in this case unsymmetrical. C_1 is kept charged to the peak signal level through CR_3, which is therefore back-biased and essentially nonconducting until a short-duration noise pulse momentarily exceeds the bias voltage stored in C_1. The excess pulse voltage is short-circuited through CR_3 and C_1, thus eliminating the noise peak. The a.f. limiter, to the right of C_2, is the conventional carrier-operated a.n.l. circuit for a.m. reception. The two limiters are switched in or out simultaneously by the two sections of S_1.

CR_4 is used as both an a.m. detector and an a.g.c. rectifier. In the latter application (Fig. 3) a signal appearing across the secondary of the last i.f. transformer is rectified by CR_4 and a negative d.c. voltage is developed from the top of C_2 to ground. This voltage forward-biases Q_9, causing the transistor to draw collector current through R_8 and R_9. As the voltage drop across these two resistors increases, the voltage drop across R_{10} and R_{11} decreases because all four resistors are in series across the supply voltage. Since the forward base-bias voltage for Q_1, Q_4 and Q_5 is taken from the arm of R_{11} (the manual gain control) the gain of the controlled stages is reduced. Two a.g.c. release times, slow and fast, are available. For slow release, C_6, a 200-μf. capacitor, is switched from the collector of Q_9 to ground. Additional a.g.c. action is obtained from Q_8; the forward bias for this transistor is the voltage drop across R_8; and as the drop increases, Q_8's collector current also increases. This results in a larger negative voltage drop from the top of R_{12} to ground, higher emitter bias (reverse bias) for Q_1 and Q_4, and reduced gain for the two stages. The apparent reason for this dual a.g.c. system is that the circuit permits the receiver to

[1] Stiles, "I. F. Noise Limiter," *QST*, June, 1960.

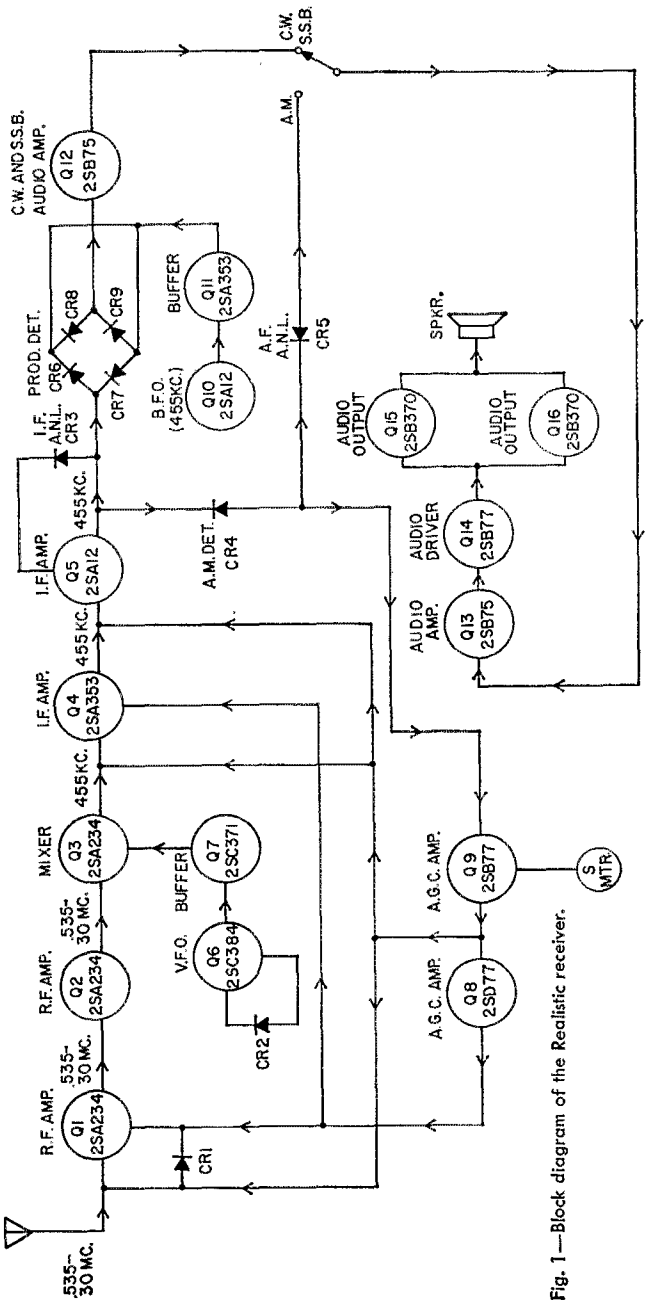


Fig. 1—Block diagram of the Realistic receiver.

handle a wider range of signal strengths without overloading than the usual a.g.c. circuit which only controls base bias. The a.g.c. circuit is left on all the time.

Because Q_9's collector current, and therefore its emitter current, increases with the signal level the emitter line of Q_9 is a good spot for an S meter.

Once the audio from a detected a.m. signal reaches S_{1B}, it is fed through the audio channel, Q_{13}, Q_{14}, Q_{15} and Q_{16}, to the loudspeaker. Only one transformer is used in the string, the output stage being a single-ended Class B circuit. A 200-μf. capacitor is used to couple Q_{15} and Q_{16} to the speaker in the set or to an external speaker or set of headphones via the PHONES jack. The jack disconnects the set's speaker when a phone plug is inserted.

For c.w. and s.s.b. detection, i.f. and b.f.o. signals are fed to a bridge-type product detector consisting of four diodes, CR_6 through CR_9. A buffer amplifier, Q_{11}, is used between the product detector and a Hartley type b.f.o., Q_{10}. Either u.s.b. or l.s.b. signals can be copied by turning the b.f.o. pitch control to the proper setting. Since the gain of the product detector is less than the gain of the a.m. detector, an extra audio amplifier stage, Q_{12}, is used between the product detector and the receiver's audio channel.

For a.c. operation of the receiver, a step-down transformer is used to feed a full-wave rectifier. This is followed by a capacitor-input filter, a transistor series regulator with a Zener diode reference element, a series dropping resistor, and another Zener. D.c. for the audio stages is taken from the capacitor-input filter while d.c. for the rest of the set is taken from the second Zener mentioned above.

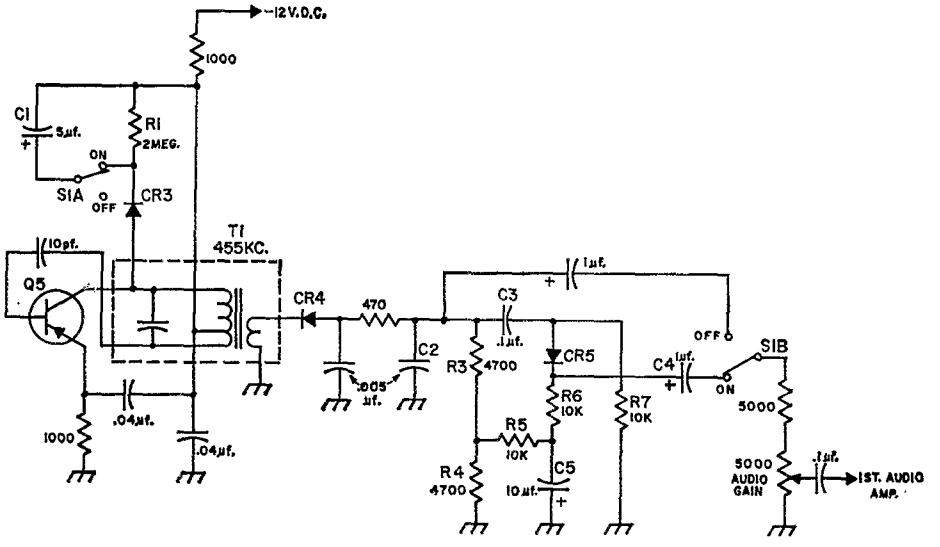


Fig. 2—Schematic diagram of the i.f. noise limiter, CR_3, the a.m. detector, CR_4, and the a.f. noise limiter, CR_5. Resistances are in ohms; K = 1000. Component labels are for text-reference purposes.

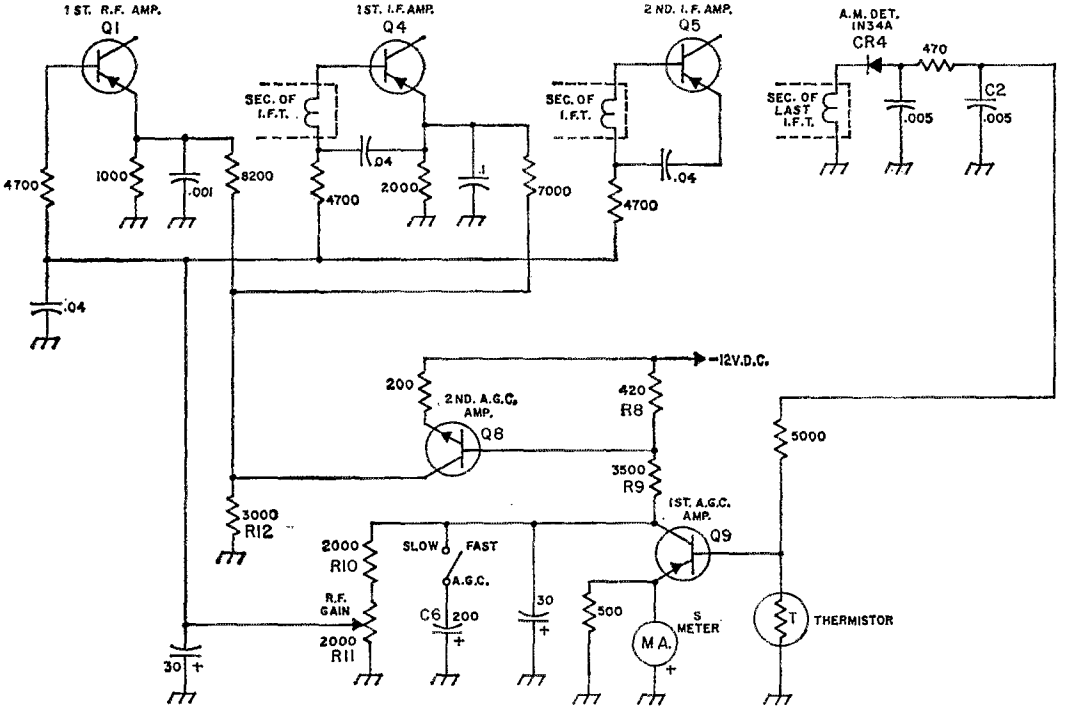


Fig. 3—Schematic diagram of the DX-150 a.g.c. system. Capacitance values are in microfarads (μf.); resistances are in ohms. The circuit is discussed in the text.

For battery operation of the set, a power switch on the back of the receiver is used to bypass the transformer and rectifiers and to permit the d.c. to be fed directly into the capacitor-input filter. Connection to an external battery or batteries is made through a three-prong socket on the rear of the receiver. To extend the life of the batteries, the power switch is wired so that it disconnects the dial lights when battery power is being used.

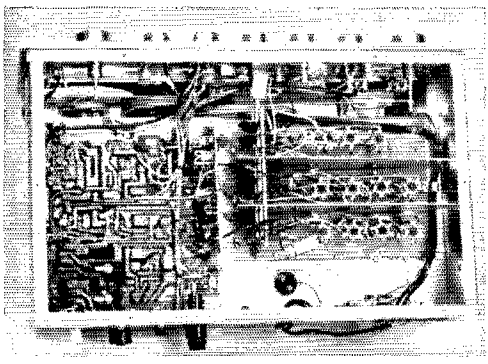
When thrown to STD BY, a REC-STD BY switch on the front panel removes voltage from all the stages in the set except the audio channel. This switch is wired in parallel with a connector on the back of the receiver. By wiring the connector to the transmitter send-receive relay or switch, the user can control the receiver with the transmitter.

Performance

The sensitivity of the DX-150 is as good as most of today's sets; when the short-wave bands are open, it should be possible for the listener to copy a multitude of signals even with a small random-wire antenna. However, strong signals on the DX-150 have a tendency to cross-modulate the signals adjacent to them. This is especially noticeable on the broadcast band; backing off the r.f. gain control does little to clear it up. After a short warm-up, the receiver exhibits little drift. The receiver does change frequency when it is bounced up and down to simulate mobile operation.

The r.f. gain-control and antenna-trimmer settings affect the receiver tuning; this is particularly annoying on the 10-meter band. S.s.b. signals that vary widely in strength (QSB) sound a little bit distorted. The noise limiters, which cut down noise at the expense of some audio distortion, are helpful for a.m. reception, but do not seem to be useful for c.w. or s.s.b. Depending upon the frequency, it takes a signal of 10μv. or less to get a meter reading of S9. The meter is easily pinned.

Image rejection was found to be 46 db. at 3.5 Mc., 43 db. at 7 Mc., 18 db. at 14 Mc., 13 db. at 21 Mc., and 0 db. at 28 Mc. These figures are quite in line with what is to be expected from a single-conversion receiver having a 455-kc. i.f. While checking the image rejection of the DX-150 on Band D (13 to 30 Mc.), we found the image to be on the low side of the signal when the set was tested at 14 and 21 Mc.; however, it appeared that the image shifted to the high side when we checked the receiver at 28 Mc. Since it is not possible for the image frequency to move from one side of the signal to the other, what happened? Apparently the manufacturer mistakenly aligned the high end of Band D at the image frequency — something that's easy to do because the image and the desired signal are both about the same strength.



Bottom view of the receiver. The r.f. coils are at the right and the bandswitch is in the center. Most of the rest of the components are mounted on the circuit boards at the left.

Realistic DX-150 Receiver

Height: 6½ inches.
Width: 14⅛ inches.
Depth: 9¼ inches.
Weight: 14 pounds.
Power Requirements: 6 watts, 105–125 volts a.c., 50–60 cycles, or 12 volts d.c.
Price Class: $120 less accessories.
Manufacturer: Radio Shack, 730 Commonwealth Ave., Boston, Mass. 02215.

Mechanical Details

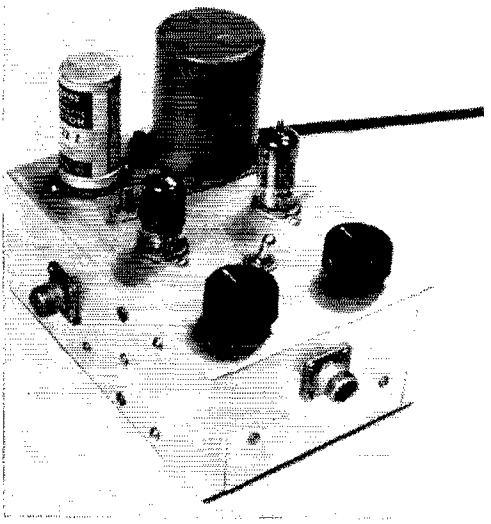
The receiver is attractive in appearance; the front panel, an extrusion of brushed aluminum, is contrasted by a dark gray cabinet. Good-sized solid aluminum knobs are attached to the controls. Two string-driven dials that have negligible backlash are used to tune the DX-150: a multicolor slide-rule dial for general coverage, and a circular bandspread dial for the Citizens Band and the five amateur bands between 3.5 and 29.7. It takes one turn of the bandspread knob to tune between 40 and 60 kc. of the 3.5-, 7- and 14-Mc. bands, 150 kc. of the 21-Mc. band and 430 kc. of the 28- Mc. band.

As can be seen from the photographs, the wiring is very neat, and the parts are easy to reach if servicing is necessary. Most of the components in the set are mounted on either of two printed-circuit boards.

The instruction manual, written primarily for the short-wave listener, contains little information that is of interest to hams. It does, however, include a tiny but useful schematic of the receiver.

Among the accessories available for the DX-150 are an external communications-type speaker (SP-150) and a 12-volt d.c. portable power pack. The latter includes all the necessary plugs and cords for operation of the receiver from eight D cells (supplied) or from the outlet for an automobile cigarette lighter. There is sufficient space in the pack for storing a complete set of spare batteries. Eight D cells are said to be capable of operating the receiver for 100 continuous hours. — *W1YDS*

Two-tone Generator with Scope-Sync Output



There are no critical points in the construction of the generator. W3QLV's is built on a 5 × 7 × 3-inch chassis, with the output jacks on the sides. R_1, mounted between the filter capacitor and one of the 12AU7s, is screwdriver-adjusted. The output-level switch is between R_2 and R_3, at the near end of the chassis. The power transformer is a surplus unit, but catalog items are readily available.

BY FRANK W. NOBLE,* W3QLV

Here is a simple method for making a two-tone test pattern "stand still" on the scope face. It makes use of the fact that a harmonic of a tone will always be integrally related to the fundamental frequency. Although exact harmonic relationship between the two tones is ordinarily avoided in using the two-tone test for spectrum analysis (because it is desirable to be able to distinguish frequency components arising from audio harmonic distortion from others present in the signal spectrum), its use for wave-envelope checking introduces no problems that are not present with any two tones.

It is possible to obtain a synchronized wave envelope pattern from an s.s.b. transmitter using a single audio tone, but the procedure involves temporary carrier insertion and the transmitter is not operating normally when tested. On the other hand, if two independent tones are fed to the microphone input, it will not be possible to get a stationary pattern by synchronizing the scope with either input. While it is possible to rectify the r.f. and use the envelope to synchronize the scope, the sync will not be as "tight" as desirable because the envelope is slow rising, and also will vary in amplitude with audio level adjustments.

Suppose two tones are related so that their frequencies are always in the exact ratio 2/1. Calling the lower tone f, the higher frequency will overtake the lower by one cycle in $1/f$ seconds regardless of the value of f. Hence if we derive a pulse from f and apply it to the scope's external-sync terminals we will obtain a stationary pattern.

In our circuit, Fig. 1, we derive a pulse from a master oscillator, a 2-kc. symmetrical multivibrator, and use it to synchronize a second symmetrical multivibrator at 1 kc., one-half the frequency. The external scope sync is taken from the 1-kc. mv. plate, where the wave is fast-rising and the level is constant. The problem of converting a square wave to the required sine wave is solved by the use of a two-section resonant filter employing 50-cent surplus 88-mh. toroidal coils.[1] The total harmonic distortion should be considerably less than 0.1% using the circuit shown. Distortion is not detectable on the oscilloscope by any means we could devise.

In Fig. 1, V_1 is the master oscillator at 2 kc. The positive grid return improves the timing accuracy over that which would be obtained with the more conventional ground return. The grid resistors and coupling capacitors largely

* 10004 Belhaven Road, Bethesda, Md. 20034.

[1] Available from Ritco Electronics, 7229-C Little River Turnpike, Annandale, Va. Other sources will be found regularly in Ham-Ads.

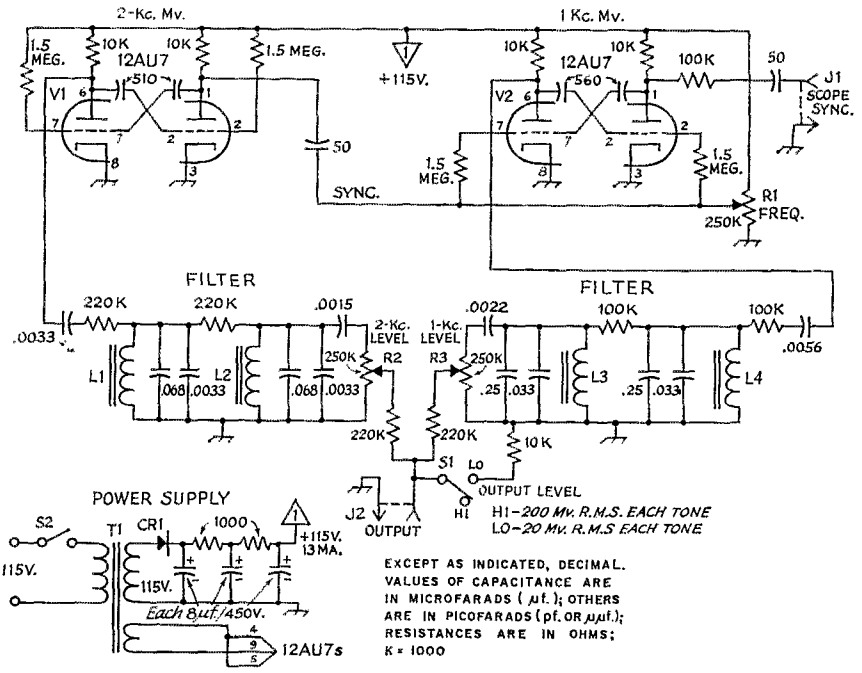


Fig. 1—Circuit of the two-tone test-signal generator. Fixed resistors are ½-watt composition. Capacitors in filters are mylar or paper; others are silver mica. Power supply capacitors are electrolytic.

CR_1—Silicon rectifier; 20 ma. or more, 300 to 500 p.r.v. depending on transformer secondary voltage.
J_1, J_2—Any type of shielded chassis-mounting connector.
L_1, L_2, L_3, L_4—88-mh. toroid (see text).
R_1, R_2, R_3—250,000-ohm linear control.
S_1—S.p.d.t. toggle.
S_2—S.p.s.t. toggle.
T_1—Power transformer, 115 to 150 volts, 15 ma. or more, with 6.3-volt, 0.6 amp. filament winding.

determine the frequency, and for this reason the capacitors are silver mica, 5 percent tolerance, and the resistors are ohmmeter-matched. V_2, operating at exactly half the frequency of V_1, is also a positive-grid-return mv. Here the positive return is used because it improves the synchronization, and also because variation of the grid potential is a very convenient way to control the free-running frequency of V_2. The sync pulse from V_1 is coupled to the arm of R_1 through a small capacitance. Synchronization occurs when the free-running frequency of V_2 is slightly less than half the frequency of V_1. Since the frequency range of V_2 is large, the values of the grid resistors and coupling capacitors in this stage are not critical as to absolute value, but the values should be equal. The capacitors should be of good quality for long-term stability; silver-mica capacitors are used for that reason.

Simple cascaded resonant circuits are used to filter out the harmonics in the square waves. The "level" pots, R_2 and R_3, feed a simple parallel resistive adding network which terminates in the output jack, J_2. The "level switch," S_1, connects or disconnects a small shunt resistance. When the resistor is connected, the level is about right for a crystal mike input; when disconnected, the level is higher for connection to a later stage.

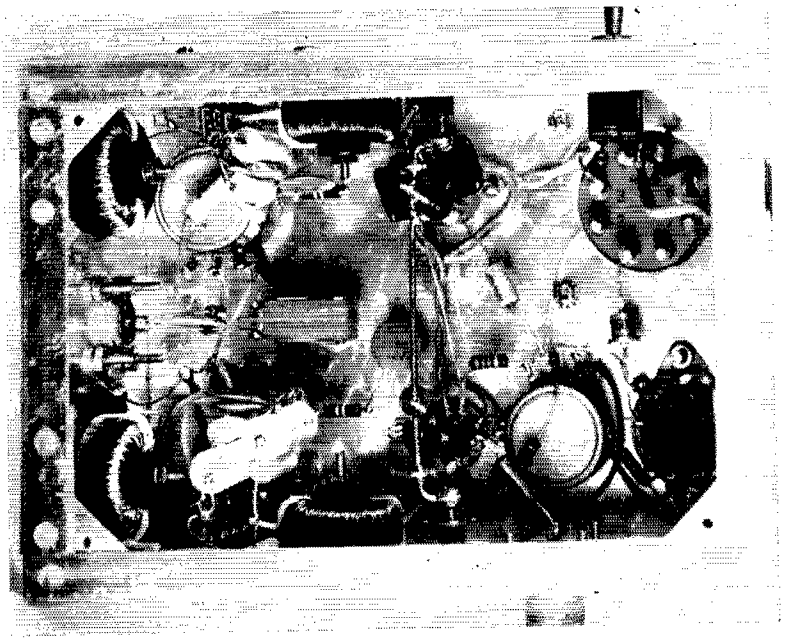
The power supply uses a half-wave rectifier and *RC* filter. Since the circuit is very tolerant of supply voltage, any small transformer which will deliver 20 ma. at 150 volts or less, and 6.3 volts at 0.6 amp., will suffice. The supply shown produces 115 volts d.c. at 13 ma. Any silicon rectifier having a rating of 20 ma. or more and a suitable p.i.v. rating for the transformer can be used.

The small coupling capacitors into and out of the audio filters were chosen to discriminate against hum while having little effect on the desired signals. Values near those specified should be used. Otherwise, more filter may be needed in the B supply, or signal attenuation may occur.

The mechanical layout is so non-critical that it is not included. The unit described was built complete with its power supply on a 5 × 7 × 3 inch aluminum chassis.

Initial Adjustment

To set the unit up, connect the tone output to the vertical amplifier and the sync output to the external-sync terminals on the scope. Bring



The four toroids are mounted on the chassis walls, as shown in this bottom view. Components can be arranged and wired in any convenient fashion.

both level pots up and adjust the scope sync control for a stationary pattern. Then adjust R_1 to make the pattern lock in at a frequency ratio of 2 to 1. This can be checked by running the level pots up and down to check that the periods of the two sine waves are in the ratio 2/1.[2] Once this adjustment has been made, it should not be necessary to reset it over considerable periods of time.

The next operation is to tune the filters. This is done by adding and subtracting capacitance, in steps of about 0.005 μf., with the object of maximizing the output. The values given in the circuit are close, but the toroids have a high Q and the capacitors have large tolerance ratings, so a bit of experimenting is in order. We used mylar capacitors because they are physically small and their long-term drift is presumed to be lower than paper units. They are expensive and may be unnecessary.

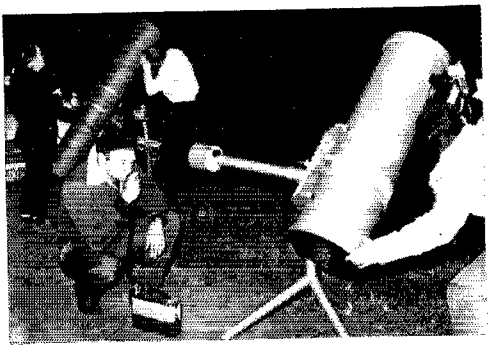
[2] An alternative method would be to take outputs separately from R_2 and R_3, applying one to the vertical and the other to the horizontal amplifier in the scope. R_1 should then be adjusted for the 2/1 Lisajous figure. — *Editor.*

Using The Generator

To obtain the two-tone pattern in a transmitter test, connect the r.f. output to the vertical plates of the scope as usual, and feed sync from the generator to the scope external-sync terminals. Feed the generator output to the audio input on the transmitter. Starting with a single tone, set the audio gain in the transmitter to give a power output of about one-fourth the maximum rating. Now bring up the second tone to equality with the first. The proper adjustment is indicated when the minimum amplitude of the pattern is exactly zero. Adjustments either side of this point will increase the minimum amplitude. Note that the synchronization is rock stable because the sync pulse is steep and is unaffected by any adjustments in the audio levels.

Since the distortion in the generator output voltage is below visibility in a scope presentation, any perceptible distortion of the wave envelope pattern must be the result of trouble in the audio, the r.f., or both sections of the s.s.b. transmitter. QST

Strays



Amateurs (Stargazing type) of the Kansas City Astronomy Club on November 12, 1967 observed a rare event — a grazing occultation of the planet Saturn. The group used two sites separated by about one mile with inter-communications provided by amateurs (radio type). Shown is WØHSK using a 2-meter f.m. Walkie-Talkie to contact WØPB at the other site. Such communications provided the amateur astronomers a means for last minute planning and consultation, and a warning as the event started.

Stopping Telephone Interference

BY IRVIN M. HOFF,* W6FFC

More on a subject that can touch any of us at any time.

An article in this magazine some time ago about telephone interference [1] reminded me that many people are still bothered with this problem. A simple solution exists, but apparently it is not well known, not even to telephone company personnel themselves in many localities. A review of the equipment being used by the telephone company today will reveal the reason for this interference and how it can easily be stopped.

In the early 1950s, the model 500 series telephones began replacing the model 300 line. These newer phones are readily identified with respect to the now-obsolete 300 series. The part you hold in your hand while talking is rectangular rather than triangular, the 500 has a "bell-loudness" control on the underside, the dial is quite large with the numbers on the outside circumference, and usually the model number is stamped on the underside in ink. There are several models, with the standard non-dialing 500 having a blank plastic panel in place of the dial. The 501 was designed for party-line use. The 500B set is the one most generally found in home use at the present time.

All of the model 500s have special networks installed that offer a form of automatic level control both for talking and listening. To quote from the AT&T directly:

"The 500 series sets were designed to provide substantial volume improvement on long loops and at the same time to be applicable on very short loops without introducing crosstalk and side-tone problems."

All sets have a 425A, 425B, etc., network that includes an induction coil, a 2-μf. talking capacitor, a 3-element side-tone balancing network, a 0.4-μf. ringing capacitor, and a dial filter consisting of a 0.1-μf. capacitor and a 50-ohm resistor. This network shapes the response to the familiar 300–3000 cycles for best transmission of the voice spectrum. Also included in the 425 assembly is the heart of the model 500 — the 311A "equalizer" circuit. (Not *all* model 500 series telephones have this equalizer, but for all practical purposes we can assume that *yours* does!) Without this equalizing network, severe crosstalk could result on short line lengths where the phone is not far from the central office. The network consists of a tungsten filament with a thermistor bead in proximity, both enclosed in a glass envelope, and a silicon carbide varistor bridged across the filament to protect it from excessive current. The action of this circuit is extremely interesting, and again we refer to AT&T for a description:

"The filament is in series with the microphone, and the thermistor bead in series with a loss-limiting resistor shunts the earphone. The loss characteristic of the equalizer is controlled entirely by the d.c. line current through the set. The tungsten filament has a rising resistance-current characteristic and inserts a combined battery supply and a.c. transmitting loss which is small at 27 ma. or less and rises to about 5 db. at 75 ma. or more. The thermistor bead is heated by the filament and because of its inverse temperature characteristic introduces a corresponding receiving loss that tracks closely with the transmitting loss."

Thus, the volume of the 500 set is about 5 db. higher at long distances from the home office than the 300 series sets. On local phones close to the home office there is practically no difference between the performance of the two sets.

Nearly every amateur running any power at all has been held responsible at one time or other for some form of interference due to the powerful signal from the transmitter being picked up by the 110-volt a.c. line — or an "antenna" of some type — and then rectified in some manner. Usually a well-placed bypass capacitor will solve the problem. On the rare occasions when an amateur would bother one of the older model 300 sets, the local phone company would send out a man armed with a few small disk ceramic capacitors which he would put across the terminals of the carbon button microphone. This would solve 99 percent of the problems. It is sad to learn that most phone companies even today *still* send men out with small disk ceramic capacitors to

*12130 Foothill Lane, Los Altos Hills, California 94022.

[1] Balmer, "Telephone QRM from S.S.B. Transmitters," *QST*, June, 1966.
See also "Technical Correspondence," *QST*, July, 1967.

put across the carbon button microphone — a technique that just does not work at all in a majority of cases where the model 500 is being used.

The truth is that most phone companies still have not learned the reason *why* the model 500 phone is peculiarly susceptible to this type of interference or what to do about it. The "varistor" in the equalizing network is little more than a pair of voltage-sensitive diodes in parallel, with one reversed. As anybody who has worked with r.f. interference can tell you, a rectifier will demodulate the audio from the carrier, and this audio will be passed along to the earphone or whatever subsequent circuit you have. In other words, it is the varistor in the 311A network that does the dirty work, and it is here that one should concentrate. Referring again to Mr. Balmer's article, he and his friends in the local phone company came to this same conclusion by empirical testing. Their answer to the problem was to order a special 425 network through the phone company that had some of these exotic parts left out. While this works, it minimizes some of the unique features of the 500 set. It is also quite a nuisance to get the phone company to special-order (or stock) such an item.

A far more simple solution exists.

A pair of high-current (75-ma. or more) 2.5-mh r.f. chokes is all that is needed to stop this interference. Installed inside the telephone itself, one in series with each side of the line and as close to the network as is convenient, they will prevent the r.f. from reaching the varistor. It follows that the r.f. can hardly bother the carbon-button microphone either. Since the microphone is hooked to a cord about 3 feet long, in extreme cases the carbon button should still be bypassed with a 0.01-μf. disk ceramic directly at its terminals for complete elimination. The use of the r.f. chokes will also eliminate the problem with respect to the "princess" telephones. Mr. Balmer mentions that they were unable to do anything about that type of phone.

The best thing to do, however, is to call the local phone company and tell them to send a man out with a "1542A inductor." This consists of a terminal block and two r.f. chokes built into a small case. It usually is installed in place of the baseboard terminal block, but at this location it seldom does much good, if the radio transmitter is located in the same building. With a pair of diagonal pliers ("dikes") the serviceman can clip off the corners of the plastic container and then mount the unit inside the dial telephone underneath the dial itself.[2] This can also be done for wall telephones. Usually, the phone company is so relieved to discover exactly how to solve your problem that they will be only too happy to try your suggestion. This also enables them to take care of similar problems of interference from the local broadcast stations and other transmitting services.

The 1542A inductor is much too large to fit inside the small "Princess" telephones, and here the 2.5-mh. r.f. chokes can easily be used.

In every instance of which I have heard, the phone company has been extremely cooperative, but usually not very successful. Inquiries to the home office for some reason have usually brought no good answers. Sending a man out to try the usual methods (installing numerous disk capacitors) is expensive and time consuming, besides keeping the employee from doing other work. So, even if you do not happen to have telephone interference yourself, you might call the engineering supervisor of the local phone company to see if he has read this article. I have found in several communities that many people are bothered by local broadcast transmitters and the phone company often has not been able to solve the problem adequately. Although they have various types of inductors designed to be installed on the outside of the house where the phone lines enter, or at the baseboard in place of the usual terminal block, in many instances they make no noticeable improvement, being too far from the actual trouble-causing element, the varistor. QST

[2] All the telephones in the writer's house in his former location in the 8th call area were "fixed" by this method, including a wall phone, a "Princess" phone, and several desk phones.

Strays

If you are interested in shortwave listening, the 1968 edition of the *World Radio TV Handbook* is available for $5.95 from Gilfer Associates, Inc., P.O. Box 239, Park Ridge, N. J. 07656. This 340-page manual, 6½ × 8½ page size, is an authorative listing of nearly everything that happens in the shortwave broadcasting bands. It gives comprehensive details on frequencies, languages and programs, country-by-country.

Also available from Gilfer Associates are a number of the ITU documents. For example, Volume I of the 1967 *International Frequency List*, showing all frequency assignments except amateur between 10 and 4995 kc., is available for $34.00. If you're interested in this sort of thing, and don't want to order directly from ITU in Geneva, write to Gilfer for its ITU flyer.

—•••—

HEADQUARTERS VISITS

The League Headquarters building is open to visitors Monday through Friday, 8:30 to 4:30, on a "drop-in" basis, and at other times by appointment. The headquarters is on Main Street (Conn. Route 176 and 176-A) about a mile north of the center of town, and about 3 miles west of Conn. 15-U. S. 5, the Wilbur Cross Highway. (For W1AW visiting hours, see the schedule on page 99).

Technical Correspondence

SCR NOISE

Technical Editor, *QST:*

In Hints and Kinks in the December issue K1MET describes a motor speed control using a silicon controlled rectifier (SCR). It's a very handy gadget for the uses described in the article, but one thing must be pointed out: No responsible amateur should use the device without proper filtering of the a.c. leads. The amateur using the speed control without filtering has no right whatsoever to complain about noise on the a.c. power lines from domestic appliances or other apparatus, since he's then generating lots of noise himself.

The output from the motor-speed control is shown in Fig. 1. Due to the steep rise when the SCR fires, the device generates a wide spectrum of noise, which of course propagates along the power lines.

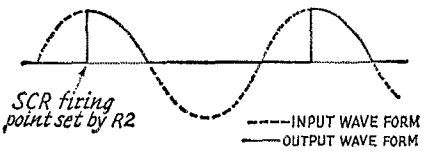


Fig. 1—Typical SCR waveform.

A filter like that in Fig. 2 has proved to be sufficient to keep the noise out of the power line. The entire device with filter must of course be completely screened, to confine the noise where it should be — in a grounded box.

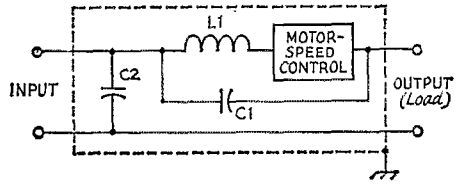


Fig. 2—Filter circuit for SCR control.
L_1-300-500 μh., ferrite or iron slug
C_1, C_2-0.1 μf. (see text)

When using the speed control with motors or tools with a power consumption of less than 50 watts, C_1 and C_2 should not be larger than 0.05 μf. in order not to disturb the wave form too much. — *Kjell Strom, SM6CPI, Gothenburg S, Sweden.*

MICRO-TO KEYER REVISITED

Technical Editor, *QST:*

Several builders of the Micro-TO keyer (*QST*, August, 1967) have described a latching condition of the relay following the completion of a letter, and also an inability to make dashes at slow speeds. Both effects are caused by excessively high voltage drops in CR_1 and/or CR_2, with the result that a small current can flow through Q_2 and thereby hold the pulse generator off. W1IKU was the first to suggest a remedy: add a 100K resistor from the base of Q_2 to ground. For those building the circuit from scratch, a better solution would be to use a low- or medium-gain switching transistor for Q_2, rather than a 2N3643. The only requirements on any of the transistors in the circuit are that they be silicon and have a beta greater than 10 (I've measured betas of 300 on some 2N3643's). W1IKU also suggests by passing both sides of the relay coil to ground with .01-μf. capacitors, since some r.f. can couple into the keyer via the keying lead.

Note that the line or dent on the IC's is by pin 8, rather than between pins 1 and 8 as shown in the schematic.

I welcome letters from anyone having trouble getting his keyer running, and would be glad to help prospective builders locate any hard-to-find components. — *Chet B. Opal, K3CUW, Baltimore, Md., 21201.*

"BREAK-IN C.W. WITH SSB EQUIPMENT"

Technical Editor, *QST:*

Sometimes, in trying to cover a lot of material as succinctly as possible, important details get covered up. Three such items came to mind almost simultaneously with the publication in November 1967 *QST* of the article having the above title. The first concerns zero-beating. With most grid-block keyed rigs, zero-beating is trivial: tie a 50K to 500K pot and a straight key in series across the key line and put the straight key on a board under your operating table. Adjust the pot for a comfortable zero-beat level in the receiver. I mounted the pot in a control-unit box because I was afraid that the desired signal level would require a different pot setting on each band. Such has not been the case, and the pot could easily be inside the rig, or down on the foot-switch board. The only problem with this scheme is that when the linear amplifier is being keyed along with the exciter, the zero-beat signal takes on a T4 quality, but with a little practice it's as usable as a T9 signal.

The second detail involves keying the extra mixer stage to eliminate feedthrough on the higher bands. Any tetrode, pentode, or pentagrid tube has a maximum screen voltage rating which must not be exceeded under any circumstances, even if you don't think you're drawing any screen current. Thus, whenever you cut off a screen-grid stage (as I did with the 12BA7 mixer in the SR-150), make sure the maximum screen voltage (100 volts for the 12BA7) is not exceeded under key-up conditions. This means that wherever a screen is fed from a dropping resistor a fixed voltage source must be used instead. In the case of the 12BA7 in my transceiver, I merely added a 10K resistor from screen grid to ground. The gain of the stage is probably slightly less now, but that's one of the reasons for an r.f. level control.

If you use a relay for keying the linear along the lines suggested in the article, keep in mind that mercury-wetted relays need a little bit of Tender Loving Care, such as a 100-ohm resistor and 0.1 μf. capacitor in series across the relay contacts. See page 44, October '67 *QST*.

Since the publication of the article, it has been pointed out to me that the Collins 30S-1 is a grounded-grid rig, not grounded-cathode, as I had mistakenly stated. — *George W. Hippisley, Jr., K2KIR/K1WJD, No. Syracuse, N. Y., 13212.*

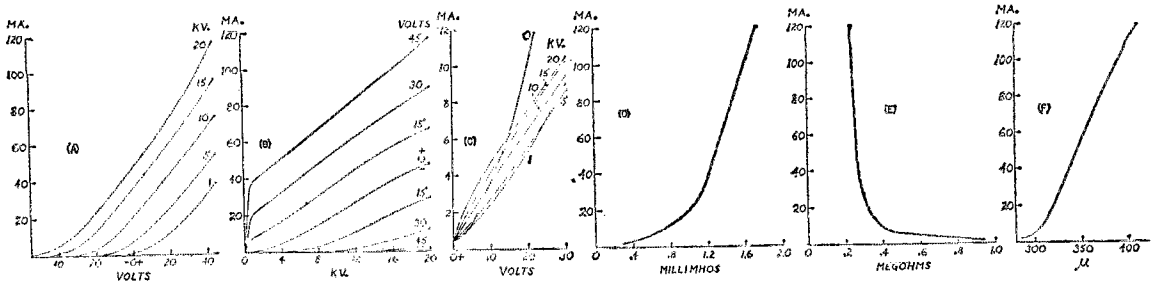


Fig. 1. Measured Characteristics: A. Plate current vs. grid voltage; B. Plate current vs. plate voltage; C. Grid current vs. grid voltage; D. Transconductance vs. plate current; E. Plate resistance vs. plate current; F. Amplification factor vs. plate current.

HIGH-GAIN TRIODE OF FORTY YEARS AGO

Technical Editor, *QST*:

The UV206 and its larger brother UV208 came out of the laboratory and into production during 1921. They appear to have been designed for converting spark transmitters to continuous-wave operation. The very high transformer voltages available caused the UV206 to have the rather unusual characteristics given in Table I. This tube was considered somewhat of an engineering wonder in its day. D.c. plate power to r.f. load power conversion efficiencies approaching ninety percent are reported[1] under what are now called extreme class C conditions. Unfortunately, most of the information is only suitable for prediction of oscillator performance. Measured characteristic curves of a nearly new sample of the UV206 are shown in Fig. 1.

Before the invention of quartz-crystal frequency control there was no particular need of a high-gain amplifier. Nevertheless, the UV206 appears well suited to this use. Consequently, a test setup was made. The well-shielded driver is a pair of UV201 receiving tubes in a push-pull Hartley circuit. It provides equal voltages of opposite phase which are applied respectively to the grid of UV206 and the neutralizing condenser. A neutralization balance better than 60 db. is secured. This is sufficiently in excess of stage gain to insure stable operation. The load, consisting of sixteen 75-watt lamps calibrated at 60 cycles, is connected across part of the plate coil having 960 microhenrys total inductance. The operating frequency is 780 kc. Table II gives the results. As may be expected, the power gain compares favorably with a modern-day screen-grid tube and good efficiency is achieved. Examination of the shape of the output voltage wave by means of an oscilloscope indicates the distortion is less than five percent. The color of the plate shades from orange at the center to dull red at top and bottom. It would appear that the limit of tube capability has not been reached under the test conditions.

The very low plate-to-filament capacitance should allow the UV206 to operate well as a grounded grid amplifier. Does anyone have more information on the designer, number made, where manufactured and used, etc.? I would be much interested to secure, by loan or otherwise, a second UV206 tube so that a push-pull arrangement could be tried; and will be pleased to learn of anyone having, or knowing, the whereabouts of same, or a UV208 tube.

—Grote Reber, ex W9GFZ, Radio Observatory, P.O. Box 293, Delaware, Ohio 43015

[1] "Vacuum Tubes as Power Oscillators", D. C. Prince *Proc. IRE*, June 1923, Vol. 11, No 3, p. 275-313.

TABLE I

Nominal Characteristics of the UV206.

Capacitances	
Grid to Plate:	12.0 ± 0.2 pf.
Grid to Filament:	7.2 ± 0.3 pf.
Plate to Filament:	0.9 ± 0.1 pf.
Filament	
11 volts, 14¾ amperes	
Characteristics at 100 ma. Plate Current	
Plate Resistance:	0.24 megohm
Amplification Factor:	390
Transconductance:	1.62 millimhos

TABLE II

Typical Performance

Plate Potential	20,000 volts
Plate Current	110 milliamperes
Output	1690 watts
Plate Efficiency	77 per cent
Grid Bias	— 45 volts
Peak to Peak Excitation	350 volts
Grid Current	29 ma.
Input	2.6 watts
Gain	28 db.

COMING A.R.R.L. CONVENTIONS

April 26-27 — Michigan State, Lansing.
June 1-2 — New England Division, Swampscott, Mass.
June 7-9 — NATIONAL, San Antonio, Tex.
June 29-July 1 — Saskatchewan Province, Saskatoon.
June 29-30 — Rocky Mountain Division, Cheyenne, Wyoming
June 29-30 — West Virginia State, Jackson's Mills.
August 3-4 — Central Division, Springfield, Ill.
August 31-September 2 — Southwestern Division, Phoenix, Arizona
October 12-13 — Hudson Division, Tarrytown, N. Y.

Hints and Kinks For the Experimenter

GMT CLOCK FACE

IN DX work the use of Greenwich Mean Time is a must. There are various time conversion charts, but all leave something to be desired. Each time you wish to use GMT, you have to read the time on the station clock and then do some figuring. Twenty-four-hour clocks are available, but they are quite expensive.

Since most hams have 12-hour clocks in their stations, why not modify these clocks to indicate 24-hour GMT? I solved this problem by developing the clock face shown in Fig. 1.

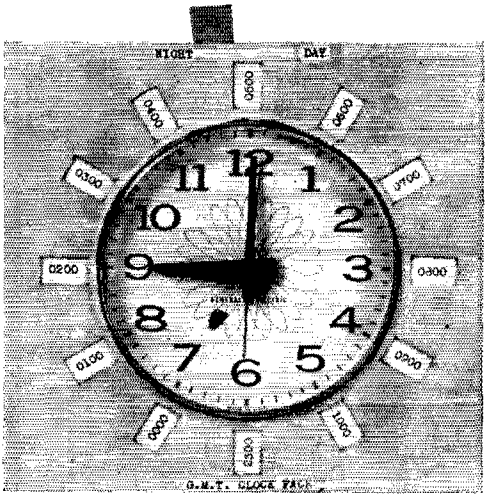


Fig. 1—The GMT clock face installed on the kitchen clock The original numerals on the clock have yet to be painted over as described in the text.

Fig. 2 shows the parts that make up the gadget. Cardboard, plastic, metal or thin wood can be used. After the parts are assembled, part 2, a movable ring, indicates the correct time division when its tab is set above the proper label (i.e., DAY or NIGHT). When the tab is moved to DAY, the GMT hours corresponding to 6 A.M. to 6 P.M. EST are shown; when the tab is moved to NIGHT (Fig. 1), the GMT hours corresponding to 6 P.M. to 6 A.M. EST are shown. To build the face, proceed as follows:

1) Disassemble your station clock, and paint out the figures 1 to 12. Be sure not to cover the hash marks that indicate minutes. Reassemble the clock and measure the diameter of the clock face. The diameter is indicated by "D" in Fig. 2.

2) Using a protractor to measure 30-degree angles, lay out part 1. Cut out twelve ⅜- by ⅝-inch rectangular openings and one circular opening with a diameter equal to "D."

3) Using a protractor to measure 15-degree angles, lay out part 2. Cut out a circular opening with a diameter equal to "D" plus ⅛ inch. Label the ring. The times shown are for Eastern Standard Time (i.e., 1700 GMT will be in the 12 P.M. slot when the ring tab is at DAY, and 0500 GMT will be in the same slot when the ring tab is at NIGHT). For CST move all figures 30 degrees counterclockwise from where shown, for MST move all figures 60 degrees counterclockwise from where shown, and so forth.

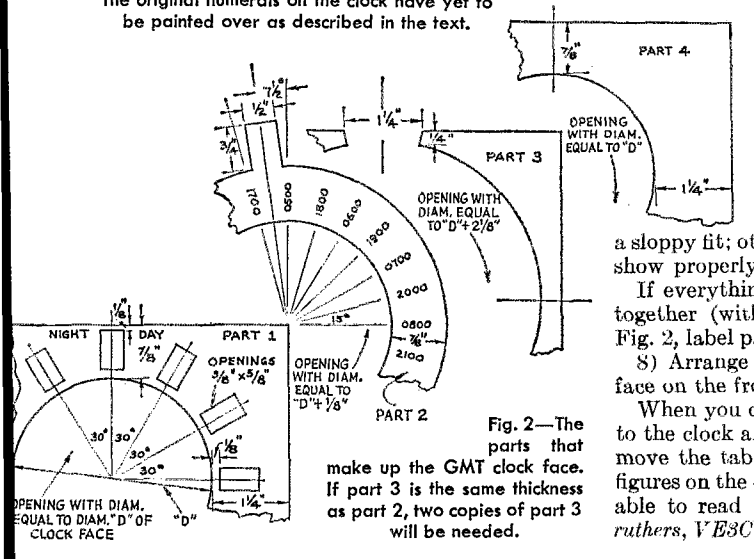


Fig. 2—The parts that make up the GMT clock face. If part 3 is the same thickness as part 2, two copies of part 3 will be needed.

4) Make two copies of part 3. Since the ring rotates inside part 3, two thicknesses of material must be used to provide room for the ring to rotate.

5) Make one part 4.

6) With the ring in place, temporarily put all the pieces together. Make sure that the ring rotates easily. Do not settle for a sloppy fit; otherwise your GMT figures will not show properly through the openings in part 1.

If everything fits well, glue parts 1, 3 and 4 together (with part 2 in place). As shown in Fig. 2, label part 1 "NIGHT" and "DAY."

8) Arrange a suitable mounting to hold the face on the front of your station clock.

When you operate in the daytime, reach over to the clock and move the tab to DAY. At night, move the tab to NIGHT. Since there aren't any figures on the clock face itself, you now should be able to read GMT at a glance. — *W. R. Carruthers, VE3CEA*

NOTES ON THE KNIGHT-KIT TR-108

In the October *QST* write-up of the TR-108 transceiver, it is mentioned that the spotting signal is very weak. The low spot output is due, I believe, to some errors on pages 24 and 25 of the assembly manual. R_{55}, a 68-ohm resistor, is shown connected between pin 3 of V_8 and pin 1 of TS_{11}. The latter pin is eventually connected to the spot switch and the send-receive relay. However, part of this hookup does not agree with that shown on the schematic diagram.

Referring to Fig. 3, remove one end of R_{55} from pin 1 of TS_{11}, and connect this lead to ground lug C or D of V_8. TS_{11} and the orange wire going from it to pin 1 of TS_4 can be removed or left intact; they serve no useful purpose. As a result of this modification you should have a spotting signal of more than adequate output.

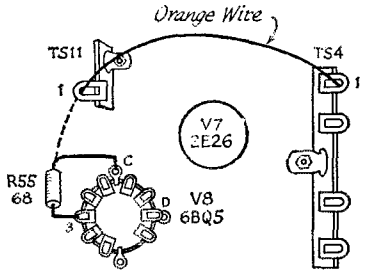


Fig. 3—Sketch showing part of the underside of the TR-108. Spotting in the transceiver is greatly improved by disconnecting one side of R_{55} from TS_{11} and returning the lead to ground lug C or D of V_8.

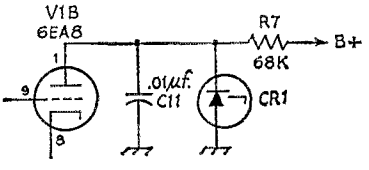


Fig. 4—Circuit for regulating the tunable oscillator plate voltage in the TR-108. C_{11}, R_7 and V_1 are original parts. CR_1 is a 67-volt, 1-watt Zener (Sarkes Tarzian VR67).

An improvement can be made to the TR-108 receiver by regulating the plate voltage of the tunable oscillator, V_{1B}. As shown in Fig. 4, connect a Zener between the plate of the tube and chassis ground and change R_7 to a 2-watt unit. Prior to this modification, during mobile operation my receiver drifted whenever the battery voltage changed. — *Frank Morrisino, K1LMY*

A SAFETY PRECAUTION FOR THE SCR MOTOR-SPEED CONTROL

The SCR motor-speed control in the "Hints & Kinks" column of December 1967 *QST* could very well become a *death trap!* I strongly suggest that the box be grounded to the power line via a three-prong plug (Amphenol 160-11) at the end of a three-wire cable, and that a three-contact female socket (Amphenol 160-2) be used at the output. — *Herbert M. Rosenthal, W2PIV*

ANOTHER METHOD OF COPYING C.W. WITH A V.H.F. RECEIVER LACKING A B.F.O.

In the August 1967 "Hints & Kinks" column of *QST*, W1HDQ described a method of receiving c.w. and s.s.b. on a v.h.f. transceiver that didn't have a b.f.o. By using the v.f.o. in the spot position and beating the output of the v.f.o. with the incoming signal, one could receive these two modes. However, some v.h.f. operators do not have a v.f.o. In that case, the following method might appeal to them.

If the v.h.f. transceiver has a squelch circuit, the circuit can be used as a substitute for a b.f.o. To receive a c.w. signal, turn the squelch control to a position where the receiver is muted. Then, with the receiver tuned to the signal, back off the control to a spot where the signal breaks the squelch when the signal is keyed. Although there is no audio note, the background hiss that is evident during key-down will contrast with the quietness of the receiver during key-up. This method works well with a rig, such as the Gonset Communicator, that has a fast attack, fast release squelch circuit. — *Thomas W. Bridges, K6DLY*

SEPARATING KIT PARTS

While putting together electronic kits, I have often found it to be quite a problem to store resistors, capacitors and other small parts, so that any particular component could be located without difficulty. I recently solved this situation during the construction of my HW-32A. As shown in Fig. 5, I placed vertical strips of masking tape (sticky side up) about two inches apart on a piece of cardboard. This permitted all the small components to be stuck to the tape until they were needed. — *Jack C. Andrews, W9YWE*

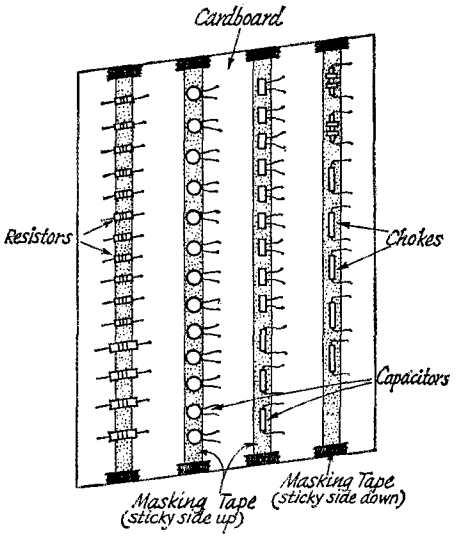


Fig. 5—W9YWE's method of separating kit parts.

The First Novice WAC

BY Dr. J. MICHAEL BLASI,* W4NXD

I RECENTLY read in *QST* that a Novice had worked DXCC before going on to get his general license. Several Novices have done this before and it is not an uncommon feat for them to get a WAC.

In the early 1950s, the first Novice received the WAC award. Since it has been about 15 years, the truth can now be told about the very first Novice to work all continents. He received no award, no publicity and only a few hams are even aware of his untold feat.

Wilbur had received his call WN2——, during the first week in July. He was the first Novice in his state to be licensed, as the newly created Novice license was only a few months old. A second-hand S38B receiver and a pair of 6L6s set him up on 7182 kc. while a dipole from the garage to the apple tree pounded out a cool 25 watts.

For Wilbur it was a long, hot summer of hundreds of QSOs. He was on forty c.w. day and night and, if necessary, ate his meals with his left hand while the right pounded out c.w. on the J38 key.

At first his parents were happy that their 17-year-old son had a hobby that kept him off the streets, but about the middle of August they realized that ham radio might become a problem. In just one month Wilbur was to start his freshman year at State U. where he had been accepted by the skin of his Novice teeth.

Two weeks before he was to leave for the ivy-covered dormitory walls of State U., Wilbur was given some cold words, words that would put fear into the heart of any Novice.

"No ham radio till next June and if you don't buckle down and make good you can forget amateur radio," stated Wilbur's dad.

Well, Wilbur was supposed to put all his gear into wooden boxes to be stored in the attic until June, but the germ in his brain was too much for a mere flesh-and-blood Novice. He carefully packed his S38B and a pair of cans into the bottom of his trunk just before he left for college. When his mother wanted to check the number of shirts she had packed he was in shock till the crisis passed.

Wilbur settled into his dorm room without any further difficulty except that he noted two rules in the list of several thousand, or so it seemed, which all students must adhere to:

1) No ham radio equipment
2) Curfew at 12:00 for all Freshmen

Any violation could result in expulsion from the University.

About the middle of November on a very dark night at 2 A.M., a thin piece of wire slowly crawled down the outside wall of the dorm. If you followed this wire up to its source you would see a figure sitting under a blanket slowly tuning for DX. You can't stop a Ham!

*711 Broad St. S.W., Gainesville, Ga. 30501.

"A FAINT ORANGE GLOW WAS CREEPING INTO THE DORM WINDOW."

Wilbur kept his listening confined to weekends when his roommate was at home. He had his *QST*s sent to him at college and this also helped to feed the flame.

Thanksgiving vacation found Wilbur back at home with a C-average and an idea in the back of his mind. While his parents were out of the house our hero set about to build a single 6L6 rig for 80 c.w. from the transmitter that had served him well all summer. It was small, but that 10 watts would get him on the air for at least two hours each week.

It wasn't easy, but if you strained your ears you could hear WN2—/2 about 3 A.M. each Saturday. He even worked a WN4 once.

One Saturday about 4 A.M., the 80-meter Novice band seemed a bit funny to Wilbur as he fired up his 6L6; the signals had a funny "ping" sound to them. He called CQ and turned the gain up to catch a chirpy signal calling him. It was SP6 — in Poland. Wilbur was paralyzed for a second. He recovered his wits and exchanged 569s before the final 73.

Now another station was calling WN2——/2. It was ZS5—— calling his first WN2. Wilbur was in another world. This couldn't be true. His forehead was damp as he logged the two contacts.

It came to him; 80 meters was wide open. A 589 from a WN7 in Oregon was next for Wilbur's potent 6L6.

A JA1 was calling CQDX 20 kc. up from his frequency. Did he dare try to keep his string going? You bet he did. A 339 from Tokyo was copied a few minutes later.

Power does strange things to mortals for

Wilbur, having signed with the JA1, called a QRZ DX which is not heard very often on 80 meters, especially from the Novice end of the band.

Rules are made to be broken and evidently the LU2 in Argentina had not known about this as he called WN2——/2.

Fifty minutes before, Wilbur had been lowering a piece of #22 wire out of his window; now he was floating somewhere between heaven and earth. A check of his log showed five continents worked in less than an hour. Was it possible? Could he get that WAC before the sun came up and his thin aerial must be pulled up?

He tuned his receiver down into the general band and prayed for his S38B to perform the last part of the miracle. At 3595 kc. he heard VK—— calling CQDX. This was almost 200 kc. from his frequency in the Novice Band and a faint orange glow was creeping in the dorm window. It was now or never. Wilber called that VK2 for five straight minutes, the longest in his life. Up went the gain of his receiver, and then nothing; but then a faint QRZ, QRZ de VK2——. The room was much lighter now and only minutes remained before the wire must come up.

Wilbur called the VK2 twice, signed his own call five times and swallowed hard. There it was WN2——/2 de VK2——, tnx call, ur rst 459....

The first Novice WAC and on 80 meters with only 10 watts!

At first he couldn't sleep, but then the rest that only a ham who has worked DX knows came over him.

It was early afternoon when someone pounded on Wilbur's door and yelled, "Telephone!"

He threw on a robe and slowly walked to the phone booth at the end of the hall.

"This is Western Union calling, I have a telegram for you from the American Radio Relay League in Connecticut. Do you want me to read it to you?"

"Er, ah, yes," stammered Wilbur, suddenly wide awake.

MR. WILBUR——
RADIO WN2——/2
ROOM 325
STATE UNIVERSITY

DEAR OM:
W1AW HAS MONITORED YOUR SIGNAL ON THE 80 METER NOVICE BAND EARLY THIS MORNING STOP CONGRATULATIONS ON FIRST NOVICE WAC STOP WE WILL SEND PHOTOGRAPHER FOR COVER STORY IN QST STOP PLEASE WIRE COLLECT YOUR CONFIRMATION OF THE ABOVE STOP.

Wilbur could not believe his ears. This was the moment of a lifetime, the dream of every ham. Then he remembered the dormitory rules he had broken, his college career and the words of his father.

"Do you wish to reply now," asked the operator?

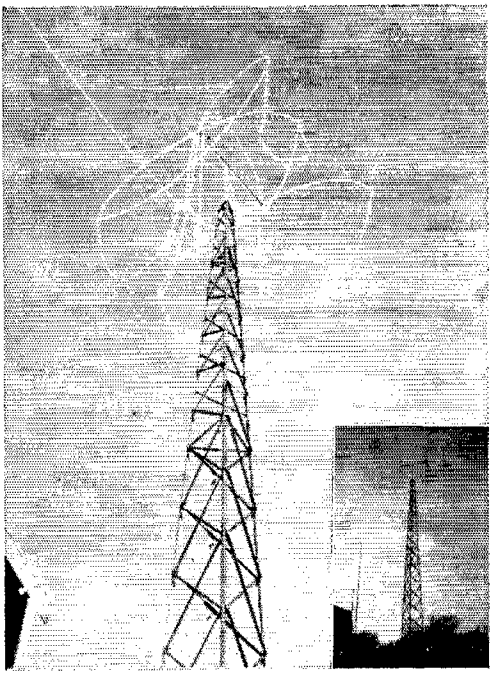
"Yes," said Wilbur. "Please inform them of the following. 'You have made a mistake. My last ham activity was in September on 40 meters!' "

It must have been dusty in that phone booth because something got into Wilbur's eyes and caused both of them to fill with tears. QST

Strays

First-Day Covers Still Available

When the Amateur Radio First-Day Covers were processed in Anchorage on December 15, 1964, we gambled and had a few extra unaddressed covers prepared, because orders for the first-day covers were still coming in and we didn't want anyone to be disappointed. We still have some of these left. They are all singles, unaddressed but carrying the stamp and the official first-day cancellation, and they will be mailed to you in an envelope. Prices are 35c each, three for a dollar. Send your orders to ARRL Hq., 225 Main Street, Newington, Conn., 06111.



Shown left is W1LZL's 14-Mc. quad after an ice storm. After seven days of frosty cold weather, the antenna thawed and returned, with no ill-effects, to its original shape as shown in right photo.

The War on Hampathy

BY JOHN W. FULLER,* K4HQK

You may not agree with the author's conclusions, and amateurs whose professions are psychology, psychiatry or motivational research may want to enhance or take issue with these ideas. However, the author admits he may be guilty of generalization and over-simplification; but at least he has some interesting ideas as to what makes us tick in this amateur radio hobby of ours.

HAMS are reputedly an enthusiastic lot. The XYLs will agree, with resignation. At this very moment though, one of us is about to find himself staring glassy-eyed through his S meter, wondering "What the devil am I doing?" Or, after the ninth QSO in a row consisting of "Tnx OM ur RST 599 in Pottsburg Pa Name Irving Hw?" another will angrily snap the toggle switches to "off," and muttering, join the wife in the living room as she pastes trading stamps in a book.

Why does this happen? What can be done? Recent statistics[1] indicating a decline in new amateur licenses have brought to mind the possibility of saving — and in some cases, *salvaging* — amateurs who've been around for awhile, yet are beginning to lose interest. First, let's examine the reasons for taking out a ticket in the first place. Something attracted us to the hobby, and several possibilities exist. Among the more common: a natural transfer of interest from commercial communications or engineering; a fascination with the idea of talking with people in foreign countries; the science of electronics; a desire to meet people[2]; the prospect of being able to communicate with anyone, anywhere, from anywhere (boat, car, etc.; and the glamour of it all.

Our second step in searching for a solution to ham apathy, or to coin a term, "hampathy," is in defining how most of us spend our time with ham radio once the "Novice passion" has subsided. Once more, and with tongue in cheek, categorizing is necessary:

Group I

The Traffic Net Operator. This gentleman decorates his walls with clipboards and net schedules. A four-tiered basket on his desk squeeks with pounds of paper. Life is regular for him, because he is net control on Tuesdays and Thursdays at 1830 on the Sons of Godzilla Traffic Net.

The Public Servant. You'll find him devotedly enrolled amongst the ranks of the AREC, the the ARPSC, Civil Defense, Coast Guard Auxiliary, the DAR, ASPCA, and UNCLE. One ear is attached to a 2-meter net, while the eyes scan the latest hurricane advisory. In a rush to carry his transceiver to an emergency, he once fell over his son's bicycle and ended up an emergency case himself.

The Developer/Experimenter. Our engineering elite. This amateur breathes oxygen so that he might advance the state of the art. One corner of his shack holds a drawing board, another a completely equipped work bench (frequency

* 1775 Leon Rd., Apt. 10, Jacksonville, Fla. 32216

[1] "League Lines," *QST*, March 1967. Page 10.

[2] A few toes may be bruised by this statement, but I believe it to be well-founded: *When an individual must turn to amateur radio for social intercourse, something exists about his personality that renders conventional social contact difficult.* There are two instances, one of which is the handicapped person (our hobby does itself most proudly in fulfilling his life). The other is the neurotic and/or obnoxious individual, who finds the airwaves an ideal medium for catching a pair of ears to hear him out. Please understand, however, that by "meeting people," I mean specifically the persons who rely on radio for the *largest portion* of their social lives. Although most of us make many friends over the ether, these friendships are usually lightly-taken and are often temporary.

counter, noise generator, cessium atomic standard). He *may* have a rig on the air.

Group II

The Rag-Chewer. Four basic types are known: 1. The old goat who owns one 75-meter crystal, has plenty of time, even more hot air, and nothing much worth saying but does so anyway (he usually runs an 813 or two on a.m. and cusses them sidewinders who he's dang sure QRM him on purpose but who don't know his old bucket of bolts blasts through anyhow). 2. The Authority, who attracts a roundtable following on the state net frequency, and then challenges anyone to disprove his opinions. 3. The Regular Joe, who swaps stories, chats about mutual interests, and sends a QSL. 4. The Vapid Churl, who acknowledges you are 40 db. over S9 and then rapidly proceeds to bore you with the tuning idiosyncracies of his final amplifier.

The Certificate Hunter. Look closely, for you may not see his station for the paper. Where awards in 79¢ black picture frames don't cover the wall, lists of unachieved obstacles do. At a dollar per award, his XYL suggests, he might have made the last two car payments. You'll find him on 14,075 kc. trying to work All Yukon Trading Posts.

The Contest Operator. Notice the red-encircled dates on his calendar. Midnight oil lubricates his amateur activity. His domain features half-empty coffee cups, soft-drink bottles with cigarette butts in the bottom, and a multiplicity of check- and double-check sheets. Once he took first place in the Drill Press Operators QSO Party and treated the wife to dinner at a burger palace.

Group III

The Project Ape. The Ape lives only to add one more little gadget to the already teetering totem atop his receiver. Once he verifies over the air that his new Little Marvel works perfectly, he silences the rig and plugs in the soldering iron, to begin the next improvement. He owes his soul to the Minibox manufacturers.

The Hallowed DX Man. Awesome in his power, the DX Man stands for all to see. Neighbors blink incredulously at the 120-foot tower crowned with wide-spaced 5-element 20-meter Yagi. Some claim he started an uprising in a small Latin-American dependency so that he might have a new country to work.

The V.h.f. Operator. Six- and two-meter phone are his delight. If he has facilities for 1¼ meters and above, he falls under the "Developer/Experimenter" shown above. One day he will Work All States, but in the meantime, contents himself with reminiscences of the 1958 sunspot peak. An unchalleneged authority on detergents, deodorants and underthings, he watches a *lot* of daytime television waiting for sporadic-E skip.

The C.w. Man. Pride is his upon achieving the 35-w.p.m. endorsement. The C.w. Man's stock-in-trade is a clean fist, an electronic keyer with dot memory, full break-in, and an A-1 Operator's certificate. Only trouble is he can't spell.

Now we get to the heart of the matter, how to combat "hampathy." You probably will find yourself in one of the categories just listed, and unless you are dyed-in-the-wool, no-questions-asked, do-it-or-die on the subject, then you *may* be vulnerable to dwindling interest. So here is the crux: *Interest and desire are strengthened when a given act or completed task brings a reward.* A reply to a CQ is a reward of sorts. And the dyed-in-the-wool enthusiast is rewarded by the self-satisfaction of doing a job well. But generally speaking, the most important form of reward sought after in ham radio is *recognition.* Not a testimonial dinner, but a simple "thanks" or "you're doing a great job." When we do something we think is pretty darned good, and someone commends us for it, we're likely to do it again. Recognition, then, being a reward, motivates us to repeat the good job and perhaps even improve upon it in order to gain another reward.

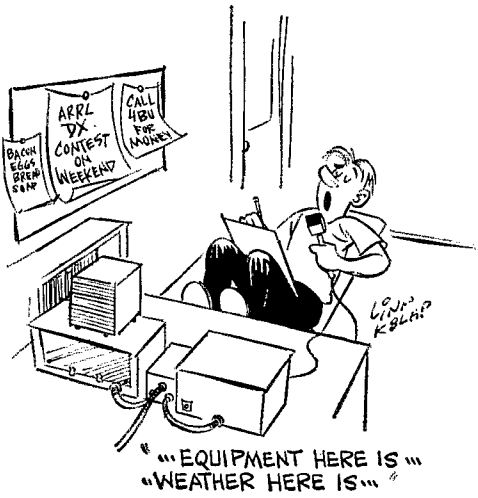
With these thoughts in mind, let's re-examine the list of 10 ham types. Notice how they're grouped. Can you see the reason for grouping them that way? Group I amateurs are most likely to stay with the hobby for a long while. Group II is shaky, and Group III hams constitute a bad risk. And here's why: the first group consists of pursuits that (a) offer plenty of potential recognition and achievement, and (b) provide no physical limitations on *quantity* (there will always be a need for traffic relaying, experimentation, and emergency service). In the middle group, although there still is no physical limit on quantity, there *is* doubt in one's mind as to the *real value* of it all, and recognition is rather limited. But the most hampathy-prone of our fraternity fall in the last group, in which achievement in terms of accomplishment and contribution are miniscule. Recognition is practically nil, and physical barriers are suddenly apparent.

Obviously, then, the solution to hampathy is to first *acknowledge* that you are disenchanted, and then seek either a way to get some reward for your efforts or find another facet of ham radio that *does* provide rewards. The best possible solution is to culture a *variety* of interests, so that when one activity becomes tiresome, another fresh activity is available for leisurely entertainment. All this, incidentally, is very well tempered by an additional hobby *apart* from electronics altogether. You know, a good thing can be overdone.

So if you feel a tinge of creeping hampathy, plop down in your favorite easy chair one day when the wife and kids aren't around, and just meditate for a couple of hours. Thumb through some old ham magazines, if you should decide to spark another interest. But whatever you choose to do, make sure there's some way of obtaining a little recognition for your efforts. This activity, figured in with your old amateur endeavor, will make you a happier ham. And best of all, your one-man War on Hampathy won't cost one tax cent! QST

I'm Not in The Contest But . . .

BY KATASHI NOSE,* KH6IJ



THIS is an appeal for help from a contester to non-contesters. By knowing something about the fine points of contesting perhaps you can tolerate, if not help us.

The contester frequently is slowed down by operators who check in saying "Sorry, I'm not in the contest, I didn't mean to interfere . . ."

Some will start giving their names (oops, handles), S-meter readings, equipment description, and weather information, even before call signs are clearly established.

A True Contester

A true contester keeps contesting year after year and probably appears on the band only during a contest. The rest of the time he probably is refurbishing his equipment or, more likely, just listening.

He recognizes other contesters and knows that he can get a short burst of information from them and be on his way.

Top scores in the ARRL DX Contest are over one million points. To earn this, a contester must make over 4000 contacts in practically all Canadian and U.S. districts from 80 through 10 meters, and even 160 and 6, if conditions permit.

He must be able to maintain an average pace of 60 contacts per hour throughout the contest, but must be able to slide up to as high as 130 contacts per hour during a hot stretch. To maintain this pace he must resort to all kinds of guiles and still maintain order. How to do this has been the subject of past particles by this author and others, and need not be repeated except to say that the contester must and can maintain complete control of his frequency. He has only himself to blame if he lets the situation get out of hand.

Goals and Procedures

A contester studies past performance of his competitors from which he sets up pace markers. For example, within the first thirty hours of the ARRL DX Contest he must be near 1800 contacts, because the next 42 hours will yield him approximately 2200 contacts for reasons mentioned later.

He also knows that it is difficult to compete across time zones. Moreover, unless he can get into the dense ham population areas (the second and third district for the U. S.) he cannot expect to compete successfully with those more favorably situated and must trim his sails accordingly.

* Physics Department, University of Hawaii, Honolulu, Hawaii 96822.

A contester knows that if he piles up contacts, the multipliers will automatically take care of themselves. It is not discourtesy which prevents him from indulging in the banalities of ham radio such as "I hope to see you further down the log" or even "signing off and clear." "73 and good luck" takes only two seconds to say, but multiply that by 4000 and that's two and a quarter hours! In two and a quarter hours he can make up to 225 contacts and that's enough to break a tie.

Have you ever picked up a pencil 4000 times? A contester soon develops the habit of hanging on to his pencil (or pen) even while sending on the bug.

Get The Information Across

If police and airline dispatchers were to carry on their conversation in conventional ham style, they wouldn't get very far. A contest is a communications exercise. A contester tries to convey maximum information within the least amount of air time. He must phrase his information in a manner so as not to confuse others. He does not change his pace, delivery, or format. He cannot afford to use the usual stalling techniques such as "er, ahhh," but instead he must be able to take a deep breath and give out a line of information without a pause.

This is simple in some contests but in others this is a formidable task because the contester must think as he goes along, assembling the information while talking, noting the time, logging, and getting set for the next burst of information.

During a particularly hot stretch, he may be logging one or two contacts behind and perhaps filling in the missing information for other contacts still farther behind. This is apt to occur

when he starts a new page on a log and is making two or three contacts a minute.

He Quickly Fishes Out The Band

Two hours is about the maximum time that one hundred contacts per hour can be maintained. Beyond that time the rate deteriorates since he fishes out the band rapidly.

The operator then has two alternatives. He can either change bands or resort to some attention-getting technique to squeeze out the band. The decision is influenced by how long the contest has been in progress and the condition of the band.

In a fished-out band there are three kinds of stations left, those that are violently opposed to contests, those that are out for a ragchew, and those who are hesitant about calling in because they are not sure about the rules of the contest. The latter two groups are a potential source of new contacts, but the problem is how to entice them to answer and still be able to promote a quick exchange of information without hurting their feelings.

One way is to intersperse the CQ with "You don't have to be in the contest, anybody, just give me a contact." This usually entices type number three and possibly two. After you get them to answer you, the rest is up to the operator's ingenuity to speed things up. One way to do this is not to give the station a chance to get wound-up by forcing a quick break-in type of operation with a series of leading questions such as, "What state are you in (usually a state of confusion)? Give me a quick break," "What's my report? Give me a quick break," then acknowledging with an "OK" and beginning the CQ cycle over again before the other station has a chance to say "73 and good luck; see you further down the log." The best time is approximately 40 contacts per hour with this method and therefore it is good only as a last resort in a fished-out band. In a good band, one CQ ought to last for two hours.

Appeal for Help to Non-contesters

A contester is not interested in handles, accurate reports, or description of your equipment. Neither does he need any good wishes and CU again. He wants the contest information and wants to get going. The faster you can provide this information, the more he will admire your operating skill.

The shorter you make your call, the better he likes it. If you don't get him on the first few tries, lay off for a while because a good contest operator will fish out the band quickly. However, if the band conditions are such that it is open for only a short time, then I have no answer other than to suggest the following technique.

Unless the DX operator has certain prejudices he will go back to the fastest operator *he can decipher*. The one who can squeeze in the most information into a given time block is usually the winner in a pileup.

Consider the one who signs as "whiskey able the number six x-ray whiskey foxtrot." In a pileup this information is profoundly chopped up because there is too much useless information. Why not just "WA6 xray whiskey foxtrot." The important thing is to get across at least two letters of your suffix, not the prefix. If the DX station has any savvy at all he will carry this bit of information to a successful conclusion. If you are a rare one, then you can play it up.

If you are a non-contester and get called by a contester, ask for the required information by a series of short transmissions. Listen to see what the others are doing and see whether your country is eligible or what type of information is sought. The contester needs your help but above all, speed is of essence.

How to Obtain a QSL

An avid contester makes over 15,000 contacts per year and is deluged with requests for QSLs. Anything you can do to ease the burden will enable you to get a QSL. Send a self-addressed stamped envelope or IRC. Express all times in GMT. Local time involves too much figuring.

Old timers recall a well-known Mexican ham who inserted in the callbook after his address, "I don't want QSLs from Ws." There were repercussions to this in letters-to-the-editor and even an article in *QST*. I do not condone this attitude because I was once a beginner, eager for any kind of QSL. However, it is both costly and time-consuming for a contester to QSL and anything that lessens the chore is appreciated. "The final courtesy of a QSO is a QSL," is no better than, "Give me your handle for the log." Neither is a legal requirement.

QSL aftermath of a contest. The smaller pile is JA QSLs to be answered!

Other Problems of the Hawaiian Contester

A surprising number of hams do not realize that KH6 is the Hawaii section. In the ARRL DX contest when I send 599000 (for one kilowatt), some times the answer is, "no kidding, how can you be using zero watts?"

The official abbreviation for Hawaii is "Hi." When I send "Hi" on c.w. in the ARRL Sweepstakes the non-savvy operator wonders what's so hilarious about the information I sent. If I repeat with "Hi, Hi" that only compounds matters. If I say "Haw" he knows I'm only kidding. By this time when I send "HAW a II" he is in no mood to decipher it because he thinks I sent the "II" just for emphasis. QST

AMATEUR RADIO PUBLIC SERVICE CORPS

CONDUCTED BY GEORGE HART, *WINJM

Which Mode?

PHONE is much more effective for handling messages than c.w. Ask *any* phone-only operator. C.w. provides greater accuracy, just as much speed, uses far simpler equipment, covers a much greater distance per watt, occupies less than one-tenth the spectrum space. Ask the ham who sticks strictly to c.w. RTTY combines all the advantages of both c.w. and phone, gives you higher accuracy with greater speed and you don't have to know the code. Ask the RTTY buff. F.m. eliminates interference. V.h.f. repeaters are gradually taking over from low-frequency relays.

It all depends on how you look at it, and how you look at it depends on your personal preference, and this often depends on how you were "raised" in amateur radio.

In public service communications, we are not so much concerned with the mode used as with the job done. In directing mobiles to strategic points in an emergency situation, or a potential one, it is ridiculous to use anything but voice. What kind of voice, a.m., sideband, or f.m.? Answer: whatever kind is *available*. For handling traffic in quantity between two far-distant points, RTTY is far superior to any other mode — if it is available. For distribution of recorded traffic among a number of points, it is hard to beat the practiced c.w. net for efficiency — *if* you have the practiced operators. V.h.f. is fine for local nets — unless most of your locals operate lower frequencies.

What all this boils down to is that if you are starting from scratch, without consideration for what you have but only what you need, then you will follow the above precepts — voice for "command" purposes, RTTY for long-haul point-to-point record stuff, c.w. for multi-distribution of record stuff in nets. *Select the mode to suit the need.* Select the frequency band for optimum path over the distance to be covered. Select the time to coincide with the need and with propagation conditions. Select the operators with the skill necessary to perform the jobs to be done, or train them specifically for those jobs. Select the . . .

But wait a minute. This is amateur radio we are talking about, not a commercial or military circuit. All these people are volunteers, offering whatever skills, equipments and time they have to serve the public in an emergency. Therefore, there is a limit to how much selecting can be done; you have to use what is available, do the best job that can be done with it, and while you are doing it make whatever progress you can toward the ideal. For example, if you are forced to use sideband for point-to-point record purposes between Los Angeles and New York, then *use* it. *Improve* it as possible as you go along, and eventually, if you can, *replace* it with a better mode for the purpose, such as c.w. or RTTY, or c.w. *then* RTTY. But if it has to remain s.s.b., then strive to make it the best danged s.s.b. circuit going.

These may sound like principles for leadership and not of interest to the average amateur, but axioms apply to everybody. Everyone has his place. If you operate phone only, your *best* function is in some kind of "command" net in which the operator serves as a person who controls the equipment while others speak; this is not the same thing as saying that record traffic should *not* be handled. But c.w. and RTTY, which cannot handle the "command" function, are more suited for record purposes. As a participant in public service communication, you have as much responsibility as anyone else, and as much interest, in seeing that your services are used in the most efficient way possible.

Garbles

Here at the headquarters we receive a great many messages asking for forms, supplies, info, you name it, if we have it we get asked for it. Usually the message requesting it contains a name and address.

Time was when this was very helpful; saved us the trouble of looking it up. Nowadays, however, we regret to say that we *always* check the call book (if a call is given) to make sure the address is correct. Why? Naturally, because of garbles in the message.

To the outsider, a garbled message is as bad PR as a good message is good PR. Traffic handlers say we don't stress enough the importance of being accurate in traffic handling, but this must mean we don't stress it *often* enough, because we have stressed many times how important and necessary it is to be accurate.

So here we are, stressing it again. In copying a message, whenever you have any doubt about some part of it, *please* ask for a confirmation or a repeat. If we amateurs are going to be valuable as communicators, we *must* be accurate. Edsel Murphy's Law says that any guess from context will be wrong. If a crash of static wipes out the middle word of the phrase "Kilroy (blank) here," the temptation is to fill in the blank with the obvious guess — but if you do that, the correct word will turn out to be "ate," not "was."

If you copy one message accurately at 15 w.p.m., you are a much better operator than one

*Communications Manager

who garbles three of 'em in the same time. Check the check. Be suspicious of messages that don't make sense. Never mind if the guy at the other end gets impatient, *make sure you have it right!*

You think we are exaggerating about garbles? Try this: Every once in a while, after you deliver a message, mail a copy of it to the originating station, ask him to compare it with the copy he sent. You'll be amazed at some of the things that happened to the message en route to its destination.

So let's tighten up, fellows and gals. Transmitting stations, make sure the message is sent correctly and properly. Don't assume the receiving operator will know what you mean if you accidentally send a B for a 6, or if you send an initial F by phone without giving the phonetic equivalent. Put yourself mentally on the receiving end, transmit accordingly. Receiving operators, don't guess. If you miss something, admit it, ask for a repeat. If the other guy sends something wrong, make him repeat or confirm it, even if you think you know what he meant.

In short, *be accurate!* Forget the speedy stuff until you have achieved accuracy. Only then are you qualified to up the speed. — *W1NJM.*

National Traffic System

A lot of net bulletins cross our desk in the course of a year's time. There isn't a region or area net of NTS, nor a TCC group, that hasn't put out a bulletin of some kind or another at one time or another. Some of them are dry and statistical, some are interest-provoking, some are controversial.

Then there are the section net bulletins, also, from Maine to San Diego, from Seattle to Sarasota, a veritable flood of them. A visitor recently asking to see some traffic bulletins was amazed at the number and variety of them. Just leafing through the stack, we come upon the OZK Bulletin (W5DTR), the Virginia Ham (WA4EUL), the QIN Bulletin (W9HRY), the Michigan QMN Bulletin (W8RTN), NCN (WA4FJM), The Oregon Netter (W7FCF), the Buckeye Net Bulletin (W8GOE), Nebrasskey (KØAKK), the LAN Bulletin (W5GHP), the MDD Flyer (K3OAE), *Zero* Beat (WA6KZI). Some other editors of outstanding section net bulletins are *W1s* DWA EFW, *K1s* IJV PNB, *WB2s* IYO VSL, W3ELI, K3KMO, WA3CFK, *W4s* ILE IYT, K4LMB, W5CEZ, K5IBZ, *W6s* ORW QMO, WA6ROF, K7NHL, WA7CLF, *W8s* CHT HZA, WA8CFJ, W9EVJ, K9GSC, WAØMMV. This does not pretend to be a complete list, and undoubtedly some we have omitted will feel neglected. If so, we apologize in advance, but we hope the above covers most of the waterfront.

The business of producing a net bulletin has bothered some. There are two problems: getting an editor, and supplying the funds. Each or both of these problems are easily solved under some circumstances, next to insurmountable in others. One group may find it has a leader who is willing to produce and edit the bulletin all on his own; this isn't common, but it happens. Another may find that certain "free" facilities are or can be made available for the purpose of reproduction, so that all that is needed is the editor. Others have capable editors but must pay to have the bulletin printed.

There is always a way, if the desire to have a net bulletin exists. The net manager may not always be capable of writing deathless or inspiring prose, but he usually has a message and somehow manages to convey it, so don't laugh. One way of covering the cost of paper and printing is by donations from net members; usually a dollar donation by each net member will cover the nominal cost of printing an unpretentious bulletin. In small nets, even multicarbons or other copying methods will suffice — and facilities for making copies are becoming more and more widespread everywhere, these days.

By all or any means, have a net bulletin. If properly done, it can go a long way toward cementing fraternal feeling among net members. Most NTS nets have a bulletin. Does yours? Give it some thought. — *W1NJM*

December reports:

Net	*Sessions*	*Traffic*	*Rate*	*Average*	*Representation*
1RN	61	846	.421	13.9	94.4
2RN	60	866	.798	14.0	95.0
3RN	62	1183	.637	19.1	100
4RN	58	1024	.555	17.6	90.3
RN5	62	1345	.563	21.7	96.4
RN6	62	2093	.952	33.7	99.8
RN7	61	1329	.623	21.8	47.2
8RN	62	1080	.582	17.4	98.4
9RN	61	1159	.795	19.0	96.0
TEN	62	1185	.817	19.1	83.2
ECN	59	294	.276	5.0	73.7
TWN	31	499	.455	16.1	86.5[1]
EAN	31	3209	1.916	103.5	98.4
CAN	31	2648	1.657	85.4	100
PAN	31	3006	1.544	96.7	100
Sections[2]	2625	24132		9.2	
TCC Eastern	168[3]	1913			
TCC Central	109[3]	1697			
TCC Pacific	136[3]	2197			
Summary	3450	51,705	EAN	27.3	85.5
Record	2811	46,885	1.872	23.5	—

[1] Region net representation based on one session per day.
[2] Section and Local nets reporting (72): AENB, D, H, M, O, P, R, S, AM (Ala.); OZK (Ark.); NCN, SCN (Cal.); HNN (Colo.); CPN (Conn.); FAST, FATT, FMTN, FPTN, GN, QFN, SATN, TPTN (Fla.); GSN (Ga.); QIN (Ind.); ILN (Ill.); Iowa 75; KPN, KSBN, OKS (Kans.); FCATN, KTN, KYN (Ky.); LAN (La.); PTN, SGN (Me.); MDDS, MEPN, Termite (Md.-Del.); EMN, WMN (Mass.); QMN, M6TN, QWN (Mich.); MJN, MSN, MSPN (Minn.); MNN (Mo.); NEB (Nebr.); NJN,

The Orange County Amateur Radio Club appointed WA6ROF chairman of a project to establish a message handling facility at the Medical Center in Orange, Calif. WA6ROF is shown explaining the message capabilities of ARPSC to Nursing Administrator Hurtley.

Shown are K3MYS and K3WAJ supervising the drafting of Christmas messages at the Philadelphia Message Center. In the group picture left to right: PR Officer Ward, K3WEU, Council Pres. D'Ortona, EPa SCM W3ELI, Registrar Weiss, Operator W3QFQ, K3EOQ, unidentified, WA3BJQ.

NJPN, PVTN (N. J.); Roadrunner (N. Mex.); NYS (N. Y.); NCN, NCSB, THEN (N. C.); OSSB (Ohio); OLZ, SSZ, STN (Okla.); EPA, EPEN, PFN, PTTN, VHFTN (Pa.); RISPN (R. I.); SCN (S. C.); TEX (Texas); BUN (Utah); VTNHN (Vt.-N. H.); VN, VSN, VSBN (Va.); WSN (Wash.); WVN, WVPN (W. Va.); BEN, WSBN (Wis.); APSN (Alta.); GBN, RTQ, WQN (Ont.-Que.).

[3] TCC functions performed not counted as net sessions.

K5IBZ reports a real nice month and is pleased with representation. WB6BBO sez the traffic total is not the complete picture because many messages handled after QNF *could not* be counted. K7JHA comments that the early RN7 session before section nets is the most reasonable arrangement. This resulted in an all-time high in traffic, sessions, rate and representation. W8CHT sez 8RN managed to set an all-time record for traffic and rate for Dec. K7NHL experimented with a second session at 0530Z during the last couple of weeks of Dec. and sez it looks promising and should improve representation on PAN. K2KIR reported good conditions for all season with very few nights troubled by blackouts or excessive QRN. There was very good representation and coverage by the region nets during the holiday rush. W8ICH/K2SIL is leaving for Hawaii, so EAN is losing one of the best there is. W9DYG reports the highest rate ever for CAN. W6VNQ issued a PAN certificate to WA7CLF.

Transcontinental Corps: W3EML sez TCC Eastern really put on a great show in Dec., setting a new traffic record, especially noteworthy because alternate functions were assigned without prior consultation. TCC Eastern certificates were issued to WA2UWA and W8ICH. WØLCX became Director TCC Central on January 22. He issued TCC Central certificates to KØYBD and K4BSS/4. W7DZX reported a fairly good month with poor conditions accounting for most of the failures.

December TCC reports:

Area	*Functions*	*% Successful*	*Traffic*	*Out-of-Net Traffic*
Eastern	168	90.5	4541	1913
Central	109	93.5	3509	1697
Pacific	136	89.7	4319	2197
Summary	413	91.0	12369	5807

Dec. TCC roster: Eastern Area (W3EML, Dir.) *W1s* BJG EFW NJM, K1PNB, *W2s* GKZ SEI, K2RYH, *WA2s* BLV UWA, *WB2s* OYE RKK, *W3s* AIZ EML NEM, K3MVO, WA3BLE, *W4s* DVT NLC ZM, K4KNP, WB4BGL, WA5SKI, *W8s* CHT RYP ICH UM, K8KMQ, *WA8s* CFJ OCG ZGC, VE2UN. Central Area (WØLCX, Dir.) W4OGG, *K4s* BSS DZM, WA4WWT, WB4AIN, W5KRX, *W9s* CXY DYG JUK VAY YT, *WØs* INH LCX, *KØs* AEM YBD, *WAØs* DOU MLE. Pacific Area (W7DZX, Dir.) *W6s* BGF EMS EOT HC IPW TYM VNQ, *K6s* IBI LRN, *WA6s* BRG ROF, *WB6s* HVA RJX, *W7s* AAF DZX HMA ZB ZIW, K7HLR, WA7CLF.

Other Net Reports:

Net	*Sessions*	*Check-ins*	*Traffic*
Mike Farad	51	551	720
Hit and Bounce	31	473	1314
South Atlantic	22	252	322
Clearing House	30	521	667
North American	26	853	1534
New England Teenage	31	312	311
EATN	31	456	438
QTC	14	213	309
7290	41	1766	938
20 Interstate	20	383	2460
75 Interstate	31	1513	1277
East Coast Traffic	30	196	130
West Mass Phone	30	230	129

Diary of the AREC & RACES

On Aug. 4, VE2BAI and his AREC members furnished communications for a boat race across Lake St. John Quebec. The 2-meter f.m. network utilizing a repeater worked out very well and contact with many agencies was available. — *VE2ALE, SEC Quebec.*

On Oct. 26 to 29, two members of the Lakehead Amateur Club furnished the only means of communications with authorities during a search for some fishermen at Greenwater Lake. VE3EEW and VE3EEM, in spite of the cold weather and uncertain food supply, stuck it out for three days in a small trapper's shack. They maintained regular schedules with a small unit operated from a 12-volt battery. One of the fishermen was found, but dragging operations failed to locate the other. — *VE3ARN.*

From Nov. 25 to Dec. 31, thirty-five amateurs utilized the facilities of the West Coast Amateur Radio Service to report a number of traffic accidents, vehicle fires and traffic hazards. On Nov. 28, W6WFV/mobile, en route to Ensenada, requested assistance via WCARS to find a party who was overdue from a vacation in Baja Calif. WA6WHP and a number of other members of the net furnished information regarding routes and facilities. By the time W6WFV arrived at the border and entered Mexico, a number of XE amateurs were alerted and

prepared to meet him and render assistance. An hour and a half later, W6WFV returned and reported that the group was found proceeding homeward. On Dec. 15 to 18, a number of weather and road advisories were handled by WCARS during severe snow storms that clobbered Ariz. and N. Mex. K7VIS handled a message requesting emergency fuel for a snowbound Indian Reservation in N. Mex. WB6YFT and WA7AKI relayed the message to authorities. On Dec. 31, W6WHL used 7255 kc. to request aid to supplement a Coast Guard search for an overdue pleasure boat in the Gulf of Calif. K6KZI and others relayed the pertinent information to XE amateurs in Sonora and Baja, Calif. WB6MXM sent messages, signed by Senator Murphy, requesting assistance in the search by some facilities in Mexico. XE2SS later requested some additional information which was provided by WA6SNE and W6ZOM. Also on Dec. 31, an aircraft operating mobile called on 7255 kc. to report that he was unable to communicate with Long Beach airport because of equipment failure. W6FQY relayed the information to the airport and communications were restored via alternate frequencies. — *WB6IZF.*

—•••—

On Dec. 1, an automobile went into the Ohio River in downtown Owensboro, Ky. A Fire Department boat and civil defense amphibious vehicle began dragging and later requested boat-to-shore communications. Within 15 minutes, K4UDZ was aboard with a 2-meter walkie-talkie and W4OYI mobile ashore at the scene. With darkness approaching, dragging was suspended. The following morning, the Owensboro AREC was available but the rising river prevented the vehicle from being found. — *W4OYI SEC Ky.*

—•••—

On Dec. 10, twenty-nine Fort Walton Beach, Fla., amateurs provided emergency communications when a severe tornado struck the area. W4MMW activated two local v.h.f. nets on 2 meters, one a.m. and the other f.m. Messages into and out of the area were handled on 80, 75 and 20 meters. Some of the agencies served were National Guard, civil defense and Red Cross, plus a large number of inquiry messages. Two-meter mobiles were used to make survey and damage reports to authorities at first, but later were used to assist in delivery of health and welfare messages. Telephone circuits were heavily overloaded or out and the v.h.f. networks enabled the deliveries to be made so that there was not a big backlog of undelivered traffic. The v.h.f. also performed as an intercom net for expeditions dispatch of messages between stations operating on the low bands. Nearly a thousand messages and inquiries were handled. — *W4RKH, SCM, Western Florida.*

—•••—

On Dec. 14, the community of Haines, Alaska, lost all commercial communications when a vessel at anchor during strong winds dragged anchor across an under-water coax cable and then picked up a secondary under-water communications cable. Within 25 minutes, KL7FRZ and KL7RU established an amateur radio link between Haines and Juneau. Two hours later the South East Alaska Emergency net was functional under the direction of KL7DFW. Net members provided a 24-hour-per-day standby on 3850 kc. so that Haines could have an emergency communications link. A number of messages were handled including coordination for the location of the broken cable and its repair. At least twelve amateurs in Alaska were known to have supplied emergency communications during the cable outage. — *VE7UY/KL7*

—•••—

On Dec. 15 at 6:30 P.M., W8SQO broke into the West Virginia Phone Net to report the collapse of the Silver Bridge at Point Pleasant, W. Va., with telephone and power service seriously interrupted as a result. WA8NDY and XYL WA8WCK were mobile near Spencer, W. Va., and proceeded toward Pt. Pleasant. WA8LAL, W. Va. State Radio Officer, was ordered to establish emergency communications at the Emergency Operations Center in Charleston. The emergency network was activated at 7:30 P.M. with WA8YSB NCS and W8IRN W. Va. SEC, and others assisting. WA8NDY, a member of the c.d. radio system, was halted at a roadblock outside Pt. Pleasant, which had been totally sealed off by police. He received clearance by c.d. at Charleston through the state police headquarters and was the only amateur radio contact at the scene of the emergency on the W. Va. side that evening. Because of the river condition and general disaster situation, there was urgent need for "hard hat" divers. The W. Va. Emergency Net initiated contact with authorities at the Pentagon, Groton, Conn., Corps of Engineers at Huntington, W. Va., Portsmouth, Va., and other points where this equipment and personnel were available. Television and radio stations were notified by the amateurs to broadcast an appeal for this type divers to get in touch with civil defense or police departments. WA8NDY positioned his mobile unit at the Mason County EOC and began supplying requested details and general information to the State EOC. At times WA8NDY had to leave the car for message delivery or other assignments, but WA8CWK took over the operation so that information was constantly available to both the W. Va. state EOC and authorities at the Kanauga, Ohio, end of the bridge via W8RRQ or W8FCF, the latter a mobile near the river bank. After five hours of continuous operation, additional telephone facilities were provided for Mason County civil defense and the amateurs closed the emergency radio net. — *WA8NDY, EC Upshur County, W. Va.*

—•••—

On Dec. 15, nearly three hours after the Silver Bridge collapse, W8ETU was notified by a civil defense radio officer that Franklin County AREC/RACES was requested to join with civil defense rescue and proceed to Kanauga, Ohio. Six mobile units were alerted, and proceeded to the disaster site. The group set up a 6-meter station at a bowling alley in Kanauga and supplied a limited amount of communications. At noon Dec. 16, the Columbus group secured when their services were no longer needed. — *W8ETU, EC/RO Franklin County, Ohio.*

—•••—

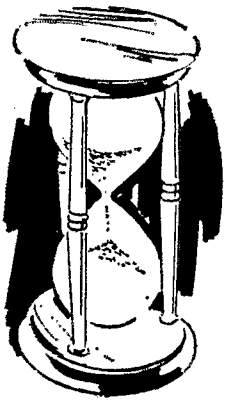
On Dec. 16, The Delaware Six-Meter Net handled Christmas greetings from a hospital. Communications originated from the hospital via 6-meter walkie-talkies manned by K3NYG and WA3ELO. W3EEB received the messages and placed them into National Traffic System nets. Seventy-seven messages were handled during the three-hour exercise. — *K3NYG, SCM/SEC Delaware.*

—•••—

On Dec. 17, four members of the Delaware Six-Meter Net furnished communications for a community center foot race which was held in Wilmington, Del. W3CGV operated a portable station

(Continued on page 152)

History Repeats Itself



The ARRL in 1922

BY WELLS CHAPIN,* W8GVW

The other night while browsing through some old books I ran into a long forgotten book by Stuart Ballantine who was among the first to gather together information and present it in one volume so that it could be used as a handbook. This book was published by David McKay in 1922. This book was a masterpiece in its time and after you read the following article you will feel Mr. Ballantine had a very wonderful crystal ball. Read it just as if you were reading a 1968 QST.

RADIO CLUBS THE AMERICAN RADIO RELAY LEAGUE[1]

When one has a hobby it is very pleasant and natural to seek intercourse with others of similar propensities. It is largely to this impulse that clubs and associations of all kinds owe their existence. So in the delightful field of radio, particularly non-professional radio; from the early days amateurs have been wont to band themselves together into radio clubs and associations. Not only is this beneficial for the ordinary reasons, but is of especial value for the proper protection of the rights of the private citizen pursuing radio for amusement or instruction, and in defending it from the onslaughts of the military and of mercenary professionals.

I feel that many of my readers will be novices in this radio business and wish therefore to address to them the appeal that after getting their radio house in order, one of their first moves be to seek out and become affiliated with their local radio club. Here you will come in contact with many kindred spirits, with the radio *beaux esprit* of your community, and the ideas to be there gathered, the free instruction, exchanges of experience and so forth, are of inestimable value. The prospect of a radio meeting at which 60-year-old presidents of large institutions and influential men will be found enthusiastically and deferentially discussing the merits of this or that "hook-up" with 14-year-old school-boys is a curious one to contemplate and to think about.

The domain of influence of a local organization is, however, very restricted, and from the point of view of protecting the amateur's rights when radio legislation is contemplated by the Government, is quite impotent. This indicates the need for an organization of national scope; one great organization embracing the grand hierarchy of radio amateurs, and not two or three. Fortunately such an organization, the American Radio Relay League with headquarters in Hartford, Connecticut, exists in this country and is probably the most powerful amateur radio club in the world, having a present membership of ten thousand. In view of the importance of this body in amateur radio affairs, and the plea which is here made that every amateur make it his immediate business to become a member of it, a few remarks on its history and aims will perhaps be appropriate. For this information I am indebted to Mr. K. B. Warner, Secretary of the League and editor of its admirable little journal, *QST*.

The American Radio Relay League is the only association of its kind in the country, being of national scope, entirely non-commercial in its nature, and truly of, by and for the amateur. It is a corporation without capital stock, with a charter under the laws of Connecticut. Its governing body is a board of seventeen directors, elected by popular vote every two years, and no man is eligible to membership of the Board who is in any way financially interested in the manufacture or sale of radio apparatus. The officers of the League are elected by the Board members and serve for two years.

The purpose of the League is the advancement of private radio, especially as exemplified by the American amateur. We are bonded together for the more effective relaying of friendly messages between our stations, for legislative protection, orderly operating and scientific growth. We have seventeen divisions in our Operating Department, embracing the United States, Canada and Alaska, and each division is in charge of a manager who is a well-known and qualified amateur. In turn he has district superintendents and city managers as assistants, forming a field organization of about 400 men, who keep closely in touch with the individual stations owners all over the country. ARRL

* 2775 Seminole Rd., Ann Arbor, Michigan 48104.

[1] Ballantine, *Radio Telephony for Amateurs*, 2nd edition, 1923. Used by permission of David McKay Co., Inc.

is a hobby with these men and all serve in their spare time without financial remuneration, as do all of our officers with the exception of the Traffic Manager and Secretary, who, devoting their entire time to the work at the headquarter's office, must necessarily make their living thereby.

The League owns *QST* as its official organ, chronicling the activities of the amateurs all over the country. *QST* is devoted solely to the interest of the amateur and that interest is principally the practical improvement of short-wave communication. The ARRL has represented amateur radio in legislative hearings ever since its formation, and it may be safely said that there have been several occasions when if no League had existed, there would be no amateur radio today. Our substantial prestige at Washington is due largely to our being bonded together in a non-professional organization into which the taint of commercialism cannot enter. We have made ourselves into that kind of an association which the United States itself can recognize and deal with.

Thus whenever any matter affecting the amateur is under consideration in Washington the view of the ARRL is sought. When that expression is secured it represents the best opinion of seventeen men from all over the country who in turn represent the general amateur in their communities. To help in this business of being truly representative of the amateur, there are some 400 clubs scattered throughout the land which are affiliated with the League. Affiliation costs a club nothing and nothing tangible is given in return except a charter, but it bonds all together with hoops of steel in a common brotherhood — that of the American ham.

From time to time our Operating Department stages special stunts just to get some fun out of radio. We regularly handle some thousands of messages every night over relay routes, but occasionally knock off and try for a record. The result is that we have handled a message from the Atlantic Coast to the Pacific Coast and got the message back to the east coast again in a total elapsed time of six and a half minutes. Recently we handled messages from the governors of the various states to the President, and forty of the forty-eight messages were delivered, five not starting and three only being lost in the process of transmission. The ARRL recently conducted experiments in connection with the fading of radiotelegraphic signals for the Bureau of Standards, and thousands of curves and data sheets were obtained which are still being analyzed at the Bureau. It was the ARRL that sent Mr. Paul F. Godley to Scotland in the recent amateur trans-Atlantic tests, in the course of which about three dozen American amateur stations were heard across the Atlantic.

It costs nothing to belong to the League except the annual dues of two dollars. One does not even have to be an amateur station owner, the only requirement being that the applicant possess a bona fide interest in amateur radio. The dues include, of course, a year's subscription to *QST*.

Interesting reading, wasn't it? The mercenaries were at work stealing our bands in 1922. We can not go wrong by practising what he says. Join your Radio Clubs — constructively criticize the ARRL. Don't just do nothing — do something to help preserve our wonderful hobby. QST

Strays

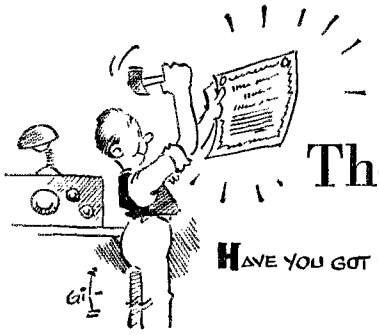
Feedback

Our apologies are in order for misspelling the names of Harold Wirsching, WA8HTA, and Benoit (Chub) Bourg, WØCOC, in "Silent Keys" for January 1968.

—•••—

The Post Office Department promises faster mail service with the new Zip codes. Use yours when you write League Headquarters. Use ours 06111.

Except for a few visible kits, all of the equipment seen in this one-corner view of W6DEG's shack is home constructed. At the top left is an antenna coupler with a built-in monitor scope and s.w.r. meter. Hanging on the corner of the panel is a transistor keying monitor. At the lower left is a 15-meter receiver; at the top middle is a WWV, 20 and 2-meter receiver with a built-in panoramic scope and trumpet speaker. An 813 transmitter is at lower middle and a 40-meter receiver is at the bottom right. All of the units use modular construction that make for easy troubleshooting, revisions, and updating.



Those Higher-Class License Examinations

In Six Parts — Part I

Basic Electrical and Electronics Principles

"RUNNING scared" about passing the new Advanced or Extra Class examinations because the assortment of sample questions published by FCC looks formidable? Relax a bit. Yes, you'll have to do some studying. But no, you don't have to have a degree in electronic engineering in order to make the grade. What you're expected to know isn't any more than you *should* know if you want to make the most intelligent use of your ham privileges and equipment.

On first inspection the sample questions seem to cover a lot of territory. A closer look shows that this is partly because the subjects are thrown into the pot apparently at random—just as they would be thrown at you in an exam. When broken down, practically every question falls nicely into one of six broad groups—basic electrical and electronic principles; applications and familiar circuits; general aspects of transmitting, including telegraph methods; radiotelephony of various types; propagation, antennas and transmission lines; and receiving methods. We have grouped the questions that way for the purposes of this series, and also rearranged their order within groups so that the same or closely-related subjects are adjacent.

We have made no distinction between Advanced and Extra questions because the breakdown showed quite plainly that both examinations ask questions in all categories. The Extra questions may dig a little more deeply into some aspects, but the fact is that anyone who is well prepared for the Advanced exam practically has the Extra in his hip pocket already. This is speaking of the *technical* part of the exam, of course; you don't have to take a code test for the Advanced, if you now hold a General class ticket.

In this series we propose to take a look at each of the above groups with a view to bringing out the scope of the examinations, which is what FCC says the questions are intended to do. This word "scope" needs to be interpreted rather generously; it doesn't mean that because an example question is on the time constant of an *RC* circuit an actual question wouldn't be about an *RL* circuit; it might be, and in either case it would almost certainly be phrased differently—in a way designed to bring out what you really know of the subject rather than what you've tried to memorize for the trip to the FCC office. This means being able to work formulas backward as well as forward. Once the scope is established, the necessary information for study can be found in ARRL publications which will be specifically referenced. Finally each installment in this series will conclude with our own concept of how actual questions might appear in a multiple-choice examination.

You've probably passed the General Class exam (and must hold a license of at least that grade before becoming eligible to take the Extra), so FCC takes it for granted that you could easily do it again. In other words, some of the actual questions you get may not be related, seemingly, to the Advanced and Extra sample questions, but may be on more elementary subjects—like Ohm's Law—that you're supposed to know. The very first sample question in the collection to follow is of that type, and is a tip-off as to what you might be asked in the elementary-electricity field in an actual examination. Review the General Class questions in the *License Manual* as you go along; any of them could appear in the more-comprehensive Advanced and Extra exams, too.

This series will deal only with the *technical* questions; those on laws and regulations demand familiarity that can only be obtained by study

The new Advanced and Extra Class examinations stay strictly within the bounds of amateur competence — no "far-out" subjects or fine details which only experts could be expected to know about. This is the first of a series to help you plan your study for the examinations along logical lines.

of the actual texts. These are given in full, where pertinent, in every edition of the *License Manual.*

—···—

Now to get down to cases. Inspection of the group of FCC sample questions that follows shows that first of all you need to have a fair grasp of the rock-bottom electrical fundamentals —what resistance, inductance and capacitance are, their properties, what happens when they are combined, how they behave in a.c. circuits, the meaning of reactance and impedance, impedance matching and the use of transformers to effect it. The decibel is included, too. All this information is to be found in a little over 20 pages in Chapter 2 in the *Handbook*—specifically, pages 18 through 41 in the 1967-68 editions, plus a short section about practical characteristics of capacitors and inductors on page 54. It is fair to assume, however, that some actual questions may go a little farther, delving into d.c. principles and tuned r.f. circuits the way the General Class examination does. It wouldn't hurt to go through all of Chapter 2.

Filters obviously are included within the scope of the examination. With one exception, all you need to know is to be found in pages 51-52 in the *Handbook*, plus pages 110-111 in the 1967 edition (112-113 in the 1968 edition). The exception is that shape factor isn't specifically named in the *Handbook*, although it is described. The definition is in the answer to the related sample question that follows.

Transistor principles, ratings, basic circuits and operating conditions are covered in Chapter 4 of the *Handbook*. The section you need to study is pages 81 to 86 in the 1967 edition, pages 80-87 in the 1968 edition. However, the earlier part of Chapter 4 shouldn't be avoided just because it doesn't deal directly with transistors; it is valuable background material that leads to the transistor itself, and thus should help make understanding easier.

Altogether, the scope of this group of questions is covered in 25 to 30 *Handbook* pages. There aren't any direct questions about vacuum tubes, but you're expected to know something about them already from the scope of the General Class exam.

It helps to memorize a few rules and formulas for arriving at numerical results. Here are the ones you might expect to have to know:

The "reciprocal of the sum of the reciprocals" rule for resistances and inductances in parallel, capacitances in series.

The formulas for calculating inductive and capacitive reactance.

The rule for finding the total reactance of reactances in series.

The formulas for the time constant of CR and LR circuits.

The rule for converting transformer turns ratios into impedance ratios ("the impedance ratio varies as the square of the turns ratio").

Now look over the sample questions. Those marked (A) are from the Advanced Class; those marked (E) are Extra Class. You should find some things in the answers that send you back to the *Handbook* for more information. When you feel pretty certain that you've got a good grasp of these questions, try the multiple-choice ones at the end.

Next month's subject will be practical applications and circuits.

FCC Sample Questions

(A) How do inductors combine in series and in parallel? Capacitors in series and parallel?

If there is no coupling between the inductors, the total inductance when two or more are connected in series is equal to the sum of the individual inductances. When connected in parallel, the resultant inductance is equal to the reciprocal of the sum of the reciprocals; that is,

$$L = \frac{1}{\frac{1}{L_1} + \frac{1}{L_2} + \frac{1}{L_3} + \frac{1}{L_4} \cdots}$$

With capacitors in parallel, the total capacitance is equal to the sum of the individual capacitances. In series, the resultant capacitance is found by the same rule as for inductances in parallel; that is,

$$C = \frac{1}{\frac{1}{C_1} + \frac{1}{C_2} + \frac{1}{C_3} + \frac{1}{C_4} \cdots}$$

(E) How does the positioning of a powdered-iron tuning slug affect the frequency of the oscillator it is tuning?

A powdered-iron slug, which has higher magnetic permeability than air, is inserted in a coil to increase the inductance for a given number of turns. Adjustable coils are wound on cylindrical forms inside which the slug can be moved back and forth so that more or less of the slug is surrounded by the winding. As more of the powdered-iron slug is inserted into the winding the inductance is increased, and the resonant frequency of the circuit therefore is lowered.

(E) How do mica and paper dielectric capacitors compare at different frequencies?

Because of the way they must be constructed to obtain useful values of capacitance, paper-dielectric capacitors have appreciable internal inductance as well as capacitance. The inductance can be ignored at low frequencies and usually can be tolerated in bypass applications at moderately

high frequencies, say 4 or 5 Mc., provided the capacitance is of the order 0.01 μf. or less. Paper capacitors, even in the low values, become predominantly inductive at 20–30 Mc. and are not useful above this range.

Mica capacitors have low internal inductance and can be used throughout the h.f. range as well as at low frequencies. Inductive effects become noticeable, especially in the larger capacitance values, at v.h.f., but with judicious selection of values and physical size mica capacitors can be used successfully at such frequencies.

At power-supply frequencies there is little choice between the two types as far as electrical performance is concerned, but mica capacitors in the required capacitance values would be prohibitively expensive.

(E) What is the meaning of the time constant in a resistance-capacitance circuit? How is it determined?

The time constant of an *RC* circuit is the time in seconds required for the voltage in a charged capacitor to decrease to 37% of its initial value when the capacitor is allowed to discharge through a resistor. Alternatively, it is the time in seconds required for the voltage across the capacitor to rise to 63% of its final value when being charged through the resistor from a fixed-voltage source having negligible internal resistance. The time constant is determined by the *R* and *C* values, and the time in seconds is equal to the product of the resistance in ohms by the capacitance in farads.

(E) What are inductive and capacitive reactance? How are their phase angles related?

Inductive and capacitive reactance are measures of the opposition to the flow of alternating current offered by inductance and capacitance, respectively. Inductive reactance is proportional to frequency; capacitive reactance is inversely proportional to frequency. In neither case is power dissipated in the reactance, although the unit of reactance is the ohm, the same name as the unit of resistance. In both types of reactance, the phase angle between current and voltage is 90 degrees, but in inductive reactance the voltage leads the current by 90 degrees, and in capacitive reactance the current leads the voltage by 90 degrees. Thus, if inductive and capacitive reactance are connected in series so that the same current flows through both, the inductive and capacitive voltages are 180 degrees out of phase. If the reactances are in parallel so the same voltage is applied to both, the current through the capacitance is 180 degrees out of phase with the current through the inductance.

(A) A resistor, capacitor and inductor each have 100 ohms of resistance or reactance. What is the equivalent series impedance of these three elements?

The value of the resistor itself, 100 ohms. Since the reactances are equal and of opposite effect, they cancel each other in a series circuit.

(E) What does the term "power factor" mean in reference to electric power circuits?

The term "power factor" refers to the ratio of the actual power consumed to the apparent power (voltage multiplied by current) in an a.c. circuit. This difference in actual power and apparent power results from the presence of reactance in the circuit.

(A) A transformer with 115 volts applied across the primary terminals has a primary to secondary turns ratio of 10 to 1. If a 5-ohm load is connected to the transformer secondary, the reflected primary impedance is what? How much voltage appears across ½ of the turns of the primary?

The ratio of impedances in a transformer is in proportion to the square of the ratio of the number of turns in each winding. Thus the reflected primary impedance would be 100 times that of the 5-ohm secondary load, or 500 ohms. Voltage distribution in a winding is essentially uniform along the turns; therefore one-half of the applied voltage, or 57.5 volts, would appear across half the primary turns.

(E) How is the decibel used for voltage and power calculations?

The decibel is based on power ratios, and is expressed mathematically by the formula

$$\text{Db.} = 10 \log_{10} \frac{P_2}{P_1},$$

Where P_1 and P_2 are the values of power being compared. For example, a power ratio of 10 equals 10 db., a power ratio of 100 equals 20 db., etc. For voltages measured across the same value of impedance, the formula is

$$\text{Db.} = 20 \log_{10} \frac{V_2}{V_1}.$$

Gains and losses expressed in decibels may be added or subtracted arithmetically.

(A) Define the shape factor of a crystal-lattice bandpass filter.

The shape factor of a filter of any type is the ratio of the filter bandwidth at some high value of attenuation, usually 60 db. below maximum response, to the nominal pass band of the filter. The pass band is ordinarily taken as the width of the band between the frequencies at which the attenuation is 6 db. below maximum response. For example, a 60/6 db. shape factor of 2.5 to 1 would indicate that the bandwidth at 60 db. down is 2.5 times the bandwidth at 6 db. down. Shape factor is a measure of the "skirt" selectivity of the filter.

(E) If a crystal lattice bandpass filter has bandwidths of 1.5 kc. at the 6 db. points and 3 kc. at the 60 db. points, calculate the shape factor.

The shape factor is the ratio of the bandwidth at 60 db. down to the bandwidth at 6 db. down (assumed in this case; other attenuation figures are sometimes used). Thus the shape factor of the filter in the question is 3/1.5, or 2.

(E) How are phasing capacitors used in crystal filters?

Phasing capacitors in crystal filters are used to vary the parallel-resonant frequency of the crystal and thus produce a tunable rejection notch which will aid in the elimination of an unwanted signal.

(A) Compare transistors and tubes. What are the advantages and disadvantages of each?

Transistors are quite small in size for a given power capacity, operate at low voltages, and do not depend on thermionic emission (as do vacuum tubes) for their functioning. Their size and voltage requirements make them particularly suitable for miniaturized equipment and portable operation with battery power supply. There is no "warm-up" delay in going into operation, since there is no cathode to heat. Their characteristics are such that they are particularly suitable for electronic switching. The overall efficiency of transistorized equipment is relatively high because a large proportion of the power-supply input is converted to useful output, since no cathode-heating power is required.

Disadvantages are sensitivity of operating conditions to temperature, the fact that the conventional (bipolar) transistor takes power from the signal input source, and susceptibility to cross modulation. (The last two disadvantages are overcome in the field-effect transistor.) All transistors have very small "working parts," which limits the power-handling capacity and makes it necessary to use special means to remove heat when appreciable power is used. Transistors are impervious to mechanical shock and are nonmicrophonic, but can easily be ruined by transient overvoltages exceeding the ratings or by excessive power dissipation. Single transistors for handling large amounts of r.f. power (over 100 watts) have not been developed at the present stage of transistor technology. The internal feedback from output to input circuits is relatively large in transistors, leading to the necessity for neutralization or "swamping," or both, in tuned amplifiers.

Vacuum tubes require a heated cathode for thermionic emission, operate over a wide range of voltages (from a few volts to several thousands), and can readily be constructed to dissipate large amounts of power in heat. Amplification can be obtained without absorbing power from the signal source in certain types of operation (Class A_1 and AB_1 amplifiers). Tubes for r.f. service can be built to handle large amounts of power — 100 kilowatts or more. Small tubes for receiving purposes can be constructed with very low internal feedback so that neutralization is not needed to prevent self-oscillation. Linear amplification and amplitude modulation are relatively easy to achieve.

Disadvantages are the necessity for supplying cathode power, which contributes nothing to the output and adds to the heat which must be dissipated by the equipment, relatively fragile construction in types using glass bulbs so that mechanical shock and vibration may be a problem, and large overall size compared with transistors. The cathode of a tube also has a finite life, so that performance tends to be degraded after long usage. However, tubes are generally capable of standing considerable overvoltage without damage, and are less susceptible to destruction by moderate overloads.

(E) How do n.p.n. type transistors differ from p.n.p. type? How does their bias differ?

The two types of material are "n" type, in which the "carriers" of current are electrons, and the "p" type in which conduction is by means of "holes" or electron deficiencies. A semiconductor rectifier consists of the two types of material in electrical contact (a "junction"). Conduction occurs when a positive potential is applied to the p-type material while the potential at the n-type is negative ("forward" bias). With the opposite polarity applied ("reverse" bias) no current flows. A transistor is formed by a layer of one type of material on each side of a slice of the other type. Thus a p.n.p. transistor is formed by putting a layer of p-type material on each side of a slice of n-type. In the n.p.n. transistor the n-type material is on each side of a slice of p-type. The inner slice is called the base, one of the outer layers is the emitter, and the other outer layer is the collector.

In use, the emitter-base junction of the transistor is forward biased and the collector-base junction is reverse biased. With the p.n.p. type this means that the collector and base are both negatively biased with respect to the emitter, and in the n.p.n. type the collector and base are both positively biased with respect to the emitter. The base-emitter bias is less than a volt, usually, but the base-collector bias may be any value up to the ratings of the transistor.

(A) Power dissipation in what part of a transistor warrants careful observance of power ratings?

In transistors, the rating is based on the amount of power which can be safely dissipated as heat in the collector-base junction. This rating should be carefully observed. Some transistors require a "heat sink," a mounting which helps dissipate excessive generated heat.

(E) Define the alpha cut-off frequency of a transistor. How is this parameter of use in circuit design?

The alpha cut-off frequency is that frequency at which the current gain (more precisely, the "small-signal common-base forward current

transfer ratio") in the grounded base circuit drops to 0.707 times its low-frequency (usually 1000 c.p.s.) value. Alpha is measured with the output short-circuited; actual gain must be calculated taking collector load resistance and other parameters into account. The alpha cutoff frequency is useful in establishing an upper frequency limit for a given transistor type in the grounded-base circuit.

(A) What is the vacuum tube counterpart of (1) a grounded-base circuit; (2) grounded emitter circuit; (3) grounded collector circuit?

The base element of a transistor corresponds to the grid in a vacuum tube; the emitter element corresponds to the cathode; and the collector corresponds to the plate. Thus a grounded-base transistor circuit would have a grounded-grid counterpart in a vacuum-tube circuit; a grounded emitter transistor circuit would be similar to a grounded-cathode vacuum-tube circuit; and a grounded-collector circuit would be the counterpart of a grounded-plate vacuum-tube circuit (an amplifier of the latter type is usually called an "emitter follower" with transistors and a "cathode follower" with vacuum tubes).

(E) What is the phase relation between the input and output circuits in the common-emitter, common-base, and common-collector transistor circuits?

In the common-emitter circuit the output signal is 180° out of phase with the input signal. In the common-base and common-collector circuits the input and output are in phase.

(E) How are transistors biased for amplifier operation? How are they biased for cutoff (open circuit) and saturation (short circuit)?

Bias values depend on the type of amplifier operation — Class A, Class B, Class C, etc. For Class A operation the base bias current should be chosen so that the operating point is at the center of the linear portion of the base-current/collector-current curve. In Class B operation the base bias should be chosen so that very little collector current flows in the absence of input signal. Class C operation requires that the bias be well beyond collector-current cutoff. Transistors are biased to or somewhat beyond the collector cutoff point when the base and emitter are at the same d.c. potential, under which condition there is no base current. For biasing to saturation the base current must be such that a further increase in its value will not cause the collector current to increase appreciably.

Base bias current is usually obtained through a voltage divider connected across the d.c. power supply. Practical biasing circuits include provision for stabilizing the transistor currents against temperature effects.

Examination-Form Questions

Q1. An audio-frequency amplifier requires a load resistance of 2000 ohms for operation at optimum efficiency, but the resistance of the actual load is 50 ohms. The load is to be coupled to the amplifier through a transformer. What should the primary-to-secondary turns ratio be?

A — 40 to 1
B — 6.3 to 1
C — 7.9 to 1
D — 1 to 13.6
E — 14.14 to 1

Q2. An automatic gain-control circuit requires a time constant of 3 seconds. The capacitance in the circuit is 0.1 microfarad. What is the value of resistance through which the capacitor must discharge?

A — 25,000 ohms
B— 3 megohms
C — Infinite resistance
D — 30 megohms
E — 0.47 megohm

Q3. An inductor and capacitor each have 250 ohms of reactance at 1000 c.p.s. If they are connected in series in a circuit operating at a frequency of 500 c.p.s. what is their total reactance, and of what type?

A — 375 ohms, inductive
B — 500 ohms, inductive
C — 375 ohms, capacitive
D — 500 ohms, capacitive
E — Zero

Q4. A 455-kc. mechanical filter has a shape factor of 2.3. If its bandwidth at the 60-db. attenuation points is 8 kc., what is its nominal (6 db.) passband in cycles per second?

A — 2200
B — 18,400
C — 2600
D — 320
E — 3480

Q5. A p.n.p. transistor is connected as a Class A amplifier in the common-emitter circuit. What are the polarities of the voltages applied to the base and collector with respect to the emitter?

A — Base positive, collector negative
B — Base negative, collector positive
C — Base positive, collector positive
D — Base negative, collector negative
E — Either, so long as base and collector have the same polarity

Q6. Draw a grounded-collector resistance-coupled circuit suitable for audio-frequency amplification, using a p.n.p. transistor and including a biasing method. Draw its triode vacuum-tube counterpart. Show supply-voltage polarities in both circuits.

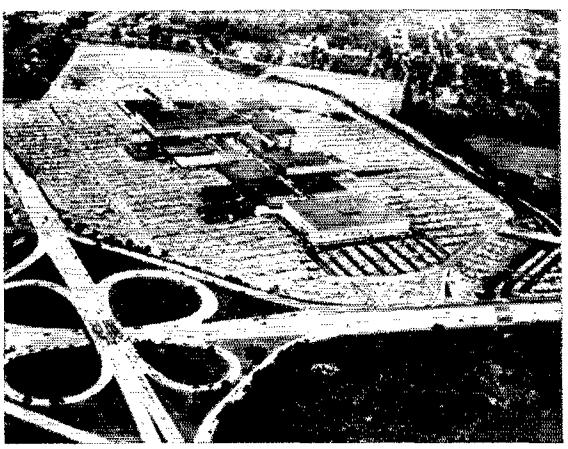
(*Answers on page 148*)

Strays

Ham Radio Expo

An unusual opportunity to expose amateur radio to the general public — several thousand square feet of exhibit area along with auditorium meeting room facilities at one of the world's largest shopping centers — is currently being pursued by a group of ARRL affiliated clubs in the Hudson Division.

May 2–4 are the dates of the "Garden State Amateur Radio Exposition," at Routes 4 and 17 in Paramus, N. J., which will feature displays of all facets of amateur radio; films, slides, talks and symposiums will cover a variety of subjects. An old-style free Hamfest with all the usual activities will top off the event. In addition, an International V.h.f. Conference is planned. A banquet on the evening of Saturday, May 4, will culminate activities. Write Ham Radio Expo, c/o the East Coast V.h.f. Society, Box 1263, Paterson, N. J. 07509, for more information.



The Garden State Plaza, Paramus, New Jersey will be the site of the Expo.

Virgin Islands Governor Ralph M. Paiewonsky presents a certificate of commendation to Dick Spenceley (l.), KV4AA, on behalf of the Department of the Army in recognition of ten years of service in the Civil Defense Communications Programs in the U.S. Virgin Islands.

G3LTF (center) visited the East Coast VHF Society, WA2WEB on the occasion of their annual Christmas Dinner. Here Peter is shown receiving an award for pioneering moonbounce in the United Kingdom from Society President K2OJD/FP8CA (left) while WB2OHH/WA1IUO looks on. The Society used the occasion to announce plans for another International V.h.f. Conference, similar to the one held in 1964[1], to be held in May at the ham radio Expo, see left.

This photograph was taken during the Field Day held in Liberia during 1967. At the left is one of the new Liberian Novices, while at the right is the Honorable Samuel Butler, EL2L, Minister of Communications of Liberia. Look for lots of Liberian activity beginning at 1200Z on March 30. There will be c.w. and s.s.b. activity on 40 through 10 meters plus RTTY work on 15 and 20 meters. The distinctive call sign 5LZ2RL will be used for most operation, except that Novices on c.w. will sign 5L2FD.

[1] See *QST* for March, 1964, p. 86, and October, 1964, p. 100.

Happenings of the Month

FCC RETIREMENTS

One of our favorite people behind the scenes in Washington is Frank Gentile, the man in charge of amateur license issuances since 1947. Though never a ham, Frank understands us and our attachment to a particular set of call letters or type of call. When the computer goofs, or in some other fashion the orderly issuance of a license goes awry, Frank puts in extra effort to straighten out the difficulty, always anonymously — he signs his memos only as "FCC Licensing Unit."

Frank has served the Department of Commerce, the Federal Radio Commission and the FCC since 1927, and has been in the licensing unit since 1939. He retired as Chief, Amateur Licensing Unit on January 12, 1968. A native of Providence, R.I., Frank is married, has one son and lives in Deer Park Heights, Maryland.

—•••—

Ralph J. Renton, W4CU, Chief Engineer of FCC since 1966, retired on January 26 after 36 years with FCC and the Federal Radio Commission. Before World War II, Ralph was a radio inspector, serving at Grand Island, Nebraska, monitoring station and at the district office in Boston. Since 1941 however, his duties have been less-closely connected with amateurs: radio intelligence, broadcast engineering, Conelrad, air defense, technical research, land mobile, etc.

He started as a listener in 1919 (copying the Boston Navy Yard NAD on a crystal detector) and was licensed as 1CU in 1924. Other amateur calls have included W9VOG and W3JWD.

AMATEURS AND MEMBERS

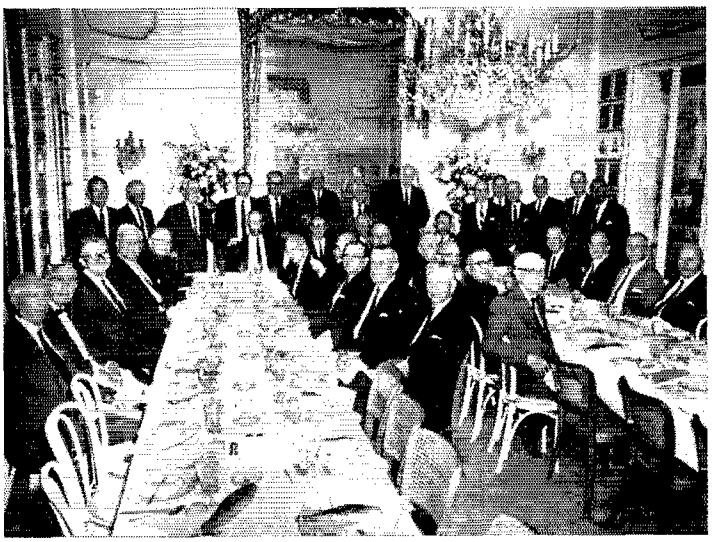
FCC's year-end count shows 257,000 amateur operators, up a thousand from 1966, but down a thousand from June 30, 1967. The amateur station count, which adds club, military recreation and individual second-station licenses, was 267,000 on June 30.

League Full Membership increased .05% to 80,984 with nine divisions gaining and seven losing members. The Dakota, Canadian and Rocky Mountain Divisions led the list of gainers, followed by Roanoke, Southeastern, Southwestern, Pacific, Northwestern and New England. Atlantic, Central, Delta, Great Lakes, Hudson, Midwest and West Gulf posted small losses in voters.

CANADIAN RTTY RULING

Canadian Director Noel B. Eaton, VE3CJ inquired of DOT whether the practice of using a narrow (100–200 cycle) frequency shift for Morse code identification of RTTY signals would be acceptable in Canada.

The Department of Transport, quoting sections 51 and 60 of the General Radio Regulations, Part II, says that since the subject stations are using a telegraphic emission of type F1 (or F2 in the upper frequency bands), identification must be by telegraphy in the International Morse Code. At the same time, section 60 permits frequency shift keying of the carrier frequency up to a maximum of 900 cycles so that the proposal for a shift of from 100 to 200 cycles when keying the transmitter for identification

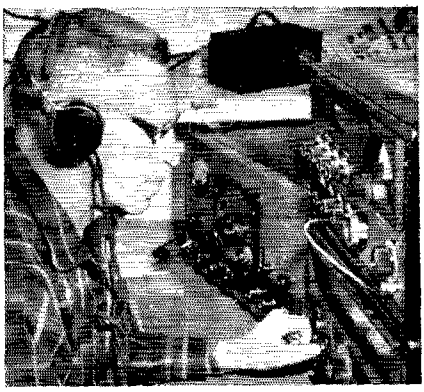


Here's the New Orleans Chapter of OOTC enjoying their annual banquet at Antoine's Restaurant, whose owner is W5RU. Others present: K5GGY, W5NO, W5AU, K5KAA, K5VMP, W4KF, W5BZ, W5WR, W5EDY, W5CJO, W5EM, W5AY, W5DU, W5JNL, W5DKR, W5HUT, W5FM, W5MXQ, W5LE W5CZ, W5ASE, W5HR, W5KO, W5BUK, W5TL, W5ABS, W5LA, W5PM and Delta Director W5LDH, totalling nearly 2000 years of hamming!

Behind The Diamond

Number 2 of a Series

In one corner of the ARRL Technical Department, the silence is broken only by the pecking of a typewriter. The words from that typewriter you see every month



in *QST*, but the by-line **"Donald H. Mix, W1TS,"** seldom. Don's task is to edit the works of "outside" authors for *QST* style, completeness and accuracy.

But though the byline does not appear as often as it once did, Don is well-known both as a 35-year employee of the League, and as a ham. Even back in the twenties, hams talked about the "Sleepless Wonder of 1TS."

Don was operator of WNP aboard the schooner *Bowdoin* when it headed for Greenland in 1923 under Macmillan. When the ship was frozen in the ice at Etah Harbor, his contacts with amateurs kept the crew in touch with home.

Don spent the next ten years in research labs. He joined the ARRL staff in 1933 to operate the Technical Information Service. In 1939 he became assistant technical editor, the job he still holds. During the war, from 1943 to 1945 he served as acting technical editor. Over the years, he's been a heavy contributor to the Handbook as well as *QST*.

As we hinted at the start, Don doesn't say too much, but his flying fingers have resulted in DXCC credit of 310 countries. Three years ago Don passed the 1,000 mark of stations worked — in Asia alone! W1TS is regularly heard in contests and CD parties, too. His current transmitter runs about 250 watts; antenna is a tri-band beam.

When Don does sign his name to an article — as for instance a number of transmitter "how-to's" in the '30s or "Ivory Tower Confessions" July 1959 — it goes on the must-read list for us! QST

"Lee DeForest Day" launched the Illinois Sesquicentennial for hams, who presented to Governor Otto Kerner the special QSL cards donated by Hallicrafters commemorating the state's anniversary. Left to right, L. A. Wollan, Jr., of the Sesquicentennial Commission, W9QVA of Hallicrafters, the Governor, ARRL vice director W9PRN and W9FFP of the Sangamon Valley Radio Club.

purposes does not appear to conflict with the regulations.

"In the circumstances the intent of the regulations, which is that transmitting stations shall be satisfactorily identified, would appear to be met and we see no objection to your proposal. We are therefore notifying our Regional offices to that effect," the DOT said.

CANADIAN TRAFFIC WARNING

The Department of Transport has recently brought to the attention of licensees of some university amateur radio stations that traffic which they were handling contravened the regulations. Specifically, the stations involved were passing traffic between one another which consisted of press material to be printed in the university publications, thus making it public rather than personal material.

Subsection II, Section 52, Radio Regulations Part II says amateur transmissions shall be limited to messages of a technical nature or of a personal character; the DOT considers material for newspapers as being public and thus not allowable.

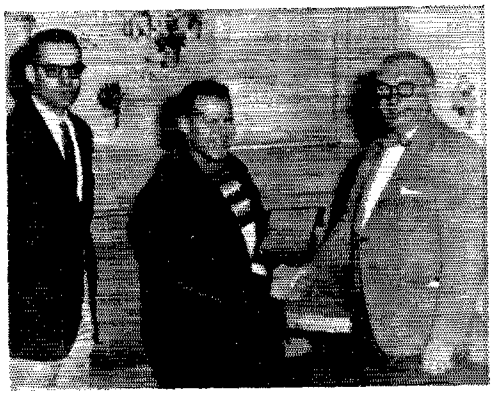
Director Eaton, in a letter to Canadian amateur organizations and officers conveying the above information, closed with these remarks:

"Incidentally, this action on the part of the Department and a recent increase in citations to individual amateurs for incorrect station identification indicates that there is much more monitoring of amateur bands being done by the Department of Transport than we have been led to believe."

(Amateurs in the U.S. follow a different test, domestically, on acceptability of traffic: there must be no pecuniary interest by any operator handling traffic, but public matters are not prohibited per se.)

RULES FOR LIFE MEMBERSHIP

1. The Board of Directors has established a provision for Life Membership in The American Radio Relay League, Inc., effective August 1, 1967.
2. Life Membership is granted only by the Executive Committee, upon proper application from a Full (U. S. or Canadian licensed) Member.
3. The Life Membership fee is twenty times the annual dues rate, or currently $130.
4. An applicant may choose an alternative time-payment plan of 8 quarterly instalments, $16.25 each. In such instance he will be provided an interim two-year Full Membership certificate. Upon completion of the payments, Life Membership will be granted.
5. Life Memberships are non-transferable, and dues payments are non-refundable. In the event an applicant is unable to complete payments on the instalment plan, he will be given a term of membership, at the annual dues rate, commensurate with payments received.
6. Other licensed amateurs in the same family, and at the same address, of a Life Member may retain or obtain Family Membership upon payment of the annual dues of $1, but without receipt of *QST*. The dues of the Family Member may be prepaid for any number of years in advance, but there is no special rate.
7. Application forms are available upon request from the Secretary, ARRL, Newington, Conn. 06111.



Andrew Pfeiffer, K1KLO, receives the August Cover Plaque from New England Division Director Robert York Chapman, W1QV, while Carl F. Christian, K1RJH, president of the Tri-City Amateur Radio Club, looks on. The winning story was "The Connecticut Longhorn," which furnished the cover illustration of August QST as well.

STATIONS ON FEDERAL LANDS

To avoid conflicts between stations desiring to use land under the supervision of the U.S. Forest Service and the Bureau of Land Management, new regulations have been added to each Part of the FCC rules outlining the steps for securing permission.

Section 97.41(c) of the amateur rules reads: "Applicants proposing to construct a radio station on a site located on land under the jurisdiction of the U.S. Forest Service . . . or the Bureau of Land Management . . . must supply the information and must follow the procedure prescribed by Section 1.70 of this chapter."

A.R.R.L. QSL Bureau

The function of the ARRL QSL Bureau system 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 1¼ by 9½ 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. **Changes are shown in heavy type.**

Cards for stations in the United States and Canada should be sent to the proper call area bureau listed below.

W1, K1, WA1, WN1[1] — Hampden County Radio Association, Box 216 Forest Park Station, Springfield, Massachusetts 01108

W2, K2, WA2, WB2, WN2 — North Jersey DX Assn., P.O. Box 505 Ridgewood, New Jersey 07451.

W3, K3, WA3, WN3 — Jesse Bieberman, W3KT, RD 1, Valley Hill Rd., Malvern, Pennsylvania 19355.

W4, K4 — H. L. Parish, K4HXF RFD 5, Box 804 Hickory, North Carolina.

WA4, WB4, WN4[1] — Richard Tesar, WA4WIP, 2666 Browning St., Sarasota, Florida 33577.

W5, K5, WA5, WN5 — Hurley O. Saxon, K5QHV, P.O. Box 9915, El Paso, Texas 79989.

W6, K6, WA6, WB6, WN6 — San Diego DX Club, Box 6029, San Diego, California 92106.

W7, K7, WA7, WN7 — Willamette Valley DX Club, Inc., P.O. Box 555, Portland, Oregon 97207.

W8, K8, WA8, WN8 — Paul R. Hubbard, WA8CXY, 921 Market St., Zanesville, Ohio 43701.

W9, K9, WA9, WN9 — Ray P. Birren, W9MSG, Box 519, Elmhurst, Illinois 60126.

W,Ø K0, WAØ, WNØ — Alva A. Smith, WØDMA, 238 East Main St., Caledonia, Minnesota 55921.

VE1 — L. J. Fader, VE1FQ, P.O. Box 663, Halifax, N. S.

VE2 — John Ravenscroft, VE2NV, 135 Thorncrest Ave., Dorval, Quebec.

VE3 — R. H. Buckley, VE3UW, 20 Almont Road, Downview, Ontario.

VE4 — D. E. McVittie, VE4OX, 647 Academy Road, Winnipeg 9, Manitoba.

VE5 — Fred Ward, VE5OP, 899 Connaught Ave., Moose Jaw, Saskatchewan.

VE6 — KarelTettelaar, VE6AAV, Sub. P.O. 55, N. Edmonton, Alberta.

VE7 — H. R. Hough, VE7HR, 1291 Simon Road, Victoria, British Columbia.

VE8 — George T. Kondo, VE8 ARRL QSL Bureau of Department of Transport, Norman Wells, N.W.T.

VO1 — Ernest Ash, VO1AA, P.O. Box 6, St. John's, Newf.

VO2 — Goose Bay Amateur Radio Club, P.O. Box 232, Goose Bay, Labrador.

KH6, WH6 — John H. Oka, KH6DQ, P.O. Box 101, Aica, Oahu, Hawaii 96701.

KL7, WL7 — Alaska QSL Bureau, Star Route C, Wasilla, Alaska 99687.

SWL — Leroy Waite, 39 Hanum St., Ballston Spa, New York 12020.

[1] **These bureaus prefer 5 × 8 inch manila envelopes.**

More about

The 1968 ARRL National Convention

San Antonio, Texas, June 7-9

SALUD Amigo!

A hearty Texas-size welcome from the nation's 15th largest city, the unique city of contrasts, whose historic buildings blend a Spanish frontier heritage with the threshold of the space age.

Here is the setting, not only of the ARRL National Convention, June 7–9 (opening 1:00 P.M. Friday) at the Municipal Auditorium, but also of HemisFair '68®, April 6-October 6, 1968, the first world's fair ever scheduled in the southwestern United States. Celebrating the 250th anniversary of San Antonio's founding, the fair has as its theme "The Confluence of Civilization in the Americas."

The San Antonio Radio Club is host for the 1968 National Convention, and they hope to make it the best ever. To search for ideas and spot pitfalls, committee members have been visiting other National and division conventions the past four years, to make your stay in the Alamo City an enlightening experience and entertaining fiesta.

Gene "Padre" La Fleur, W5WZR, will be master of ceremonies, a colorful contributor to any convention! There will be a host of speakers from ARRL Headquarters, FCC, the Military Affiliate Radio System (all three branches), NASA, Southwest Research Institute and from around the Southwest to cover a myriad of amateur topics.

Ladies not wishing to take in the technical sessions may enjoy a fashion show, Grey Line tour of the historic quarter, a morning coffee, a luncheon and an initiation into SWOOP, a secret sorority for the wives of amateurs! Other events are still being hatched up by the Alamo YLs.

To cap it off, HemisFair's featured performers this weekend are Jack Benny and the Baja Marimba band.

Nets in San Antonio operate normally on 7290 kc. daytime and on 3961 kc. in the evening. Also, 52.525 and 146.94 Mc. f.m. are monitored almost continuously. During the Convention, there will be additional talk-in frequencies on 3900 and 7250 Mc. Flying in? Contact Gen-Aero on the Unicom channel at San Antonio International, 123.0 Mc.

The pre-registration package price of $14 (with separate-event rates in parentheses) includes all this: Registration ($4) covering admission to the meetings, exhibits and goodies; preconvention party Friday night ($4), an informal soiree to renew old acquaintances and make new ones while enjoying a tasty buffet of ham, shrimp, and roast beef, with background music by a strolling Marachi band; Saturday night dance ($5) with two bands to provide popular and country-and-western music along with other entertainment; and the Texas barbecue/banquet ($4) Sunday noon at the Convention Center next door to HemisFair. Pre-registration ends May 1, so sign up early with

Gene Jank, W5EJT
100 N. Winston Lane
San Antonio, Texas 78213

Give him your "handle," call and QTH just as you want them to appear on your convention badge. Be sure to list the number of overall registrations or the number of tickets for each individual event.

And say! Housing will be tight, because of the fair, so make reservations early. Downtown accommodations run from $17.50 to $25 double at these hostelries (distance in blocks from the convention headquarters listed in parentheses): Gunter Hotel, Blue Bonnet, Travis Plaza (all 1½); St. Anthony (3), El Tropicano (1½), Menger Hotel (7), LaQuinta (10) and Palacio del Rio (8). These are in order of ascending costs; all require an advance deposit of one day's rent. There are other motels near downtown and farther out, too.

Make your plans now for a double treat — HemisFair '68® and the 1968 National Convention! QST

Delaware — The Kent County Amateur Radio Club will hold its Annual Auction on March 12, in the basement of the Kent County Court House, Dover, Delaware. For further information contact K3OCE.

Illinois — The Sterling-Rock Falls Amateur Radio Society is sponsoring a Hamfest at the Sterling Coliseum in Sterling, Illinois on Sunday, March 31.

Texas — The Midland Amateur Radio Club, W5QGG, has scheduled its annual swapfest for St. Patrick's Day weekend. The dance will be held Saturday night, March 16, at the Sands Motel, and the swapfest, Sunday, March 17, in the Midland County Exhibition Building. Homebrew and c.w. contests are scheduled. Further information and registration forms may be obtained by writing P.O. Box 967, Midland, Texas 79701.

Washington — The Skagit Amateur Radio Club of Washington State will hold its 15th Annual Banquet at the Bryant Grange Hall on April 20. An all-day program is planned, with Northwestern Division Director Thurston and other ARRL officials on hand, special activities for the women, etc. A tour of the U.S. Navy's million-watt radio station at Jim Creek is planned; advance registration for this tour is required. For further information, contact Norman G. Ray, W7LFA, 14005 132nd Ave., N.E., Kirkland, Washington 98033 QST

I.A.R.U. News

INTERNATIONAL AMATEUR RADIO UNION

WELCOME TO LONDON PROGRAM

The "Welcome to London Program" of the *Radio Society of Great Britain*, 28 Little Russell St., London, W.C.1., is designed to assist visitors in meeting British radio amateurs, provide assistance with shopping, advice on restaurants, sightseeing, theaters, travel, emergency medical or legal aid, etc. The Society says it would be mutually helpful if visitors were to write beforehand introducing themselves and explaining their requirements. No charge is made for this service. Upon arrival, amateurs are invited to telephone 550.0882, 205.1443, LAB.5733, 204, 2520, SMI8.5866, or 2050 (Southampton, Newport, Isle of Wight). *RSGB* regrets that no responsibility can be accepted for booking hotel accommodations, and prospective tourists are strongly advised to have confirmed hotel bookings before arriving in London.

AUSTRALIAN LICENSING NOTE

In response to a request by the Wireless Institute of Australia, VK Wireless Telegraphy Regulations have been amended to provide for a reduction of code speed requirement for a full license (AOCP) from 14 to 10 w.p.m.

NIGERIA LICENSING

Because of the continuing political difficulties in Nigeria, no new amateur licenses are being issued and all such applicants are being advised to re-apply at a later date. However, existing licenses are being renewed for 1968, and about ten 5N2 stations will be active this year.

CHANGES AND CORRECTIONS

The *Radio Sport Federation of the USSR* reports that information contained in "QSL Via Box 88" pg. 77 of September, 1967 *QST* is inaccurate. *RSF* says that all QSLs to USSR amateurs should be sent to Box 88, Moscow, USSR.

The *Club de Radio Experimentadores de Nicaragua* advises that all U. S. cards for YN amateurs should be sent to: Mike Murciano, YN1MO/W4, P.O. Box 902, Coral Gables, Florida.

Effective January 1, the prefix for Barbados was changed from VP6 to 8P6.

RSGB OFFICER CHANGES

John Graham, G3TR became president of the *Radio Society of Great Britain* this year, succeeding A. D. Patterson, GI3KYP. John has been a licensed radio amateur for more than 30 years. Replacing G3FMT, A. E. Dowdeswell, G4AR has become *RSGB* General Manager.

DX OPERATING NOTES

Reciprocal Operating

(**Bold face** indicates changes since last list.)

United States Reciprocal Operating Agreements currently exist *only* with: Argentina, Australia, Austria, Belgium, Bolivia, Canada, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, **Finland,** France, Germany, Honduras, India, Israel, Kuwait, Luxembourg, Netherlands, New Zealand, Nicaragua, Norway, Panama, Paraguay, Peru, Portugal, Sierra Leone, Switzerland, Trinidad and Tobago, United Kingdom and Venezuela. Several other foreign countries grant FCC licensees amateur radio operating privileges on a courtesy basis; write headquarters for details.

Canada has reciprocity with: Bermuda, France, Germany, Israel, Luxembourg, the Netherlands, Senegal and U.S.

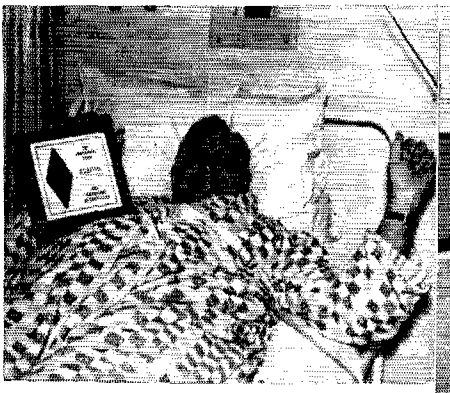
Third-Party Restrictions

Messages and other communications — and then only if not important enough to justify use of the regular international communications facilities — may be handled by U.S. radio amateurs on behalf of third parties *only* with amateurs in the following countries: Argentina, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Greenland (XP calls only), Haiti, Honduras, Israel, Liberia, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay and Venezuela, Permissible prefixes: CE CM CO CP CX EL HC HH HI HK HP HR LU OA PY TI VE VO XE XP YN YS YV ZP 4X and 4Z. Canadian hams may handle these same type third-party messages with amateurs in Bolivia, Chile, Costa Rica, El Salvador, Honduras, Israel, Mexico, Peru, U.S. and Venezuela. Permissible prefixes are: CE CP HR K OA TI W XE YS YV 4X and 4Z.

DX Restrictions

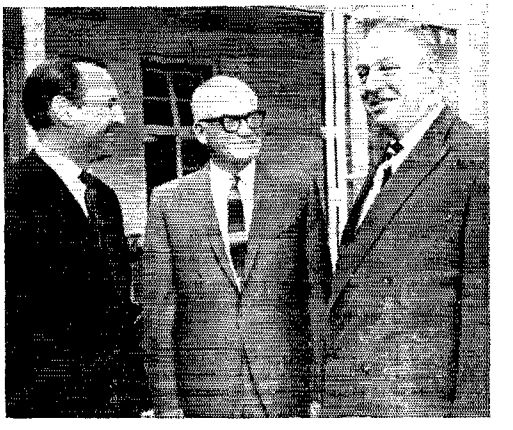
U. S. amateur licensees are warned that international communications are limited by the following notifications of foreign countries made to the ITU under the provisions in Article 41 of the Geneva (1959) conference.

Cambodia, Indonesia (including West New Guinea), Thailand and Vietnam forbid radio communication between their amateur stations and such of other countries. U. S. amateurs should not work HS XU XV 3W8 or 8F. Canadian amateurs may not communicate with Cambodia, Indonesia, Laos, Thailand, Vietnam and Jordan. Prefixes to be avoided are HS JY XU XV XW8 3W8 and 8F.



Here are two recipients of ARRL International DX Competition awards. Above is ZS6DW who received his award just prior to an operation, and right is JA1CWZ top Asian c.w. high-scorer.

On a recent U.S. visit G2MI was presented a placque for his work at the *RSGB* QSL bureau by the North Jersey DX Association. Above Art is shown with his wife Lucy. G2MI, who also visited IARU/ARRL headquarters on his trip, is QSL Manager and a Past President of *RSGB*.



On a recent visit to South Africa, Barry Goldwater, K7UGA, had an opportunity to meet several ZS amateurs and discuss reciprocal operating. From left to right are ZS1TP, K7UGA, and ZS1ACD.

Recently the *Philippine Amateur Radio Association* celebrated its 35th anniversary with a well attended banquet. PARA, founded in 1932, is the direct successor of Philippine Radio Club founded in 1924 and the Radio Club of the Philippines founded in 1922. DU1OR reports that one of the highlights of the anniversary celebration was the congratulatory letters received from IARU President Denniston and others.

Correspondence From Members-

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

ADVANCEMENT

¶ I passed the Advanced Class today; the test took 45 minutes. The worst part is nervousness, fear of failure. However, I studied hard. The ARRL *License Manual* was a big help, but anyone without a solid technical background would find it difficult to pass.

The test was no snap. It really checked your knowledge. I have a feeling many will flunk it if they don't know the fundamentals of s.s.b. and transistor circuits.

I hope in a year to go for the Amateur Extra. — *Willard R. Moody, K3VOW, Riverdale, Maryland.*

¶ Ever since the official notice that the FCC approved incentive licensing I've been studying for my Advanced ticket and I hope to be able to get it within three months. I have set a goal of 5 years to get my Extra, but I want to have the satisfaction that in 1973, when I send a CQ in the lower end of the 20-meter band, whoever listens to it can say: "Now, here is a fellow that knows what he is doing!" — *Gilbert Velez-Borrero, W3YYO, Philadelphia, Pennsylvania.*

¶ Not being satisfied to proceed with only part of the whole picture, I found myself looking for a good school that could supply an equally good course in electronics. I have found the school, Purdue Extension, here in our locality, and I have found their electronics course to be very good. I might also add that getting back to school after so many years has been richly rewarding, and a real challenge.

If incentive licensing can indirectly cause a person to return to school after 26 years, it cannot be all bad!! — *William E. De Geer, WA9MOE, Gary Indiana.*

¶ Thanks to your promptness in publishing the questions for the Advanced and Extra Class license in the November issue, I was able to pass both the first round. Technical — yes; unattainable — no.

To sum it up, the only things needed are a strong desire to better the state of the art and sound studying of basic amateur procedures. — *William N. Kendall, KØCOU, Minneapolis, Minnesota.*

¶ To start with I was a happy Technician for fifteen years and could not care about the rest of the bands, but something happened. Up comes this new incentive licensing, and I found I was being robbed to the tune of 250 kc. That was in June and up to now I am an Advanced Class operator. — *H. M. Ashpole, KP1QJ, Glendale Heights, Illinois.*

¶ Actually, for the amount I'm on the air, I probably don't need the Extra Class privileges. But when they offer a higher grade examination, it seems like admitting defeat not to go down and pass it. — *Charles W. VanWay, WA4YNE, Nashville, Tennessee.*

¶ I am 16 years old and got my General a year ago (it was a snap). And a year from now I am going down to L.A. and show everybody that I care what happens to amateur radio, and I dare the rest of you to come along. — *Arden L. Accord, WB6SKQ, La Canada, California.*

¶ Recently I mailed to you a check to renew my membership in the ARRL for the eighth time. Originally I subscribed to our journal, *QST*; that is, the membership in the ARRL carried no meaning for me. Consequently, I never took occasion to write my director to let him know how I felt on any issue, nor did I write to the *QST* staff for any reason.

However, after following the pros and cons of incentive licensing and realizing the ever-present danger to our frequency allotments, I have come to regard receiving my monthly issue of *QST* as a pleasureable by-product to my necessary support of the ARRL. Had it not been for the efforts of the ARRL from its beginning to the present, there might well be no amateur radio today.

So after eight years of benefitting from fifty years of efforts and activities of the ARRL, permit me to offer a belated thank you and my continued support.

I must QRT now in order to study (from ARRL publications) for the Advanced Class license which I am only too happy to have the opportunity to strive for. — *Robert W. Irish, Jr., K5ZOL, Dallas, Texas.*

¶ The letter that really got to me was the one in January *QST* from Hugh Vandergrift, Huntsville, Alabama, about all of you being "professionals." From his letter I gather he was calling anyone who got Extra as a result of the incentive licensing a "professional." Therefore, this must mean me too. I would like to tell him and you how much of a professional in radio I am. I am a housewife and mother of three kids, who spends most of the time washing, ironing, cooking, mending and like that. You'd be surprised how much time is spent just looking for lost items!

My husband had an interest in radio but never got an amateur ticket until after he had given me the bug and I went ahead and got my General in 1955. He then felt he had to keep up so he got a General a year later. I had a hankering to get an Extra but never really put my heart into it until incentive licensing began to be talked about in earnest and I decided the time had come. So, to build up code speed I enjoyed my hobby c.w. style and you would be surprised how easy on-the-air c.w., having fun, will pick up your code speed; 20 isn't really as fast as you think. Theory for one who can iron a shirt and cook beans but not much else is a little bit more work. But again, half an hour an evening instead of TV and it doesn't take too long to begin to understand a little of what goes on inside even expensive equipment. I am the first to admit that I don't understand it all but if you read something often enough a little of it seeps in. With a fair memory there really isn't too much trick to getting an Extra.

I don't really understand all the fuss. If a housewife can do it, certainly the superior male can. My husband certainly won't admit that he can't get one; he is spending his half hour a night and hopes to get his Extra sometime soon. He has an advantage of course, he knows it doesn't really take much to get an Extra, his wife got one didn't she? — *Lucille E. Hilpert, W9VSR, Winnebago, Wisconsin.*

HAM RADIO IN SCHOOL

¶ I had a mild stroke in 1961. Being discharged from the hospital, I asked my M.D. "How long have I got to live, Doc?" His answer put me to shame: "Ask rather, how much good can I do for others while I'm still here!" (My M.D. is also a D.D.)

So I started looking. I found a school (Rabun Gap Nacoochee School) in North Georgia, pretty much for underprivileged kids who were living generation after generation off the land just as their forebears had. I pulled up my belt and went in and suggested to the Principal that I had something to offer his kids for free: an education in *radio*. He was skeptical, but let me try it in evening "volunteer" classes, no credit, just "fun."

It was so successful that the school board invited me to take regular class periods, with ½ high school credit for completion of ½ year. We have been turning out "hams" at the rate of from three to five licensees each half year — all of them happy and enthusiastic. I think I'll have one Extra Class before graduation, too.

That's the news. Now here's the point to all this: any old timer who wants to find a hobby to exercise in his "declining" years can find a school where kids who need it can be made into hams, or even pros. It's not too much extra effort to teach second phone; and let me add, that it really gives one a sense of justifying his being alive in later years, just to see the bright smiles when kids get their tickets. — *S. P. (Mac) McCabe, W4CRM/W4ZFF, Live Oak, Florida.*

MANNERS

¶ After reading the many letters complaining of various incidents of operating by *lids*, I must state that my recent experience indicates the number of courteous, proficient operators on the band far exceeds the number of lids.

The Korean government permitted third-party traffic for the period 23 December 1967 through 3 January 1968. I had a schedule with HL9TG to handle messages for our servicemen for every night of this period. Since the Korean stations are somewhat limited in power we anticipated some troubles from QRM. We found this to not be true. The cooperation from our fellow hams was amazing. I heard numerous instances of others trying to keep the frequency clear, stations moving so they would not cause QRM, etc. Although HL9TG would be a prize DX contact, there was not a single instance of any one trying to break-in. The result was a very rewarding period of message handling. The propagation on the bands did not always cooperate but the hams sure did. All I can say is, I am proud to be called a ham. — *Roy A. Cartier, W4YJJ, Winchester, Virginia.*

¶ I guess there's room for everyone in ham radio. Recently, in two separate QSOs I heard amateurs advocating the use of nuclear bombs on other countries. This was on twenty meters!

These people have a right to their opinions (I suppose). But, if they really feel that they must put this sort of stuff on the air, why don't they use a not-so-international band, like 160 meters in the daytime?

How would these people feel if they heard amateurs from some other country advocating the bombing of this country? It kind of derogates the purpose of amateur radio — doesn't it? — *Richard Amtman, Chicago, Illinois.*

¶ I wonder how many of the licensed amateurs in our country know the reason for being issued a license. If more of them stopped to think that we as amateurs are supposed to be a public service maybe there would be less interference on traffic nets. After listening to some of the goings-on on 75-meters I wonder what kind of idiots are being issued licenses. Not all 75-meter operators come under this accusation, but anyone who spends an hour listening will know what I mean. Mostly everyone who now has a license worked for it at one time or another. The only thing to do is go back to work, improve yourself and your license and then be able to operate in an area that may, for a while, be free of some of these objectionable characters. — *Gregory F. Burton, K1TZD, No. Granby, Connecticut.*

QST EXTRA

¶ Congratulations on the initiation of "*QST* Extra." I hope that this new addition will help intermittently active amateurs like myself to partially bridge gaps in our knowledge and understanding of, and acquaintance with principles

and progress that we miss during our inactive periods. — *Keith Jones, WØPZL, Denver, Colorado.*

QST COVERS

¶ It's time someone commented on recent *QST* covers. As a reader since the early 20s I have seen them improve over the years. 1967 has been outstanding.

January, May, August and October tell a story, if without imagination, and do it well. The June issue kept up a tradition. February, March, April, July, September, and December rank as being good art, newsworthy, and story-tellers par excellence.

Thanks for a high standard in covers among *all* magazines. — *Harry Mills, K9AA/4, Annandale, Virginia.*

LEGAL AID

¶ Recently one of our club members, Mr. William Schmidt, applied for a building permit from the City of Wichita to erect an antenna tower and was turned down.

The City's position was that there was no restriction on the height of TV towers but amateur radio towers should be restricted to 20 feet because of r.f. radiation.

Mr. Schmidt, WØOZN for many years and an Extra Class license holder, wisely did not argue the point but immediately wrote you and explained the situation.

You forwarded a "Legal Packet" that Mr. Schmidt presented to the "City Fathers" and after a short deliberation of the salient facts, Mr. Schmidt was told to re-apply for his building permit which was granted with no restrictions.

I wish to thank you for your prompt aid in ironing out a situation that could have become rather "sticky" for the local amateurs. Few amateurs realize the importance of remaining calm, gathering evidence (or help) from ARRL and presenting it to the proper officials for just decision. Most times, if the facts are presented properly, justice will prevail. — *Raymond L. Blain, President, Wichita Amateur Radio Club, Wichita, Kansas.*

AMATEUR RADIO AND DISTRESS INFORMATION

¶ I commend you on the excellent article written by RMCM Charles R. Dean, WA2NDQ, USCG, Retired, entitled "Amateur Radio and Distress Information" which appeared in your January 1968 issue.

A discrepancy appeared in the article, however, which you may wish to rectify. On page 63, Table II, the telephone number for the Third Coast Guard District on Governors Island was erroneously listed as 264-5601. It should correctly read (212) 264-4800.

Thanks for an otherwise interesting and informative article. I am certain that the dissemination of this information to your readers shall prove an invaluable communications tool in the Coast Guard's continuing effort to improve marine safety. — *W. S. Haight, Lieutenant U.S. Coast Guard, Asst. Chef, Search and Rescue Branch, Third Coast Guard District.*

CONVENTION DATES

¶ Frequently in the past months, various amateurs have made the remark that the Central Michigan Amateur Radio Club of Lansing, Michigan must be "out of their minds" for holding the Michigan State ARRL convention April 26 & 27, 1968, the same week-end as the Dayton Hamvention!

Let's set the record straight. When we of the C.M.A.R.C. decided to hold a convention, one of our first correspondences was to the Dayton group asking them for their projected date for the '68 Hamvention, realizing that many amateurs enjoy attending this affair. We never received a reply. On April 18, 1967 we received our sanction from the ARRL. On April 22, 1967 we publicly announced the date at the Grand Rapids convention. Our first knowledge of the Dayton event was from the December *QST* eight months later.

We regret that this may inconvenience some of our fellow amateurs, but *we* tried! I can only say, with the outstanding assistance we are receiving from the League, other Michigan clubs, the city of Lansing and our own club members, those who attend the ARRL sanctioned Michigan State Convention will not be disappointed. — *Dick Kelley, K8BZY, Lansing, Michigan.*

[EDITOR'S NOTE: To avoid recurrences, Dayton Hamvention announces the following future dates: April 26–27, 1968; April 25–26, 1969; April 24–25, 1970; April 23–24, 1971; April 28–29, 1972; and, April 27–28, 1973. DARA says it didn't receive the CMARC inquiry last year.]

Strays

Project Oscar, Inc. recently held an election of directors and officers. Elected to directorships were Bill Eitel, W6UF (Board chairman); Bill Orr, W6SAI (vice-chairman); Ed Hilton, W6VKP; Chuck Towns, K6LFH; and, Bob Walton, W6CYL. Director Harley Gabrielson, W6HEK resigned his position and Bill Stevenson, W6LUQ was appointed for the remainder of the term. Project Oscar officers for 1968 are: W6CYL, president; W6SAI, vice-president; W6VKP, treasurer; and, Bill Walters, W6MKE, Secretary.

Members of the Murray School Radio Club, WA6YBN, are planning to operate on a field day, March 23 from Death Valley, Inyo County, California. The junior high school operators will be on the Novice bands gaining experience in portable field operation. A special QSL will be issued for the event. Murray School has amateur radio classes as a part of their curriculum and they license 2–6 amateurs a year.

ARRL AWARDS HONOR ROLL FOR 1967

In a membership association as large and as widespread as the League, much of the organization's work is accomplished by volunteers in the field. The League has some 35 unpaid directors, vice directors and elected SCMs and a like number of volunteer SECs; hundreds of *QST* contributors and authors; thousands of Official Station Appointment-holders; and some 35,000 members of the Amateur Radio Public Service Corps — all participating for the love of amateur radio and in support of League objectives. In addition to more general expressions of appreciation for such cooperative endeavors, the Board of Directors has occasionally singled out some individuals for special recognition on a particular contribution to the art. In the past year, the Board conferred the ARRL Technical Merit Award and twelve Cover Plaque Awards.

THE HIRAM PERCY MAXIM GOLD MEDAL

The Hiram Percy Maxim Gold Medal was created by the Board at its meeting in May, 1964, as an award for extraordinary contributions to the science of communications by a radio amateur. It is to be conferred only by the Board, and only in exceptional instances.

To date, the sole holder of the honor is the late John L. Reinartz, K6BJ, in recognition of his outstanding achievements of pioneering the early development of amateur radio communications equipments and techniques, which contributed so heavily to the opening of practical short-wave communications.

THE ARRL TECHNICAL MERIT AWARD

William Conkel, W6DNG and **T. Ray Naughton, VK3ATN** won the 1966 ARRL Technical Merit Award for proving that communication via lunar reflection is within the realm of conventional amateur operation. Though "moonbounce" has now become a part of the amateur scene, many of the records set for earth-moon-earth QSOs have involved the use of professional apparatus (e.g., the big dish at Arecibo, Puerto Rico). W6DNG and VK3ATN, however, have each set records for particular paths with more-common gear: Bill's antenna is an array of yagis while Ray uses a rhombic for two-meter work.

The Technical Merit Award was created by the Board at its 1953 meeting to be presented each year to an amateur chosen for his outstanding technical contributions to amateur radio.

Nominations for the 1967 award may be submitted by any amateur to Vice President Wayland M. Groves, W5NW, Chairman of the Merit and Awards Committee, or to a division director (addresses on page 8). Deadline is April 15, 1968.

COVER PLAQUE AWARDS

At its 1961 meeting the Board established an award for *QST* authors adjudged by the directors in mail balloting to have written the best article of each month. A unique plaque goes with the award — the actual printing plate used for the cover that month, chromium-plated and mounted on a polished board.

Cover Plaque Awards for 1967 were earned by these articles:

January: "Modeling Radiation Patterns of Whip Antennas" by Dale W. Covington, K4GSX

February: "Practical Consideration and Application in a Multi-element Quad," by Roderick M. Fitz-Randolph, W5HVV/7

March: "Ninety Feet for One Hundred Dollars," by Thomas J. Brooks, Jr., W5OSL

April: "Solid-State Receiver Design with the MOS Transistor," by G. T. Daughters, WB6AIG; Wes Hayward, W7OI and Will Alexander, WA6RDZ

May: "The Vacation Special," by R. F. Latter, W2YFM

June: "A 50-Watt P.E.P. Output Transceiver for 75," by Kenner E. Day, W5TAB

July: "The WØEPV Squeeze Keyer," by Jimmy Moss, W5GRJ

August: "The Connecticut Longhorn," by Andrew Pfeiffer, K1KLO

September: "The Swiss Quad at ZS6PP" by E. P. Towers, ZS6PP

October: "Save Those Transistors," by Everett Emerson, W6PBC

November: "Break-In C.w. with S.s.b. Equipment," by George W. Hippisley, Jr., K1WJD

December: "Transceive with Transistors (Almost)," by Varoujan Karentz, W1YLB

Our hearty congratulations and thanks on behalf of League members to these gentlemen, and to all the authors whose voluntary efforts make *QST* what it is. QST

The World Above 50 Mc.

CONDUCTED BY BILL SMITH,* WB4HIP

E.M.E. for the Layman — Conclusion

THIS month we conclude a three-part discussion of e.m.e. (earth-moon-earth) principles by Mike Staal, K6MYC. The final section covers antenna mounts, drive systems and readout mechanisms.

First the prospective moonbouncer must decide if he is going to use his antenna system for anything other than e.m.e. experiments. This decision governs the selection of an appropriate mount and drive system. A very simple mount can be constructed if the antenna is to be used only for e.m.e. and thus be aimed at a specific point in space. This may be a logical place to begin, but you will probably soon become frustrated at being limited to perhaps 5 or 6 hours each month when the moon passes through the antenna's pattern. I suggest at least a partially-steerable array.

If only e.m.e. is contemplated, a polar (or equatorial) mount would be a wise selection as it requires only one drive mechanism for tracking and some form of manually tilting the array slightly from day to day to set the *declination*[1]. To accomplish this, your antenna mast or tower must be mounted parallel to the axis of the earth. Thus, if your station location is at 35° north, the mast would be fixed at an angle of 35° from the earth's surface at such location, oriented in a north-south direction (see fig. 1.). The declination (manually-tilted axis) changes from day to day. Information may be found in *The American Ephemeris and Nautical Almanac*, 1968, available through the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. for a nominal price. All that is necessary now is that your drive mechanism rotate the antenna at a rate of 15° per hour to track the moon.

This is all fine and dandy for e.m.e., but if you want to use your array for satellites, meteor scatter, aurora or something similar, a polar mount is not much good. A drive system permitting the array to be fully steerable in both azimuth and elevation (az-el) is the answer.

The array at K6MYC is mounted atop a homemade 12½-foot tower. The four legs of the tower are fastened to a platform which in turn is bolted to the roof of the garage directly above the operating position. A large unmodified prop pitch motor is mounted inside the top of the tower. A husky steel plate is welded to the rotating gear and another plate is attached to the first with ordinary door hinges, see the photographs. These hinges are employed in the elevating mechanism. To this plate a 3-inch aluminum channel is attached and the main boom of the array is clamped in this channel. A jack screw with right-hand left-hand square threads starting from the center out raises and lowers the array. At the lower end of the jack screw is a 20-to-1 gear reduction box giving a zero to 90° elevation time of three minutes. With the plates together the array is pointing straight up. The entire elevation drive rotates with the array.

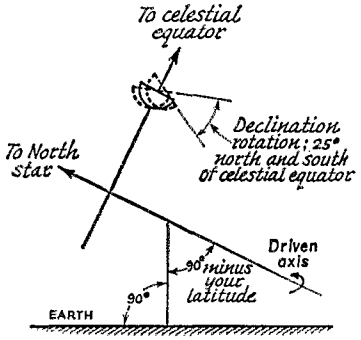


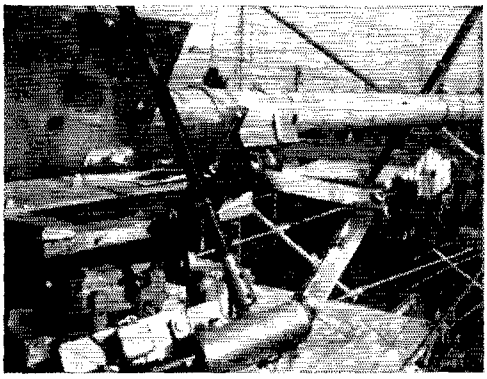
Fig. 1.

Selsyn hookups are used for direction readout and may be varied to suit the particular builder. I'll let you work out your own azimuth system, but my elevation selsyn mount is quite simple. The selsyn is attached to the main array boom and aligned with it. A weight was tightly affixed to the selsyn shaft and, of course, the weight always hangs straight down regardless of the position of the array. The mates to both selsyns are mounted on a panel in the shack. Crude, perhaps, but it gives *one-degree accuracy*, and in e.m.e. you can't afford less!

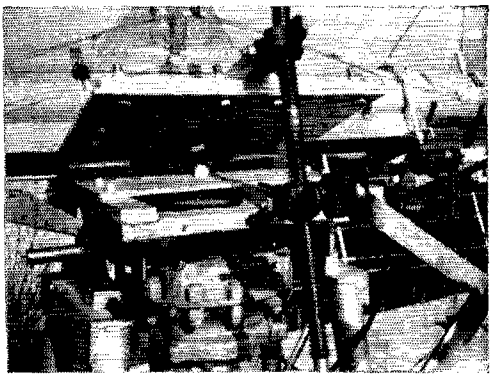
A handy item for telling if your array is pointing at the moon is the RCA SQ2520 photo-cell costing about $2, or its equivalent. This device is sensitive enough to detect the light of even a small sliver of moon. When placed at the end of a 20-inch long one-inch diameter tube and the leads connected to an ohm meter, it is an

*Send reports and correspondence to Bill Smith, WB4HIP, ARRL, 225 Main St. Newington, Conn. 06111.

[1] *Declination.* Angle in degrees north or south of the celestial Equator (the circle that would be formed at a right angle around the polar axis).



Mounted on the lower end of the jack screw is the 20-to-1 reduction system. Note the collinear elements and main boom.



The elevation selsyn is mounted on the boom to the right of the mount. Note the jack screw, elevation plates and channeling holding the main boom on the mount assembly.

accurate indicator of proper aiming. Obviously it must be mounted so to be aimed along the exact plane of your array. It is useful only at night when the moon is visible.

As can be seen, the problems of mounting, steering and controlling an e.m.e. array are mostly mechanical and must be left to the ingenuity of the builder. Following the basic principles given here on locating the moon the builder may develop his own system.

It has been a pleasure to present these notes on e.m.e. problems, and it is my hope that many of you will become interested in building your own e.m.e. system. — *K6MYC*

Mike says he will answer individual questions addressed to Mike Staal, K6MYC, 13310 Carrick Street, Saratoga, California 95070. I'm sure he'd appreciate stamped addressed envelopes. Our thanks to Mike for sharing his ideas.

1296 Mc. E.M.E. Test Set

The Crawford Hill V.h.f. Club, W2NFA, has scheduled an e.m.e. test on 1296 Mc. for April 12-14. Dick Turrin, W2IMU, says the tests will be conducted between approximately 2300 GMT, April 12, and 1028 GMT, April 13, and from 0018 to 1057 GMT, April 14. Echo testing will be conducted the first one-half hour of each period. An alternate test period has been scheduled in case local weather or technical problems prevent operation April 12-14. The alternate test period is April 19, 0620 to 1520 GMT, and 0705 to 1632 GMT, April 20.

The equipment at W2NFA includes a minimum of 200 watts output on c.w. or f.s.k., a 60-foot parabolic reflector with an estimated gain of 44 db. over isotropic, transmitting right-hand and receiving left-hand circular. The receiver noise figure is 3 db. The transmitting frequency will be 1296 Mc., plus or minus 5 kc.

WB2NDH will be active on 14.235, 21.385 or 28.690 Mc. for liason. Requests for schedules and reception reports should be mailed to Dick Turrin, W2IMU; Box 45 RR2; Colts Neck, New Jersey 07722.

Plans for this test were formulated early in December when G3LTF visited the Crawford Hill Club. W2IMU, who is an advocate of using 1296 and up for e.m.e. work, says he would like to see an annual worldwide e.m.e. weekend initiated. Presumably the date would be coordinated so that large antenna installations would be available for schedules with individual stations. A report on the April test will be in an early edition of this column.

About the Boxes

DXing on v.h.f. and u.h.f. must be at an all-time high according to the number of additions being received for the states worked boxes. It is time consuming to keep the boxes a realistic indication of current activity and past achievements. Some listings are badly outdated due to deaths, loss of interest or relocation. It is therefore appropriate to make a thorough revision of the 144, 220 and 432 standings. After this issue *all* present listings will be invalidated and *new* reports are being solicited.

The policy on the listings, perhaps not adequately publicized, is to include *only* states and U.S. call areas. The distance is not affected by political boundaries. As an example consider W6DNG's 144-Mc. standing of 9 states, 5 call areas and 5850

RECORDS

Two-Way Work

50 Mc.: LU3EX — JA6FR
12,000 Miles — March 24, 1956
144 Mc.: W6NLZ-KH6UK
2510 Miles — July 8, 1957
220 Mc.: W6NLZ — KH6UK
2510 Miles — June 22, 1959
420 Mc.: W5LUU — WA4KFW
1150 Miles — April 13, 1965
1215 Mc.: W6DQJ/6 — K6AXN/6
400 Miles — June 14, 1959
2300 Mc.: W1EHF/1 — W2BVU/1
170 Miles — July 13, 1963
3300 Mc.: W6IFE/6 — W6VIX/6
190 Miles — June 9, 1956
5650 Mc.: WA6KKK/6 — WB6JZY/6
179 Miles — October 15, 1966
10,000 Mc.: W7JIP/7 — W7LHL/7
265 Miles — July 31, 1960
21,000 Mc.: W2UKL/2 — WA2VWI/2
27 Miles — Oct. 24, 1964
Above 30,000 Mc.: W6FUV/6 — W6SJO/6
700 Feet — October 27, 1967

MOONBOUNCE RECORDS

Two-Way Work

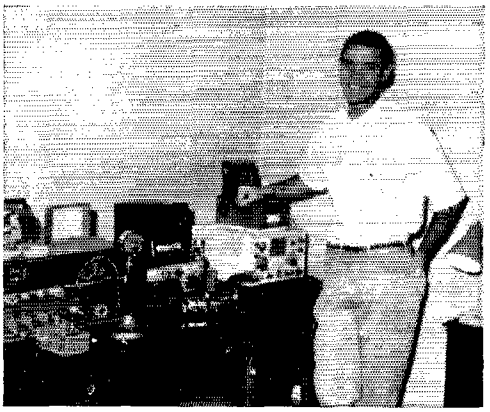
144 Mc.: VK3ATN — K2MWA/2
10417 Miles — Nov. 28, 1966
420 Mc.: WA6LET — G3LTF
5528 Miles — Sept. 25, 1965
1215 Mc.: W1BU — KH6UK
5092 Miles — August 9, 1962

miles. The mileage is derived from his QSO with OH1NL, but the contact with Finland is not considered a "state" or a "call area." Canadian and other non-stateside stations should also report only the 50 states and the 12 U.S. call areas for the state and call area columns. The ARRL WAS rule that all contacts must be made from the same location will apply. One location is defined as an area in which no two operating sites are more than 25 miles apart.

2-METER STANDINGS

W1JSM	33	8	1398	W5REP	16	9	1000
W1AZK	33	8	1384	WA5MFZ	12	6	1225
K1ABR	32	8	1330				
K1HTV	32	8	1252	W6GDO	17	4	1325
W1AJR	25	7	1130	W6WSQ	16	6	1390
K1BKK	24	7	1275	W6NLZ	12	5	2540
W1HDQ	24	7	1040	WB6KAP	12	4	1120
K1WHT	22	7	1030	K6HMS	11	5	1240
K1WHS	19	7	1030	W6DNG	9	5	5850
K1UGO	19	6	1250	K6JYO	9	4	1240
K1MTJ	19	6	1225	W6ZL	6	4	1400
K1JLX	18	6	800	K6HCP	4	2	690
K1OYB	16	5	1225				
				W7JRG	27	6	1320
W2NLY	37	8	1390	K7NHI	24	5	1275
W2CXY	37	8	1360	K7ICW	16	4	1246
W2ORI	37	8	1320	W7LHL	12	4	1170
W2BLV	36	8	1020	K7ZIR	11	4	1130
W2AZL	35	8	1380				
K2LMG	32	9	1710	W8PT	41	9	1260
K2HLA	32	8	1300	W8KAY	39	9	1210
WA2FGK	31	8	1340	W8QOH	38	9	1320
W2CLL	26	8	1150	K8AXU	37	9	1275
W2LWI	24	7	1050	W8SDJ	37	8	1220
WB2FXB	20	7	1025	K1CRQ/8	32	9	850
K2YCQ	20	7	650	W8SVI	31	8	1100
K2DNR	20	6	1010	W8BKI	30	8	1240
WA2PMW	19	6	1000				
WA2JAM	17	6	670	K9SGD	42	9	1300
WA2UDT	16	5	550	K9UIF	41	9	1150
				W9WDD	40	9	1300
W3RUE	36	8	1100	WA9DOT	40	9	1200
W3BYF	34	8	1275	W9WOK	40	9	1170
W3GKP	32	8	1108	W9MAL	38	8	1060
W3SGA	32	8	1080	W9AAG	37	9	1200
W3KCA	28	8	1110	K9AAJ	37	9	1200
K3OBU	21	7	930	W9BRN	34	8	1210
K3CFA	21	6	950	W9YYF	31	8	1050
K2RTH/3	20	7	1200	W9IFA	31	8	1050
W3BDP	19	7	1100	W9UNN	31	8	1050
				W9PBP	29	8	820
W4HJQ	39	9	1150	WØBFB	45	10	1350
W4WNH	38	9	1350	WØDQY	41	9	1300
W4HHK	38	9	1280	WØNXF	40	10	1325
W4MKJ	37	9	1250	KØMQS	40	9	1150
W4LTU	37	8	1220	WØEMS	33	9	1350
K4IXC	36	8	1423	WØLFE	33	9	1040
K4EJQ	34	8	1100	WØEYE	33	8	1380
W4FJ	33	8	1050	WØENC	32	7	1250
W4MNT	32	8	1225	WØMOX	27	7	1300
W4CKB	30	8	1300	WØLER	27	8	1100
K4YYJ	28	8	950	WØLCN	23	6	1000
W4AWS	26	8	1350	KØEMO	20	7	1125
K4QIF	26	7	1100	WØCUC	20	6	1403
K4MHS	24	8	1000				
W4VLA	24	8	900	KH6UK	2	2	2540
WB4HIP	20	8	1119				
K4SUM	17	6	653	VE1CL	8	5	800
				VE2HW	12	5	800
W5UGO	42	10	1398	VE3DIR	39	9	1300
W5RCI	41	9	1280	VE3BPR	30	9	1250
K5WXZ	35	9	1225	VE3AIB	29	8	1340
W5AJG	33	9	1360	VE3EZC	24	7	1090
W5FYZ	33	9	1275	VE3ASO	19	7	850
W5JWL	33	7	1150	VE3EVW	19	7	600
W5UKQ	29	8	1150				
W5PZ	29	8	1300	F8DO	1	1	5100
W5HFV	27	10	1285				
K5TQP	27	7	1254	OH1NL	1	1	5850
W5SWV	20	5	960				
W5WAX	18	7	1310	VK3ATN	2	2	10417

The figures after each call refer to states, call area and mileage of best DX.



Harley Herndon, WA6HXW, of Inglewood, California is one of the regular 50-Mc. observers on the West Coast. He is considered by many to be one of the up-and-coming v.h.f. men.

The purpose of the complete revision is twofold. First, we get everyone on the same basis for states and call areas; and second, those who are no longer active will not be listed, with the exception of certain leaders, past or present, whose work remains truly outstanding. Listings will be reviewed each 12 months and those stations not reporting activity will be removed, taking into consideration their total standings. WØBFB is going to find it difficult to work his 46th 144-Mc. state, and obviously it is not proper to drop his listing on that account. The ones who will be most affected are those near the bottom of their respective listings, and we hope this attempt at more realistic listings may serve as encouragement to continue active DXing *and* reporting.

With the current state-of-the-art, a listing of approximately 25 states or less on 144 Mc. from the second call area is not particularly significant, except as it may serve to show a relatively new man's progress up the ladder. The "magic number" for listing depends upon your location; 12 states from California is a real accomplishment. The same philosophy holds for 220 or 432. We might also publish a 1215-Mc. listing, eventually, if there is sufficient interest.

Please jot down your current standings for each band and mail it to me at 1238 Woodcroft Road; Richmond, Virginia 23235. Submission of a contact list is requested and the most distant station should be noted. Several of you have indicated a wish that the standings appear more frequently, and in the future we shall attempt to publish them every second month beginning with the May edition if sufficient revised listings are received by April 15.

Altering Crystal Frequencies

OVS Burton Lang, VE2BMQ, has been experimenting with the frequency alteration of type HC-6/A, and other miniature sealed crystals. His method is based on the fact that altering the thickness of the plated electrodes will pull the frequency. Changes of 300 to 400 kc. at 2 meters are possible by this method.

First it is necessary to remove the crystal from the sealed case. This is most effectively and safely done by *careful* use of a propane torch with a low flame. Gripping both crystal pins in a wide pair of

220- and 420-Mc. STANDINGS

220 Mc.				K2HQL	8	4	250
W1BU	14	5	600	W7PUA/2	7	4	500
W1HDQ	12	5	450	W2YPM	6	3	300
W1AJR	12	4	480	WA2DTZ	6	3	200
K1JLX	11	4	615				
K1UGQ	9	3	400	W3RUE	12	6	585
				W3MMV	11	5	410
K2CBA	16	7	660	K3CLK	9	4	—
W2AOC	15	5	530	W3FEY	8	4	296
W2SEU	12	5	450	K3IUV	9	3	310
W2DZA	12	5	410	W3SZD	5	4	300
W2NTY	12	5	300	W3UJG	4	2	350
K2DZM	12	5	400				
W2LWI	12	4	400	W4HHK	12	4	550
K2KIB	12	4	300	K4QIF	8	4	450
K2ITQ	11	5	265	K4SUM	8	4	402
K2ISA	11	4	300	K4NTD	7	2	835
K2ITP	10	5	265	K4EJQ	6	3	500
K2AXQ	9	3	240	W4FJ	6	3	300
K2JWT	6	3	244	W4GJO	6	2	1000
K2UUR	6	3	210	W4TLV	6	2	500
WA2BAH	6	3	200	WA4BYR	6	2	420
K2DNR	6	3	175	W4GOO	6	2	415
K2DIG	4	3	140	W4RFR	5	2	665
K2YCO	3	2	200	W4TLV	4	2	500
W3ARW	17	8	600	W5RCI	16	5	725
W3FEY	11	5	350	W5ORH	11	3	700
W3RUE	10	5	480	W5AJG	7	3	1010
K3IUV	10	3	310	W5ORH	7	3	650
W3LCC	10	3	300	W5SWV	7	3	525
W3JYL	8	4	295	W5HTZ	5	3	440
W3NG	7	4	350	W5UKQ	5	2	600
W3JZI	4	3	250	W5ML	5	1	350
W4TLC	5	1	315	W6GDO	2	2	493
				K7ICW	3	2	165
W5AJG	3	2	1050	W7JRG	2	2	420
W6GDO	2	2	100				
				W8PT	13	7	715
K7ICW	4	2	250	W8TYY	9	5	580
W7AGO	2	1	160	W8IFX	8	5	470
				K8DEO	8	5	390
K8AXU	11	5	1050	K8REG	7	4	300
				W8FWF	6	4	450
W9OVL	6	3	475	W8JLQ	6	3	275
W9JCS	6	2	340	W8RQI	6	3	270
WØEYE	4	2	175	K8AXU	5	3	660
VE3BPR	3	3	300	K9UIF	13	6	700
				WA9HUV	12	6	500
420 Mc.				K9AAJ	11	5	425
W1BU	13	3	390	W9AAG	11	4	600
W1AJR	12	4	410	W9BRN	10	5	565
W1QOP	11	3	390	W9GAB	9	4	608
W1UHE	10	4	430	WA9NKT	9	3	400
K1JIX	10	4	385	W9OKB	8	4	430
W1HDQ	10	3	250	W9OJI	6	3	330
W1QWJ	10	3	230				
W2BLV	13	5	460	WØDRL	10	4	550
K2DZM	10	4	390	WØNXF	5	3	375
W2OTA	10	4	300	WØEYE	5	2	425
K2CBA	9	7	220	WØENC	2	1	400
WA2EMB	9	4	400	WØPHD	2	1	225
W2VCG	9	4	280				
WB2EGZ	9	4	260	VE2HW	2	2	350
WA2EUS	9	4	220	VE3BPR	7	4	600
K2UUR	9	3	280	VE3EZC	6	4	510
				VE3AIB	5	4	450
K2YCO	8	6	500	VE3BQN	5	4	447

The figures after each call refer to states, call area and mileage of best DX.

pliers, evenly heat the metal case a few inches above the flame. When the solder is completely melted, pull the case off straight with a second pair of pliers. Remove the excess solder from the base with a soldering iron and shake the assembly to throw off the molten solder.

There are several ways to change the mass of the plated electrodes. Reducing the mass by removing metal increases the frequency and vice-versa. If only a small increase in frequency is desired one can rub the plating carefully with an ink eraser followed by a wash with water or acetone. This will polish the electrodes, removing a small amount of metal and raising the frequency.

The most reliable way of adding or removing metal from the electrodes is an electroplating-electroetching method. Prepare a solution of 5% copper sulphate in water, a piece of copper wire as an electrode, and a power supply of about 1 ma. for plating current. A suitable supply is a 6-volt battery with a 5000 to 10,000-ohm resistor in series. By connecting one electrode of the crystal through one of the pins to the positive terminal, and placing both in the solution for a few seconds, an etching of the electrode will reduce its mass and raise the frequency. If a lower frequency is desired, reverse the power supply connections and copper will electroplate onto the crystal electrode increasing the mass and lower the frequency.

When plating or etching it is essential that the process be done in small steps to insure that the desired frequency is not passed, or that the crystal activity is not lost. A little experimentation will show the approximate frequency movement per second of etching, or plating time. It is essential that the electrode not be etched too much as it can become separated from the pin connection. After each step the crystal should be washed with water, rinsed with acetone and dried. The cover is then held in place with a rubber-band and the crystal tested in its intended oscillator circuit. If the frequency is not sufficient repeat the plating or etching process. If the desired frequency is passed, reverse the connections and back-up. When the desired frequency is attained solder the cover back in place.

OVS and Operating News

50 Mc. came alive with F_2 signals New Year's eve following a solar flare on December 30, and produced QRM the likes of which have never been heard before in Hawaii on 50 Mc. But the band didn't only open from our western states into Hawaii, it also opened into the Caribbean. Some of it may have been *Es*, but no doubt about it, the bulk was almost forgotten F_2. Numerous reports have been received, and I especially thank KH6EEM, K7ICW, WA6HXW and K6EDX for their early and highly detailed observations.

Apparently the first hint of things to come was K1MTJ's logging PJ2CO on Aruba in Portland, Maine at 1500 GMT, December 31. At the same time aurora signals were also being copied by K1MTJ. By 1635 GMT, WA7FJQ, Kingman, Arizona was working KP4CK and KP4AST, Puerto Rico. Five minutes later K7ICW worked the Puerto Ricans from Las Vegas. Similar contacts were reported by KØGJX, South Dakota, and WA9FIH, Illinois. K6EDX heard one W4 briefly about the same time period, but that was all for the 31st. The word had spread, however, that something was afoot and many DXers were on hand Jan. 1.

Apparently K1MTJ was again the first as he

Cliff Smythe, VE3EZC, of near Toronto, Ontario is a relative newcomer to meteor scatter, but has been quite successful during showers and random scatter schedules. He may be found most nights on 3.815 Mc. looking for 2-meter schedules.

reports hearing PJ3CW at 1425 GMT. (Several PJ stations favor 50.25). At 1645 GMT the band opened for K6EDX to the east coast, closed briefly, and then went wild 20 minutes later with 1s, 2s, 3s and 4s filling the band. K7ICW's report is almost identical, give or take a few minutes. In Southern California, WA6HXW observed the opening from 1630 to 1825 GMT, except between 1710 and 1750 GMT when the band was quiet.

KH6NS first worked the west coast at 1904 GMT, and KH6EEM says his first contact was at 1922 GMT. For the next two hours those two stations were swamped with eager 6s until the band closed at 2100 GMT. Reportedly, the best DX of the session was worked at 1945 GMT, K4QKR in Florida to KH6NS.

January 2nd began at K6EDX not showing much promise, the m.u.f. hit only 37 Mc. to the east coast but at 1900 GMT, KH6NS came through working stations from Texas to Washington. KH6NS was surprised to find six open, because he was hearing only a 43-Mc. paging station in Mexico City. That opening lasted about 20 minutes.

These two men have given most 144-Mc. DXers their Oklahoma contacts. Jay, W5ORH, (l.) won't make known his 144 standings, but a guess would be 40 or more states, and Larry, W5UGO, has 42 confirmed.

January 3rd started slow also, but at 1625 GMT, WA6HXW heard 3s and 4s break through, seven minutes later K6EDX heard the east coast followed by VP7NA in the Bahamas. The opening lasted until 1739 GMT and all was quiet until 1815 GMT when WA6HXW copied TI2NA, Costa Rica. TI2NA was working KH6NS, but it wasn't until 1935 that the Hawaiian was heard in California.

January 4th was apparently quiet, but on the 5th, TI2NA worked several stations in California and Oklahoma. On the 6th, WA6HXW worked KH6NS at 1930 GMT. Then on January 8th, KH6EEM worked KH6CH/KW6 on Wake Island at 0100 GMT. The Wake Island station was running 50 watts on 50.4. January 10th produced an interesting observation at W6ABN. He copied the BBC on 41.5 Mc. at 1700 GMT, the first time the BBC has been heard in the Los Angeles area since March 16, 1959. The m.u.f. to the east coast at the time was 46 Mc.

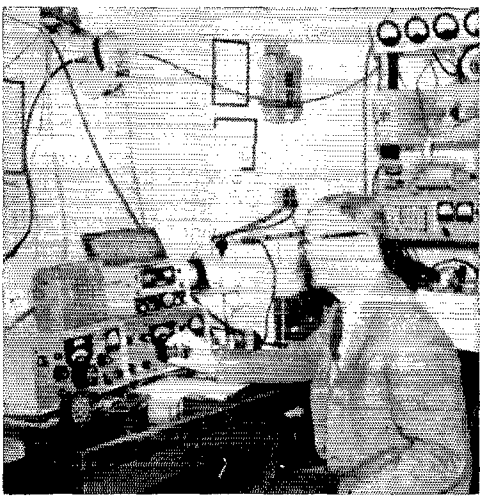
There continue to be second-hand reports of contacts being made between the eastern United States and Africa, but no first person reports have been made to this column although the stations reportedly involved have been queried. Much interesting and valuable information may be derived from F_2 and we certainly would appreciate receiving reports from more stations. But no rumors, please!

Not to be outdone by his son, W5UGO, Ray, W5HFV has 27 states on 144 Mc. The Nichols share a kw. to stacked Yagis near Tulsa, Oklahoma.

Several *Es* openings enlivened the V.H.F. Sweepstakes weekend, Jan. 6–7, and VE1AFB, Nova Scotia, found himself very popular in the midwest and east. Ionospheric scatter was also good during the contest mainly because of more than the usual number of stations active. Thanks for reports by W1HDQ, WA4LTS, W5ORH and W8PT/4.

144 Mc. is rather inert this time of year. The daily meteor count is at its annual low and tropospheric conditions are likewise generally poor. The Quadrantids shower, during the first week of January, was extremely poor and only one contact has

(*Continued on page 154*)



Ted, W4FJ, Richmond, Virginia, has been on v.h.f. more years than he probably cares to remember. Recently he became quite active on 432 with 250 watts into stacked 11-element Yagis.

Strays

Mike Caveney, VE3GG, ex 2GG, spent most of his 83 years in gold camps in the north of Ontario and Quebec. Now he spends his time hamming and writing. Our reference in a *QST* "Stray" sometime back to a poem entitled "Silent Keys" written by Mike resulted in an overwhelming demand for the poem. So, by popular demand, we reproduce it here.

Silent Keys

Down through the years, close to 50,000 QSOs,
Like ships in the night, dipping mast head lights
From everywhere around this spinning glove.
Now my ship is harbored, in the sunset of my days.
The feeble faltering of electrocardiograph
Foretells the imminent end, maybe tonight. Who knows?
With dog asprawl my slippered feet come dreams,
Nostalgic memories of fond remembrance.

Where are they now? The legion of the lost,
Those gay companions of my buoyant youth,
Their open spark gaps grunting like unfed pigs,
Those trombone trumpeters tooting the code.
The whirling rotaries which always said "good night"
While pulling motor switch on the last GN
Made music, with a dying fall so like a last farewell,
Which often, to me, seemed to say "never more."
Then the advent of c.w.; what odious comparison,
When first I heard their piping plaints
Cheeping and twittering like timid mice,
Actually daring to QRM the rearing lions on spark
who rolled like thunder across the night sky.

Well do I recall the chagrin; later, sour frustration.
Listening how effectively their flute like notes
Chewed tiny holes in distance, too small for lions,
Until I at last surrendered, and had to build anew.

I look around me now, note the fast dwindling few,
Washed up on the beach by the tide of time;
Slow moving, priority candidates who await our turn,
That black lined casket called "SK" in a future *QST*.

Well then, chin up! What about the glorious nights
Weaving invisible webs across the gliding moon,
The breathless ectasy, the awesome wonder,
A flex of finger only, yet heard around the globe?
Where else could one find such miracles of magic?
Yes, like Cleopatra, I too "have immortal longings,"
Yearning somehow to join the legion of the lost,
To sit beside them in their unknown Valhalla,
That bourn from which no traveller returns.

Exchange comments in our mild amazement as we hear
The clamourous multitudes of joyous hams,
Many grandchildren of the men we grew to love,
As they QSO the very stars with casual concern.

— *Mike Caveney, VE3GG*

March 1943

. . . Our cover shows a studious young man hard at work on radio theory. K. B. Warner editorially urges all hands to spend some time studying, since we can't operate. He also laments the fact that the red tape involved in getting a WERS permit has kept thousands of hams from participating in really worthwhile emergency communications, such as a recent Ohio River flood. We took no part even though many communities and even cities were isolated.

. . . Down in old Kentucky there is a large Signal Corps operation for the express purpose of training pre-service civilians and replacements. Clinton B. DeSoto, W1CBD, in another of his profusely-illustrated articles tells how the place operates. At the time of publication, the future of this school is somewhat uncertain, even though its value is unquestioned.

. . . The Russian telegraphic alphabet is described by Louisa B. Dresser, Editorial Assistant. This looks a little tough, but is no match for Arabic! Maybe some hams will want to use this dope when talking to fellow hams in the U.S.S.R.?

. . . W. J. Mertz. VE4UN, tells how to make a really useful and inexpensive bridge out of old parts from the junk box. With it, resistance, capacity and inductance can be measured with good enough precision for most ham applications. It is a bridge circuit and looks like a real good deal.

. . . This time it is vectors, in George Grammer's continuing series on elementary mathematics. He tells what they are, how we use them and make them behave. Just a little trigonometry is required. If you really want to understand a.c. circuits, you must have a go at these highly useful concepts.

. . . Better read Clint DeSoto's Chapter 2 of his serial," Who Killed the Signal." This is not only entertaining but intentionally instructive. The "actors" are radio parts.

. . . An exciting letter from Don Leahy, W8TKY, describes an action-packed trip to Russia. He was an RM1 on an armed merchant ship. They got through and he has returned to Brooklyn. A real rough deal in all respects. Don was subsequently cited and promoted for his part.

. . . McMurdo Silver, sort of anticipating s.s.b. techniques of today, has a fine article on "Unscrambling Secret Speech Transmission." This is a speech inverter, wherein low frequencies come out as high ones and *vice versa*. The circuit is only useful for simple inversions. — *W1ANA*

Strays

Stolen Equipment

On the night of January 16, someone broke into the office at the Forrest Hill Church of the Nazarene in Peoria, Illinois and stole a new WRL Duo-Bander 84 along with associated equipment. The thief left the office in a shambles. In his haste to make his departure he overlooked the instruction manual for the equipment. Just in case the thief reads this notice, I would invite him to return to my office any morning and I will gladly give him the instruction manual . . . and a free sermon on the commandment, "Thou shalt not steal." Harry Gruel, W9AHQ/W9JVA, pastor.

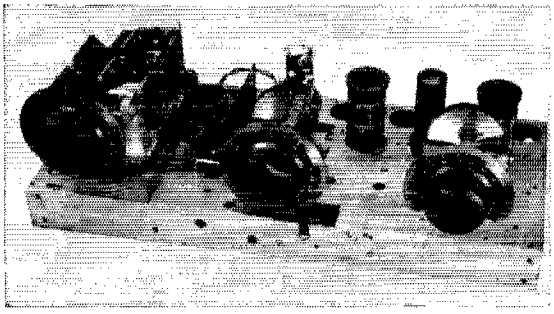
—•••—

The Post Office Department promises faster mail service with the new Zip codes. Use yours when you write League Headquarters. Use ours, 06111.

Ray Naughton, VK3ATN (center) is shown receiving the ARRL Technical Merit Award for his moonbounce efforts. Making the presentation is E. J. Wilkinson, Assistant Director, General Radio PMG, while Max Hull, VK3ZS, *Wireless Institute of Australia* president, looks on.

Going, GOING, GONE! Just a pair of weekends left in the big bash, the ARRL International DX Competition. Phone is slated for March 2–3 and the c.w. windup March 16–17. Full rules appeared in December 1967 *QST* (p. 60). Plaque winners for the 1967 affair include (on the left) **PY2BGL** pointing to a nifty addition to his collection for leading South American c.w. entry and, (on the right) **HI8XAL** (dark suit) shown receiving one of his two trophies for leading phone *and* c.w. single operator in North America. The OM making this presentation is none other than contest pro W3GRF, president of Potomac Valley Radio Club at the time Fred won both sessions. PVRC is "home club" for HI8XAL. *Figures!*

From the Museum of Amateur Radio



Radio transmitter made and used by Robert Anderson, W9MWC, during the Ohio River flood of 1937 to obtain food and supplies for the 1500 inhabitants of marooned Shawneetown, Illinois and to accomplish their eventual flight to safety. The unit was transported at the height of a blizzard, in a small open boat over great areas of water running at flood force, and set up in a raging storm at 12° above zero to establish the first direct communication with relief agencies. For his meritorious performance, W9MWC was presented the 1938 Paley Amateur Radio Award.— *W1ANA*

How's DX?

CONDUCTED BY ROD NEWKIRK,* W9BRD

How:

Rocky Marciano's recent victory over Jack Dempsey by computer has wide import. Gosh — no mayhem, no milling mobs. Just shove collected data on reflexes, punching power, endurance, recuperative index, agility, etc., and press the read-out. No fuss, no bloodshed.

It causes us to wonder, with the din of ARRL's 1968 DX Competition throbbing in our ears, if we're not doing this contest thing the old-fashioned hard way. Are we establishing our DX pecking order with too much turmoil now that more orderly scientific procedures are at hand?

Who "wins" DX contests? More often than not, the best operators with the best stations. If not, then we fail to prove anything anyway and might as well skip the whole thing. Okay: is there a neater way to find the best ops with the best outfits? Apparently there is, or the Rock couldn't have clobbered the Manassa Mauler.

First we obtain certified data from contest entrants. Equipmentwise much information is easily obtainable from manufacturers and the catalogs of distributors. Homebrewers, always a nuisance, would have to submit notarized specs. (Perhaps we had best leave homebuilders out of it. What are *they* trying to prove?) Per-band antenna gain, front-to-back ratios, power, QSY rapidity, receiver selectivity/sensitivity and so forth would be facts easily digested by Mr. Computer.

Station location, another cinch. Just follow SWBC station criteria of terrain evaluation. You know, ground factors, horizon fall-off, etc. Local noise interference would be another factor subject to certification after tape studies. Propagation conditions? Records on file at CRPL, ITU and other sources should permit enough discrimination to match Massachusetts Ones against the Connecticut species for longitudinal and latitudinal variations over the selected period.

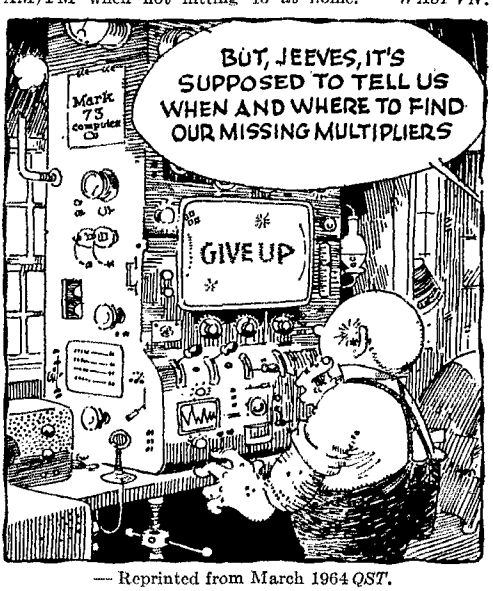
Operator capability and condition? Well, this is what the Marciano-Dempsey "fight" demonstrates. No longer do we have to go through the wringer to evaluate these things. No sweat, no strain. Reflex action, code speed, speech and fist clarity, timing, endurance — all binary meat for the Big Box.

Yeeks — how about XYLs or the lack thereof? Handicap or multiplier? (Don't you *dare!*) The little woman's role in a contest man's success can be so crucial that no computer could afford to disregard it. As HC1TH testifies, "Rita kept the kids quiet, fed me, told people I wasn't home, let me yell throughout the night without a bad word, still treated me as a human being, and is the main reason I scored 2,670,000 points in the '67 ARRL Test." Gee, guys with gals like that should get dividers, not multipliers.

Guess we'd better hold off on this whole scheme for now, at least until they come up with computers courageous and capable enough to tackle such a decisive complex variable. See you in the Test pile-ups next year as usual — XYL permitting.

What:

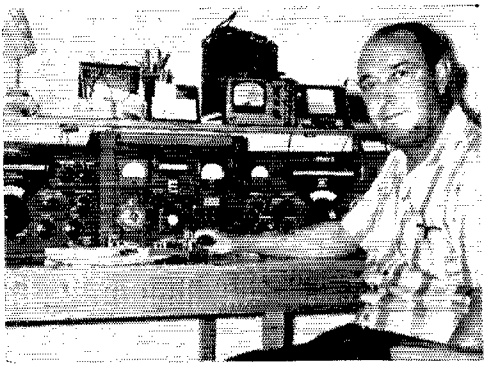
Less tourism and international expenditures may slow our DX turnover, 'tis said, but there seems to be more than enough to go around. Since you've doubtless got your own ARRL DX Contest stalk list clutched tightly in hand we'll rest up the "How's" Bandwagon this month in favor of a smattering of *vox* DX *populi*. . . . "CEØPC, PZ1AH, TGØAA and 6W8CW bring me close to 40 countries on 160." — *WØVXO*. . . . "One-sixty sure lively! Passed my Extra." — *WA1FHU*. . . . "Hope to see more *QST* construction articles, etc., for 160 meters." — *W1BB*. . . . "Anyone interested in correspondence in French might try FY7YM." — *W7DQM*. . . . "A number of new ham arrivals in the Kwajalein region." — *KX6BU*. . . . "Sure wish 10 meters would stay with us longer." — *CX4DT*. . . . "Much fun working maritime mobile aboard 90-ft. barkentine *The Pride* en route the Bahamas this winter." — *WAØKXJ*. . . . "ZF1ES makes it 58 for my AF-67 and PMR-6." — *WA5PIF*. . . . "Been working at WFIN/-AM/FM when not hitting 40 at home." — *WA8PVN*.



— Reprinted from March 1964 *QST*.

. . . "Lots of countries and WAC — all I need is some QSLs." — *WNØRVR*. . . . "My 2C's serial number is 0003." — *WNØKVR*. . . . "Passed my General!" — *WN1HHO*. . . . "Me, too. Now for a new 3-element beam." — *WNØRJY*. . . . "KL7FDG, 10 c.w., was my 50th state." — *WA5MIN*. . . . "The 5V4 gang plans a lot of 21-Mc. s.s.b. activity." — *K9CSM*. . . . "Ten is *beautiful*." — *WA1GGN*. . . . "9G1KG, 20 c.w., was my best in a long time." — *W9LCG*. . . . "Need XE1YL for my gals collection." — *W2QHH*. . . . "DXperimenting with attic antennas." — *WA9BRD*. . . . "Haven't chased DX much for years but still interested." — *W4BU*. . . . "JY1's recent U.S.A. visit was a classic example of international good will and understanding made possible by ham radio." — *W8TXT*. . . . "Need Del., Utah, KL7 and

*7862-B West Lawrence Ave., Chicago, Ill., 60656



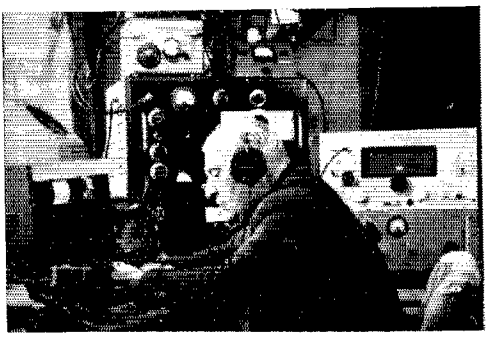
PY1NO and YV1DP are avid c.w. DX diggers with potent signals from the south. In last year's ARRL DX Contest Luis ran a respectable fourth in fierce Argentine competition. Gregorio, signing YV1DP/5, needed just one week end to win for Venezuela with 1470 code contacts. (Photos via W1YYM)

KH6 for WAS." — *WN1HVL*. . . . "Wish DX stations would tune higher into the 21-Mc. Novice range." — *WN4GSS*. . . . "DX conditions substantially improved." — *WN8VZS*. . . . "Scores of JAs and UAØs on 15." — *W7POU*. . . . "Nightly openings to Europe on crowded 40." — *WB2ZNZ*. . . . "Africa blasts in on 15 c.w. around 2000 GMT." — *WB4EFE*. . . . "Oh, to be an FP8! The 'Atlantic wall' is almost too much." — *W5QGZ*. . . . "Been a reader of *QST* for thirty years." — *YN1MO*. . . . "Hams interested in u.f.o. phenomena are invited to contact WB6RPL." — *WA9THB*. . . . "Finally worked KH6IJ after reading and hearing about him for twenty years." — *W9JVF*. . . . "A card from one of my two KH6s will give me WAS." — *WA3DMH*. . . . "After 28 years of hamming the DX bug caught up with me." — *WØDAK*. . . . "Went all the way through school with old friend 5N2AAX." — *W4JUK*. . . . "EL2AG graduated from Dartmouth a year ahead of me." — *W4NJF*. . . . "This month's North Jersey DX Association DX Round-up at Wayne, N. J., follows the IEEE convention by one day." — *W2PXR*. . . . "Who are you hiding from under that eye shade?" — *WB4HIP*. . . . "Seems a shame that so many youngsters start right out with store-bought black boxes these days." — *W2LYH*. . . . "One-hundred-per cent c.w. out here." — *K6ARE, ex-KA7DR*. . . . "Ready to start topping off my new 60-ft. crank-up." — *WØPAN*. . . . "Caught WØTUT/mm off the Ivory Coast on 15 c.w." — *WA3HRV*. . . . "Putting the finishing touches on my SB-101 for 15 and 20." — *W1BUBY*. . . . "Long a reader, finally a contributor." — *W3CKU*. . . . "School is QRMing my DX." — *WA9MQI*. . . . "If more DX tries 10 and 15 I'll hit 200 by spring." — *VE3CDP/W9*. . . . "Finally recovering from the holidays overload on my Post Office job." — *W3HNK*. . . . "Send additional postage to your bureau to bring your on-file s.a.s.e. in line with new rates." — *WA8MCQ*. . . . "Trailer travel lets me fire up my SR-160 from rare states now and then. They really go for Montana." — *WØCIS*. . . . "Busy on 10, 15 and 20 with my new TR-4." — *W9LNQ*. . . . "Caught JAØBCO and UAØEQ long path on 7003 kc. at 2200 GMT, December 29th." — *W4KFC*. . . . "Very busy lately but I always try to steal some time for rare DX." — *KP4RT*. . . . "Note that our club station, DL4RM, now has its own mailing address." — *DL4FS*. . . . "Postage on one or two ham magazines, if sent as printed matter, costs no more than a couple of packs of cigarettes. Let's help our overseas friends." — *K9BNF*. . . . "No 75-meter work allowed in VR3-land." — *KP6AP*. . . . "Let's have more stuff in your 75- and 80-meter sections." — *ON4UN*. . . . "Ten days on 10 got me 110 DX stations with a low dipole." — *WA1CYT*. . . . "Thanks to K5LMJ/6, W6s ABX ANK AOM BE FSC LAB PWG VIO, WB6NNU, W7HIO, K7INA, WA8AZB, W9ASO and WA9GJV for generous traffic assistance." — *KG6IC*. . . . "Been here in Uganda as a frustrated s.w.l. for more than a year." — *W9JOP*. . . . "JA3IG has a handy filing system for QSL data including first names, QSO dates, etc." — *W3BT*. . . . "Our MARTS QSL Bureau is extremely efficient." — *9M2DQ*. . . . "A borrowed Valiant and new 14-AVQ bring me back to serious DXing." — *K2BJH*. . . . "Power company still puts in an S9 T1 signal at my place." — *W8YGR*. . . . "Awaiting M1B's QSL for QSO on 28,665 kc. at 1500 GMT." — *W9VNG*. . . . "The XYL here works good DX as WN4IIF." — *W4YOK*.

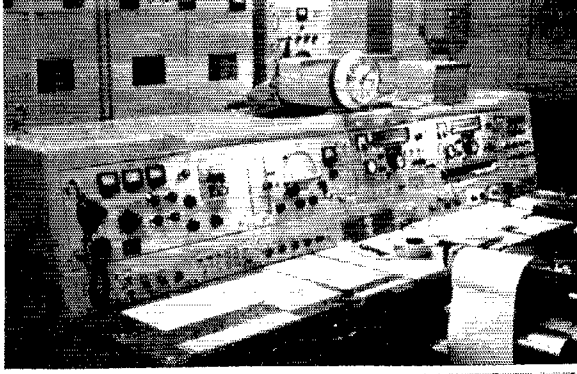
—•••—

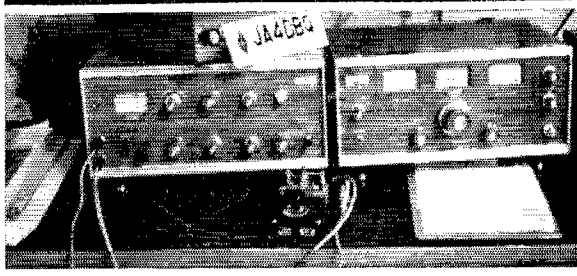
Space permitting, next month we'll check band activity with the aid of (20 c.w.) Ws 1AYK 3HNK 4YOK 7POU 8IBX 9LCG 9LNQ, Ks 2BMI 4TWJ 6OZL, WAs 1CYT 1DJG 1FHU 1IUL 2PZD 3HRV 8MCQ 8PVN 9THB, WB2SSK, I1ER; (20 phone) Ws 2DY 2VOZ 3HNK 4YOK 5QGZ 8YGR, Ks 4HQD 4TWJ 9UCR, WAs 1DJG 6JDT 7AUW 8MCQ 8WSI 9THB, WBs 2RJJ 4EWU, KP4DBJ; (15 c.w.) Ws 4YOK 7POU 9LNQ, WAs 1CYT 1DJG 1FHU 8PVN, WB2SSK, WN4IIF, I1ER; (15 phone) Ws 2DY 4JVN 9LNQ, K4TWJ, WAs 1DJG 5PIF 7AUW; (10 c.w.) Ws 4YOK 5QGZ, WAs 1CYT 1DJG 5PIF 8MCQ; (10 phone) Ws 4YOK 5QGZ 8YGR 9LNQ, K4TWJ, WAIs CYT DJG, KH6BZF, KG6IC; (40 c.w.) Ws 4YOK 8YGR, WAs 1CYT 1DJG 1FHU 5MBC 8MCQ 8PVN, WN4IIF; (40 phone) W8YGR; (80 c.w.) Ws 1SWX 4YOK, WAs 1CYT 1FHU 8MCQ; (160 c.w.) W1BB and WA1FHU, plus correspondents to file. Did you catch that fantastic 40-meter opening as the old year ended? A good tip-off was the roaring signal of Radio Peking. Long-path Asians were unbelievably solid. What next? Who knows? Clamp your phones on and keep tunin', *tunin'*.

G4CP gives his beam a visual check before hitting the north Atlantic path. That towering QSL stack behind Ron, an outbound shipment, resulted from last year's ARRL Test. G2DC, right, is a multiband c.w. DX connoisseur of wide renown who also enjoys our annual event. (Photos via W1YYM)



JA4DBQ operates aboard tanker *Idemitsu Maru*, one of the two largest ships in the world. Another ham, JA1XUM, is the vessel's third op. WA1CZH, an electronics specialist who provides these photos, writes, "Her physical dimensions (1122 feet in length, a beam of 163 feet) give but a faint hint of the overwhelming impression of immensity felt by a visitor. Every month she carries 210,000 tons of crude oil from Kuwait to a refinery at Tokuyama, Japan." Idemitsu signs JHBD on ship bands. Neat shack!





Where:

AFRICA — 5Z4DW cautions, "After January 1, 1968, there is no guarantee that QSLs sent to the East Africa bureau will reach me. Therefore cards intended for my station should be sent via RSGB or to my address [in the catalog to follow]." Jock reminds us to remind all DXers that, while ARRL and many sister societies accept and relay QSLs for members and nonmembers alike, some overseas bureaus operate on a members-only basis. So don't count on your QSL via the XY bureau reaching XY2AA unless XY2AA recommends the routing during QSO. 5Z4DW continues, "I regret that this will be some inconvenience to operators who have already dispatched cards via bureau since that date but I shall be pleased to reply on receipt of QSLs via RSGB or my home address." . . . . . W9JOP writes from Uganda to W2CHT, "We have hundreds of cards in the bureau for 5X5SR but I'm sorry to say he was not legal. He was never heard at this end, never claimed QSLs and attended no meetings of the Kampala Radio Club." . . . . . W9VNG's QSL managership for ZD8RK commenced January 16, 1968 . . . . . VERON's *DXpress* indicates that VE3IG may be of assistance in confirming contacts with operator Bill of 9F3USA . . . . . QSLs for 9Q5PA QSOs in 1963–'66 may be secured through K5LZT, s.a.e. (self-addressed envelopes) plus IRC (International Reply Coupon) required . . . . . "S.a.s.e. (self-addressed stamped envelopes) or replies go via bureaus," is K9BNF's reasonable stipulation concerning his QSL labors in ZE1CY's behalf. "Bob states that *Callbooks* are hard to come by in Rhodesia, so I'll be glad to relay any unneeded recent past issues forwarded to me." . . . . . WA1DJG finds that 7X2VJ really goes for U.S. mint commemoratives — QSL pronto . . . . . Good idea to clearly check off or underline the address you intend to extract from your *Callbook*. OM. WØTCF keeps receiving W9WNV/DX mail meant for KØTCF . . . . . *DX News-Sheet* finds Marion islander ZS2M1 lately specifying QSLs via ZS2PX.

ASIA — VU2DIA bombed K6OZL in January with a batch of QSLs bound for W/Ks. If yours is due, drop Ron an s.a.s.e. to 1029 Geary St., San Francisco, Calif., 94109 . . . . . W7PHO advises inquirers he has no BV-type QSL arrangements . . . . . "Logs not received since last July," laments WB2SSK, "so I will no longer be able to handle QSLs for 4X4CJ. Unanswerable cards received have been mailed to 4X4CJ. Perhaps he will reply via bureaus." . . . . . 9M2DQ, via W2AEP, urges W/K/VE/VOs to make sure they keep s.a.s.e. on file with their local ARRL QSL Bureau branches . . . . . Ex-XZ2AD, now in Thailand at the address in the listings to follow, welcomes mail from old on-the-air friends. Oung would rather you omitted radio terminology and call signs from the cover.

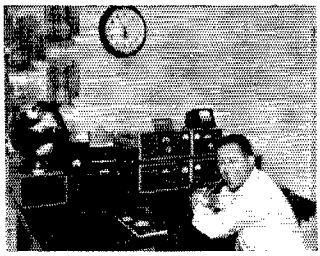
OCEANIA — "All stations QSOd *will* receive cards," guarantees KP6AP (K6CAA) concerning his Line Islands visit. Try the address in January's "How's" . . . . . "I am no longer QSL manager for KG6SL," notifies W4FRO, excepting QSOs made January 15 through June 6, 1967, for which he does hold logs. "Been trying since July to get just a sign from him that he's still interested in having his QSOs confirmed. No response." . . . . . K8WXV, based on Iwo, iterates his intention to confirm every KG6IC QSO direct on receipt of s.a.s.e.

EUROPE — The present DL4FS has held that call since September 1, 1967, but still receives QSL requests for earlier contacts. QSOs with Bernie may be confirmed via the address in the catalog to follow. "I QSL 100 per cent." . . . . . W5QGZ still awaits cards from many of the W/Ks he QSOd and QSLd as DL4LA . . . . . K9BNF expects overdue logs from QSL client OK1AKO whose ham radio activity was temporarily shelved by family illness. Patience, please . . . . . *DX News-Sheet* suggests possible Iceland QSL routes to TF2s WKH (via WA9IPK), WKM (SM7DQC), WKs (WB2DXL) and WKT (K3HLU), also that I1ALX, Box 33, Fiesole, Italy, may be of assistance in confirming 3A2MJC QSOs made between December 25, 1967, and January 5, this year.

SOUTH AMERICA — Rare viewpoint from the DX end courtesy 28-Mc. fan CX4DT: "I do not grudge a QSL direct to anybody who really needs it quick since I have no financial worries to that effect. On the contrary, I am very pleased to know that Uruguay QSLs are sought after by U.S. hams and I feel honored when I am asked for one. I'm only sorry that sometimes with pile-ups I have to dispense with rag-chewing, however much I would like it, to work the fellows one by one real quick. It is nice to hear some of them ask me for my card with eagerness; that is my greatest reward." . . . . . "As of this January I'm QSL manager for PZ1CF," informs W3HNK, specifying IRCs from foreign applicants.

HEREABOUTS — "Ought to be some sort of award for QSLers of the Month," feels K6ARE, so the least we can do is award them mention in your *QST* DX pages. Like this: CEØAE, CP5AA, CR6DA, DL5OU, EA9AZ, EL2AC, FW8RC, G3FBU, GB2DX, GC3LFJ, GM3IAA, HA5DA, I1ZQ, KS4CF, KX6s BQ DB, KZ5GN, OA4PF, OH2s BEM BR/mm, TGØAA, VK6IZ, VPs 2MO 8IE, VQ8s CC CCR, W6HCX, ZDs 3G 7DI, ZE1CX, ZS9L, 7X2VJ, 9G1KG and 9Y4DS, as well as QSL tenders Ws 4YWX 7VRO, Ks 6ENX 9KLR and WA8RWU, all nominated for such distinction in "How's" correspondence from Ws 1SWX 8YGR ØDAK, K6ARE, WAs 1CYT 1DJG 2HIU 5PIF 7AUW 8PVN 9RLF and listener P. Kilroy. Anyone we missed? . . . . . *Help!* These italicized brethren seek clews toward coaxing QSLs from holdouts mentioned: *W5LXG*, EI3AK, K5QFH/KH6, KP6AZ, KS6BT, OHØAA, OX3JV, VP2SY, 6O6BW, 8R1G, 9H1AG, 9M2PO; *W6KNH*, SVØWB (W4SSG?) of '59 vintage; *K2BMI*, YI2AC; *K8ARE*, CE9AL, HM9DC; *WA1CYT*, EA6AM, FL8RA, TT2WD, XE2AA; *WA1DJG*, FL8RA, PX1AN '66, 5R8BA; *WA7AUW*, G3JUC, SM5KB, TG4VH and YN1AA . . . . . W4s FRO JVN, WAs 2CNA 7AUW and ØNBZ offer to serve as QSL aides to overseas types in need of such assistance . . . . . WA5PIF declares, "ZF1ES, reachable via RSGB, QSLs 100 per cent via bureaus." . . . . .

KA2JP talked up a 728-QSO storm in the '67 ARRL Test, finishing as second-high KA, fifth for Japan. (Photo via W1YYM)



VK6s MK and RU, Western Australia big DX guns of long standing, were most hospitable to VK2ADY during Don's stopover there late last year. (Photos via W9WNV)

W8GIU's move to Texas complicated his QSL-managerial efforts. "I'll be out from under and caught up shortly," he vows .-..-.- Bye-bye VP6, hello 8P6! W8IBX, WB2UKP and *DX News-Sheet* correlate new Barbados calls with the old style as follows: 8P6AY-VP6GC, 8P6AZ-VP6AO, 8P6BH-VP6KL 8P6BU-VP6PJ and 8P6CC-VP6WR, respective QSL routes unchanged .-..-.- W9SZR (ex-HI8XAL) advises, "As a cooperative measure with the Union Dominicana de Radioficionados, K3EST is serving as QSL manager for HIs 7JMP 8RVD and 8TEP; K9GZK likewise for HI8s BST CNJ and IBC, all after January 1, 1968. S.a.s.e. will get direct reply, otherwise answer via bureau." .-..-.- "I've been QSL manager for VP7NA for a number of years and expect the relationship to continue for some time to come," remarks K9GZK, no longer answerable for VP7NP pasteboards. WAØKXJ, after a pleasant Bahamas visit, adds, "Anyone who worked VP7NA or WAØKXJ/mm from December 24 through December 31, 1967, should QSL to my home address with s.a.s.e. Harold preferred me to take charge of QSLing for QSOs made while I was at the key." .-..-.- Time to restate that we normally have no space allocation to duplicate data already available in the *Callbook*, nor can we usually repeat a given listing more often than every six months or so, and then only when evidence is to hand that the information remains valid. Also note that for direct reply, unless specifically waived, self-addressed stamped envelopes (self-addressed envelopes with International Reply Coupons when appropriate) should be included in mailings to QSL managers herein designated. Shucks, this is good practice when seeking postal response from *anyone*. Now perhaps one or more of these will hit the spot, but keep in mind that each item is neither complete, accurate nor "official" . . .

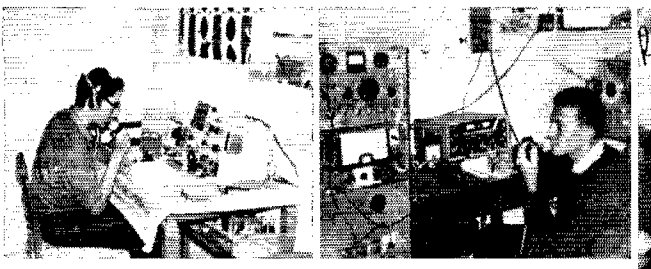
CE6EZ, via KØSQX
ex-CM2SW-CO2SW (to KP4CRT)
CO8MN, A. Soto, P.O. Box 102, Bayamo, Cuba
CR6KT, P.O. Box 289, Luanda, Angola
DL4FS, Bernie Welch, CMR Box 4488, APO, New York, N. Y., 09057 (see preceding text)
DL4RM, Club Station, CMR Box 2474, APO, New York, N. Y., 09057
EP2DW, SFC D. Willett, US AstraComFac, Tehran, Box 1500, APO, New York, N. Y., 09205
FR7s ZO/g ZQ/g, P.O. Box 4, St. Clothilde, Reunion Is.
HIs 7JMP 8RVD 8TEP (via K3EST; see preceding text)
HI8s BST CNJ IBC (via K9GZK; see preceding text)
HS1AF, 49 Soi Atavimol, Rajprarop Rd., Bangkok, Thailand

YV5CEY raps out some c.w. from Caracas with the obvious approval of his dad, YV5BWP. (Photo via W3HNK)

Is 4RUI 6FRU (via I1ZIZ)
KØILI/KG6, O. Johnson, P.O. Box 1048, APO, San Francisco, Calif., 96634
KH6BJ/6, R. Dreher, % Granger Associates, P.O. Box 11273, Palo Alto, Calif., 94306
KH6EDY, USCG Loran Stn., USNS Box 36, FPO, San Francisco, Calif., 96614
MP4MBC, Amateur Radio Club, RAF Masirah Is., BFPO 69, England
OA0ENP, Nestor, Base Naval del Peru, Callao, Peru
ON4UN, J. Devoldere, Box 41, Ghent 1, Belgium
PK1SH, Box 2127, Djakarta, Indonesia
PK8YAK, Haruman 28, Bandoeng, Indonesia
PK8YFE, Poen, Tjipaganti 136, Bandoeng, Indonesia
PK8YZZ, Lemong St., 25-A, Bandoeng, Indonesia
PY7AUT, C.P. 975, Fortaleza, Ceara, Brazil
PZ1CF (via W3HNK; see preceding text)
SV0WU, P.O. Box 66, Rhodes, via Greece
TJ1AO, Box 49, Yaounde, Cameroon
UA6NQ, V. Ignatov, GPO Poste Restante, Novocherkassk 30, U.S.S.R.
UP2OV, Box 310, Kaunas, Lithuanian S.S.R., U.S.S.R.
VE3CDP/W9, D. Clements, 400 Summit Dr., RR 1, E. Alton, Ill., 62024
VE3DXV/W6, A. Mentes, 536 Walker Dr., Mountain View, Calif., 94040
VK4HG, J. Hamilton, 37 Byfield St., Reservoir, Victoria, 3073, Australia
VP7s NA NP (see preceding text)
WA2CWG/OA6, Yvonne Noe, P.O. Box 35, Ilo, Peru
WB6HXO/KH6 (to KH6GGR)
XE1GJR, P.O. Box 154, Tehuacan, Puebla, Mexico
YN4JAB (via G. Baker, W8GIU/5, 413 Maple Av., Dalhart, Texas, 79022)
YV4s ID NQ, H. Tovar, P.O. Box 18, Maracay, Venezuela
YV5s CIZ/1 CKR/1, Aptdo. 41, Valera, Venezuela
ZE1CY, Box 738, Gwelo, Rhodesia (QSL via K9BNF)
5U7AN, B.P. 201, Niamey, Niger
5Z4DW, G. Perrett, P.O. Box 834, Nakuru, Kenya (see text)
7Q7AM, Box 215, Kilgngwem, Malawi
7X2VJ, J. Vignolles, Box 165, Oran, Algeria
8P6s AY AZ BH BU CC (see preceding text)
9J2LN, J. Lehman (W4POL), Box 18, Chisamba, Zambia
9N1BUZ, Box 176, Kathmandu, Nepal
9Q5GG, Box 377, Mbujimayi, R.C.
9Q5PT, P.O. Box 3162, Kinshasa, R.C.
9V1NV, R. Heslop, 34 Poulden Ct., Jalan Kayu, Singapore 28
9X5AA, B.P. 28, Kigali, Rwanda

CE3UF/Ø (to CE3UF)
CEØXE (to XE2NZ)
CR6IK (via K3ZVM)
EAØCM (to HB9CM)
EAØFP (to HB9FP)
EAØTU (to HB9TU)
GB3RAG (to G3VJU)
JX2AD (to LA2AD)
KG6SL (see text)
VQ8CB/a (via KØTCF)
VQ8CBN (via KØTCF)
VQ8CDC (via VQ8AD)
VQ9L (via VQ9TC)
XW8CAL (via VE6AO)
ex-XZ2AD (see text)
YV5AGD (via W5PWG)
ZC4RB (via G3VIR)
ZD8RK (via W9VNG)
4X4CJ (see text)
9Q5CD (to W8UTQ)
ex-9Q5PA (to K5LZT)
9Q5SE (via W4RNC)

Our QTH contributors for this run are Ws 1IKE 1SWX 1WPO 1YYM 2DY 4KFC 8IBX 8YGR 9DOR 9LNQ 9SZR 9VNG, Ks 2BMI 4TWJ 9GZK, WAs 1DJG 1FHU 2PZD 5PIF 9RLF, **WB2s** SSK UKP, **G8AUU, KH6BZF,** J. Morris, Columbus Amateur Radio Association *CARAscope* (W8ZCQ), DARC's *DX-MB* (DL3RK), *DX News-Sheet* (G. Watts, 62 Belmore Rd., Norwich, Nor. 72. T, England), Florida DX Club *DX Report* (W4BRB), International Short Wave League *Monitor* (A. Miller, 62 Warward Ln., Selly Oak, Birmingham 20, England), Japan DX Radio Club *Bulletin* (JA1DM), Long Island DX Association *DX Bulletin* (W2GKZ), Newark News Radio Club *Bulletin* (L. Waite, 39 Hannum St., Ballston Spa, N. Y.), North Eastern DX Association *DX Bulletin* (K1IMP), Northern California DX Club *DXer* (Box 608, Menlo Park, Calif.,



4X4s YY UH and SO, left, center and right, are typical of Israel's thriving DX community. Scholar 4X4SO hopes to visit our country soon to study for his doctorate. (Photos via K3MNJ, Ws 3HNK and 2IWP)

94025; attn. K6CQF), Ontario DX Association *Long Skip* (VE3DLC), Southern California DX Club *Bulletin* (WA6GLD), Utah DX Association *Bulletin* (W7LEB) and, last but hardly least, VERON's famous *DXpress* (PAØs FX LOU TO VDV WWP). Great diggin', lads!

Whence:

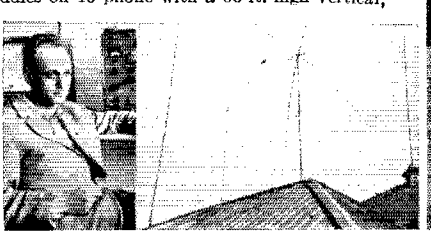
EUROPE — Mark that shack calendar, OB. From 1200 GMT April 27th to 1800 the 28th you can choose phone or c.w. weapons for battle in the 1968 *PACC Contest* sponsored by Holland's VERON society wherein non-Netherlanders will work as many PA/PE/PI persons as possible, once each per band, 1.8 through 30 Mc., using the customary RS- or RST001, RST002, etc., serial swap. You earn three points per two-way exchange, total points to be multiplied by the number of Dutch band-provinces contacted, for final score (province abbreviations to be used: DR FR GD GR LB NB NH OV UT ZH and ZL). Each log, postmarked on or before June 15, 1968, should be sent to P. v.d. Berg, PAØVB, VERON Contest Mgr., Keizerstraat 54, Gouda, The Netherlands, accompanied by a signed statement that the participant has observed the contest rules as well as regulations for amateur radio in his country, to be eligible for possible certifications of performance. At the same time you might request specifications on VERON's various worthy DX diplomas. In last year's PACC affair K2KBI, Ws 2ZV 9LKI 9JQD 4KMS 4DMT and 4JUK finished in that sequence for our side, with VO1AW, VE1AE and 3C2IL running 1-2-3 up Canada way. The Dutch big ten, in order: PAØs BRM LOU GMU SOL AAJ VRZ VB HES GRF and FAK. Country leaders include CR7IZ, CT1OI, DL8MM, F9DW, F9VN/FC, G2LB, GD3AIM, GM2HCZ, HA5KFZ, HB9QA, HP1AC, JA3ECE, LA7TH, OE1LM, OH7AA, OK1AHG, ON5KD, OY4M, OZ1QW, SM5BNX, SP8HR, UA4KKC, UA2KBD, UA9HM, UB5HS, UC2KAG, UD6BW, UH8BO, UI8AI, UP2KNP, UQ2FJ, UR2LO, VK2AVE, YO8DD, YU1EXY and 4X4NY. East Germany, West Germany, Hungary, Czechoslovakia, Poland, Russia and the Ukraine each surpassed the number of Yank entries. *C'mon!* . . . . . GB3RAG, due to terminate operations about now, was a multiband DX splash by University of Salford Electronics Society, G8AUU secretary . . . . . ON4UN, GW3AX, LA5KG and DL5XU are the nucleus of a phone DX net on 3795 kc. at 2100 GMT each Monday and Thursday. "During our sessions DX information is exchanged by members and a DX bulletin will be broadcast by the net director," says ON4UN. "All interested hams are invited to check in." Okay, but somebody had better tune up-band . . . . . "I'm new on the bands," admits OY4OV to s.w.l. J. P. Morris of Cleveland. "My daily QRV hours are 1800 GMT on 3750-3800-kc. sideband. On week ends I also work 14,250-14,350, 21,300-21,375 or 28,500-29,000 kc. at 1000-1600 GMT." . . . . . Consult with NRRL-Larvik, P.O. Box 59, Larvik, Norway, for data on Norwegian Award 1968, a certification based on '68 QSOs with certain LA colleagues . . . . . K9BNF reminds us that unceded back issues of U.S. electronics literature are hungered for in Czechoslovakia and other DX regions. A current subscription to *QST* in the name of a DX friend is a prized boon, indeed . . . . . DL4FS looks for Stateside buddies on 10 phone with a 60-ft.-high vertical, 1300-1700 GMT . . . . . UV3BC/M (for Mirny) puts Antarctica on 20 c.w. around 1700 GMT . . . . . Rockall island, a desolate crag off the Outer Hebrides, is reported under RAF and RSGB DXpeditionary surveillance.

ASIA — Alas! K6OZL hears that Mr. Andaman Islands, VU2DIA, heads for the mainland this month or next. The line forms near 14,060 kc. around 0100 GMT . . . . . From 9M2DQ via W2AEP: "Why no 9M2DQ signals to the States these days? I left my two towers and beams at Baling estate which was sold in March, then spent four months at a temporary location before going to England on leave. Since December I've been at Kedah with only my TR-4 and trap dipole. Not sure I'll remain here." . . . . . W3BT visited JA3IG's 200-ft.-high shack at Osaka recently. "You should see his collection of JT cards! He finds VP2 the hardest area to work from there. Watch for him on 21,050 kc. almost daily at zero GMT." . . . . . UA9OHf's friend UA9PD recounts his ham career in lines to W1YYM translated by W1ARR of Hq. After apprenticeship on u.h.f. from 1956 to '60 Vladimir hit the h.f. DX trail from club station UA9KOG. Since 1961 UA9PD has served as Novosibirsk Radio Club's QSL bureau manager. Vlad delights in 14-Mc. contest work with his UA1FA-designed 100-watt transceiver and rotary beam, also trying 21 Mc. occasionally . . . . . Eastern oddments via the clubs press: AP2AD wants to try East Pakistan again, meanwhile representing the West with AP2s KS and SG on 20 voice. . . . OD5BZ still points toward Qatar. . . . HZ3TYQ of ArAmCo may be available for more rare DXcursions out his way.

AFRICA — Uganda commentary courtesy Kampala-based W9JOP via W2CHT: "At present the only active licensed stations are 5X5s FS and JK, the former in Jinja, the latter in Kampala. I'm with the Embassy and previously signed BV1USA, KR6EU and DL4OP. Due to an emergency situation, recently extended another six months, I am unable to become licensed. Our local radio club has two members with G calls (one is 5Z4LE) who also cannot obtain Uganda licenses. Kampala Radio Club, 5X5JK, meets Tuesdays at 1700 GMT and usually operates s.s.b. on 21,350 kc." . . . . . G3BID, back in the Gambia as ZD3F, hopes to visit Senegal as G3BID/6W8 . . . . . Africa addenda courtesy DX club newshawks: Red Cross reps EAØs FP and TU (HB9s FP and TU) followed EA9CM (HB9CM) with January radiations from Fernando Poo. . . . VQ8CDC of Chagos haunts 14,020-14,040-kc. c.w. at 1200-1500 GMT. . . . FR7s ZO/g and ZQ/g arouse 20-meter Glorieuses interest. . . . 5U7AN adds a fresh Niger note to 15 and 20 voice. . . . 3V8BZ's closedown detunes Tunisia. . . . CN8s FF and FS switched Stateside with FV to follow this month. . . . ZD8J is due for QRT after turning out more than his share of Ascension wallpaper. . . . CT3AV is devising s.s.b. gear but the Azores remain straight-a.m. territory. . . . Ex-TL8SW-3V8CA (W8UTQ) greets friends on 21-Mc. c.w. at 1300 GMT as 9Q5CD.

OCEANIA — "We recently installed a new triband beam," writes KG6IC's K8WXV from Iwo Jima. "I

(*Continued on page 152*)



UWØFK, left, takes a breather between 14-Mc. openings while UA9PD keeps an ear on the band. Some of UAØKFG's sky-wiring is in view. Yep, ham radio's booming in Siberia. (Photos via W1s ARR and YYM)

CONDUCTED BY LOUISE RAMSEY MOREAU,* WB6BBO

That Unanswerable Question

IN early history there was the riddle of the Sphinx that no one could answer. Pilate asked "What is truth?" The smile of Mona Lisa is still a mystery that men try to solve. Every YL operator has, at some time, been asked "What *ever* made you get into *this?*" And, like the old riddles of the ancients, it isn't easy to answer.

Why *do* we find ourselves learning a new language? Working over a machine that emits little beeps of sound, and sweating to be able to translate that sound easily and quickly? Why do we feel we are no longer satisfied with the on-off switch and the volume control of the radio, but must learn the inner workings and the underlying theory behind it? Ask any YL, ask yourself, and there is a pat answer: I heard amateurs talking and wanted to do it too; well, I was recuperating from surgery and had to do something to pass the time; it was in self defense so I would know what the OM and our son were talking about. These are some of the stock replies. It is no more easy to put our reason into words than it is for people to tell why they enjoy mountain climbing, collecting Spode "Blue Castle," or rock hunting.

Certainly there is an interest that sparks it; if there weren't none of us would have taken the time and trouble to find out how one went about acquiring a license. The interest grew to curiosity, or none of us would have waded through all that dry theory that had once touched us briefly in science classes in school, and then was conveniently forgotten once we had passed the course. There was the challenge of the code that a beginner once described as sounding like a lot of crickets on a summer night, and the excitement of finding out that it was just as intelligible as any other language. So, that original interest sparked curiosity, which in turn developed into a desire for the thrill of talking to other people who were not those familiar friends in the bridge club, or the second-cup-of-coffee chat with the next door neighbor, but broadening it so that the familiar friends were spread over several states, and that over the back fence chat was with a YL half way around the world.

The interest and curiosity are only part of the reason, perhaps the real answer to the question lies in a statement made by the wife of an amateur who said "My husband would like me to get a license, but I just can't be bothered."

There is one time when we ask ourselves that question. The night when, armed with our license and the gear all warmed up and the CQ called, we hear our own call coming back for the first time! As we start to answer with a hand that behaves like a jackhammer on the key, and in that moment of buck fever every bit of that painfully learned code leaves us, we ask ourselves "What *ever* made me want to get into this?"

*YL Editor *QST*, Please send all news notes to WB6BBO's home address; 1036 East Boston St., Altadena, Calif. 91001.

WN9TVM. "Becky" has worked and confirmed all 50 states since receiving her Novice license. She recently passed General class and can be found on 80 and 15 meters. She shares the station with OM Marv, WN9TVJ, and their daughter Kathy, WN9TVF.

28th YL Anniversary Party
1967

Phone	*c.w.*	*Combined c.w.-phone*
1. VE3EZI 14,656*	1. VE3BII 3,816*	1. VE3EZI 18,206*
2. K6KCI 13,731*	2. VE3EZI 3,550*	2. VE3BII 17,440*
3. VE3BII 13,624*	3. VE6ABV 2,337*	3. WA8ARJ 10,960*
CORCORAN AWARD	VE3EZI 18,206*	

PHONE SCORES

WB6ORE/1	1,406*	K4RNS	6,404*
W2OWL	5,720	WA4YNX	4,725*
WA2GPT	5,616	W4ZDK	4,418
WB2OQU	2,756*	K4RHU	4,049*
W2EEO	308	W4EHN	2,850
W3TNP	6,247*	WA4FEY	2,434*
WA3AZU	3,237*	W4HWR	472
WA3GMN	2,535	K5LUZ	5,229*
WA3AOJ	525*	K5DAB	4,947

K5OPT	4,900
WA5JFZ	4,005
K6KCI	13,731*
K6DLL	7,215*
WA6AOE	6,885*
WA6UBU	5,175*
K6VFE	3,040
K6QPG	420*
K7RAM	7,920
K7MRX	5,346
W7RVM	12,350*
K7UBC	8,319*
K8RZI	11,576*
WA8ARJ	10,960*
WA8EKQ	7,906*
K8LHF	7,902*
K8ITF	7,290*
K8VCB	6,325
W8WUT	6,160
K8PXX	5,170*
K8TVX	5,005*
WA8ENW	4,232
K8ONV	1,792
K9LUI	11,200*
WA9FRS	6,691*
K9QGR	4,565*
K9ILK	3,990*
K9TNC	3,915
WA9HLW	2,565*
WAØPPK	5,520*
WØJUV	4,455
WAØPPV	3,284*
KØJFO	2,475*
VE3EZI	14,656*
VE3BII	13,624*
3C7NW	6,435
VE3GTI	5,618
3C4ST	1,855*
KL7FQQ	6,750
KL7FJW	4,100*
KL7FNM	3,600
DX Phone	
DJ2YL	7,990
PY2SO	7,636
TG9LN	5,733
ZL2JO	4,769*
OF2TJ	4,001*
ZS6OB	2,436
JA1YL	1,627*
I1PLH	1,125*
OH5SM	1,078
VK3KS	581
JH1GMZ	342

DJ2YL, high score DX phone, 1967 YLAP.

C. W. SCORES

K1QFD	1,462*
WB2OQU	1,586*
WB2PYI	1,050
WA2GPT	240
WA3AZU	504
WA3AOJ	270*
K4RHU	1,121*
W4ZDK	352
K5LUZ	935*
WA6AOE	814*
K7RAM	851
WA7BDD/7	800*
WA8EKQ	2,227*
WA8USU	1,705*
K8ONV	1,617
K8PXX	1,417*
K8ITF	1,332*
WA8ENW	1,204
WA8ARJ	700*
WA8KMT	285
WA9HLW	1,666*
WAØPPK	1,365*
VE3BII	3,816*
VE3EZI	3,550*
VE6ABV	2,337*
3C6ATH	1,485*
VE5DZ	607*
VE6ANK	600*
KL7FNM	570
DX c.w.	
VK3KS	825*
PY2SO	736
OH5RZ	344*
JA1YL	180*
ZL2JO	169*
OH2YL	160*
LZ1KAA	75*
G2YL	40*
F2SQ	40*
JH1GMZ	7*
DX Combined Scores	
PY2SO	8,372
ZL2JO	4,938*
JA1YL	1,807*
VK3KS	1,406*
JH1GMZ	349*
Confirmation Logs	
K1EKO	
K2UXW	
W3CDQ	
WB4GIS	
W4TVT	
WB4COP	
W6PJU	
WA6EVU	
W7NJS	
WA8CXF	
K8MQB	
KØWZN	
VE3GTI	
VE7ADR	
KL7BBL	
KH6TI	

* Low Power multiplier.

F2SQ, DX c.w. participant in the 1967 YLAP.

C. L. A. R. A.

The Canadian Ladies Amateur Radio Association, the centennial project of the Ontario Trilliums, has been officially formed. The members of the executive committee who will guide this newest of YL organizations, are:

President, Chris Weeks, VE1AKO
Vice president, Donez Booth, VE6ATH
Receiving treasurer, Marion Inkman, VE7BQV
Disbursing treasurer, Sally Ranti, VE2KO
Publicity, Bubbles Timlick, VE4ST
Editor, Thelma Woodhouse, VE3CLT
Sunshine chairman, Vera Hines, VE8HH

Sponsored by the T.O.T., and Sparkettes, the development and expansion of C.L.A.R.A. depends on the support and interest of all Canadian YLs who are invited to join this all-Canada YL Club.

Claire Bardon, W4TVT, 1968 Vice president of YLRL.

Madge Mason, WA6LWE/NØRAG

If she is presiding at the YLRC-LA, or the Ramona Radio Club of San Gabriel, or chasing DX, or chatting on the Tangle Net, she is WA6LWE. If she is in the Navy MARS circuits, v.h.f. or Mainline Nets, she is NØRAG, but always Madge, and always busy.

Madge was licensed in 1960, and joined Navy MARS when it first started. For a while she was working with the 602 stations picking up traffic from the Pacific area, and relaying it on v.h.f. at night for delivery five days per week. This past year, due to other responsibilities, her activity has tapered down to two days a week with liaison the night before on the v.h.f. nets to pick up traffic for relay on her Mainline schedules the next day.

Madge Mason, WA6LWE/NØRAG.

A member of YLRL, and formerly District Chairman for the Sixth YLRL District, Madge is the 1968 president of YLRC of LA, and as if that weren't enough gavel pounding for one month, she is also president of the Ramona Radio Club. Her interest in Amateur Radio is YL nets and DX, when she isn't busy with her MARS skeds.

The Masons are a ham family with OM, Bob, WA6KZK, and their son Paul, WA6EUZ. A daughter, Luise is unlicensed, but Paul's wife, Judy is studying for her Novice license.

VE7TH, B.C. "Ham of the Year."

When her son, Arthur, left Victoria to become a radio operator at Great Bear Lake, Freda Muskett decided to get a license so they could keep in touch. Arthur gave his mother a deadline of six months to get on the air, and she made it in three! As Freda puts it, "It wasn't just the code, it was the great deal of trading and scrounging, and improvising to gather all the parts." But she found them and managed to get her gear built and on the air.

VE7TH, Freda Muskett, B.C. "Ham of the Year."

During World War 2, she was off the air but that did not stop her interest, rather she worked with airmen to help them increase their code speed. This activity has been carried on since then, and she still gives weekly code classes in her home.

For her long time service to others, as well as her good operating ability, and her selfless lending of her home to the Victoria hams who need work shop space, VE7TH was awarded "Ham of the Year," by the B.C. amateurs at a dinner on December 8, 1967.

While c.w. is her favorite form of emission, she is presently studying for her advanced license so she can have phone privileges as well. QST

Strays

B.A.R.T.G. SPRING RTTY DX CONTEST

The British Amateur Radio Teletype Group is sponsoring a Spring RTTY contest that will run from 0200 GMT on the 2nd of March to 0200 GMT on the 4th of March. Stations may not be contacted more than once on any one band (80 through 10 meters), although additional contacts may be made with the same station if a different band is used. Use the ARRL Country list for country status. However, KL7, KH6, and VO will be considered as separate countries. The message exchange will consist of message number, report (RST), time in GMT, and country. All two-way RTTY contacts with stations in one's own country will earn two points, with stations outside one's own country earning ten points. All stations will receive a bonus of 200 points per country, including their own. The countries worked total is an accumulation of each band total. Scoring will be done as follows: (A) Two-way exchange points times total countries worked. (B) Total country points, times number of continents worked. Add A and B for total score. Logs and score sheets should be sent to B.A.R.T.G. Contest Manager, Alan Walmsley, G2HIO, The Firs, 3 Trinity Close, Ashby-de-la-Zouch, Leicestershire, England, not later than May 1, 1968.

—•••—

Visitors to the IEEE convention who are accustomed to including the Single Sideband Show in their activities will be glad to khow that it is being continued this year under W2AVA's sponsorship and will be held Tuesday, March 19, from 12:00 noon to 9:00 P.M. in the Penn Top Room, Statler-Hilton Hotel, Seventh Ave. at 33rd Street in N. Y.C.

—•••—

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.

Operating News

GEORGE HART, W1NJM, Communications Manager
ELLEN WHITE, W1YYM, Deputy Comms. Mgr.
Administration: LILLIAN M. SALTER, W1ZJE — *DXCC:* ROBERT L. WHITE, W1WPO
Contests: ROBERT HILL, W1ARR — *Training Aids:* GERALD PINARD
Public Service: WILLIAM A. OWEN, W1EEN

Sending Code Spaces. With so many of us humping to get our code speed up to the required 20 for that coveted extra class license, this is a timely subject. Recently, we have exchanged some most interesting correspondence on the subject of code with W2JMZ and WAØNQQ. It all began when the latter questioned the former's "baud" count in his call letters.[1] In the ensuing discussion of who was right and who wrong, a few basic principles about code were observed which might be of assistance if passed along to the fraternity.

It is common knowledge that the length of the code "dah" is three times the length of the "dit." What we fail to consider, sometimes, is that a dah would not be a dah nor would a dit be a dit unless it has spaces both before and after. Absurdly obvious? Absolutely! Then why mention it? Because the *length* of those spaces is just as important to proper code formation as is the "key down" length of the dit or the dah itself. If you don't have space between dits and dahs, you'll have a continuous tone. If you don't have proper space between code-sent characters, you'll have continuous dits and dahs and will be unable to distinguish one character from another. If you don't have proper space between words, you'll have continuous characters and will have great difficulty in separating them into words.

Still pretty obvious, isn't it? And yet, judging from some code we have heard, proper spacing is fearfully neglected in the jumble of dits and dahs which are supposed to make intelligence.

A comprehensive treatise on this subject could occupy many pages (and we just might write one, some day!), but for the moment, let's consider just a couple of principles. First, that each dit or dah must have a *minimum* spacing after it in order to *be* a dit or dah. Second, that the length of the spacing required is just as important to proper code transmission as is the length of the dit or dah itself. Therefore, the spaces are an *integral part* of the code, and the concept of the 3-to-1 ratio between dahs and dits is meaningless.

The unit of time in code is called a "baud." The key-down part of a dit is one baud, but it must be followed with at least one key-up baud to make a dit *be* a dit. The key-down part of a dah is three bauds, but again it must be followed by a baud of space. Thus, a dit is two bauds, a dah four bauds, and instead of a dah

[1] "How To Win the 1967 C.W. Sweepstakes," Sept. 1967 *QST*, p. 52. You can't get away with anything, these days. What's more, W2JMZ didn't even win!

OPERATING EVENTS (Dates in GMT)
ARRL-IARU-SCM-Affiliated Club-Operating Events

March	April	May
2 **LO Time** (League Officials only).	1-30 IARC Propagation Research Competition (p. 75, Feb. *QST*).	2 **Qualifying Run, W6OWP**
2-3 **DX Test**, phone (p. 60, Dec. *QST*).	5 **Qualifying Run, W6OWP**	2 **LO Time** (League Officials only).
2-4 BARTG Spring RTTY Contest (p. 94, this issue)	6 **LO Time** (League Officials only).	4-5 Nebraska QSO Party
7 **Qualifying Run, W6OWP**	16 **Qualifying Run, W1AW**	11 **FMT** (ARRL Official Observers, *only*).
9-10 YL/OM Contest, c.w. (p. 92, Dec. *QST*).	20-22 **CD Party** (c.w.)*	11-12 OZ-CCA Contest
16 **Qualifying Run, W1AW**	27-28 Ohio QSO Party (p. 104, this issue).	15 **Qualifying Run, W1AW**
16-17 **DX Test**, c.w. (p. 60, Dec. *QST*).	PACC (p. 91, this issue).	June 8-9 VHF QSO Party
18 W1EIA High Speed Code Test (p. 97, this issue).	27-29 **CD Party**, phone*	22-23 Field Day
30-31 Florida QSO Party (p. 126, Feb. *QST*).	* League Officials and Communications Dept. Appointees only.	Sept. 7-8 VHF QSO Party

being three times the length of a dit, it is actually only *twice* as long. Since you can't do without spaces, we can now talk in terms of "keying cycles" instead of bauds, to simplify things. But it is simpler only if you consider that one keying cycle is equal to the key-down baud of a dit *plus* the *minimum* key-up baud. Thus, each dit is one cycle, each dah two cycles. Separation between code characters is one cycle, between words two *additional* cycles, and at the end of the sentence two more additional cycles —or a total of one between characters, three between words, five between sentences. In every case, the number of cycles required *includes* the minimum space before beginning the next character, word or sentence.

Sound pretty technical? It's just one of those things that are basically absurdly simple but not universally understood. What we are really trying to say is that spacing is a vital part of code and is the thing most grievously neglected in so much sending we have heard. Watch your spacing! Better to exaggerate the spacing between words than to omit it. Better to enlarge the spacing between letters than to make AN sound like P, ME like G, GET like GA. Don't forget that when you are sending code you are also *sending spaces*.

Copying Behind. Stuck at fifteen w.p.m.? Many prospective extra-classers throw up their hands, say they just "aren't the type" who can master the code. Poppycock! Anyone who learned to talk can learn the code. The latter is a hundred times easier. What happens is that you reach a "plateau" beyond which you cannot progress unless you change your method of copying. You have to stop copying letter-by-letter and start copying syllable-by-syllable.

To most, it comes naturally, just as it came to you through the years in copying the spoken word. You don't copy each sound, you listen to a phrase, store it in your memory while you are writing it, and at the same time listen to the next phrase you expect to copy. After a certain point in progress, you do the same thing with code.

The typical progression goes something like this: first you memorize the code as dots and dashes, and an A is a dot followed by a dash. When you first hear it, it sounds like dit-dah

BRASS POUNDERS LEAGUE

Winners of BPL Certificate for December Traffic:

Call	Orig.	Recd.	Rel.	Del.	Total
K6BPI	4910	2161	1969	192	9232
W3CUL	1855	3692	3221	346	9114
K9ONK	225	2749	2722	28	5724
WA2UWA	59	2585	2570	8	5222
K5TEY	360	1074	830	8	2272
WA1EEZ	73	906	818	24	1821
K3MYS	162	846	790	11	1809
WA7DXI	96	796	732	38	1662
WØLCX	16	796	700	16	1528
W7DZX	20	722	667	11	1420
W7HMA	51	683	668	5	1407
W3VR	133	637	591	33	1394
W3EML	21	711	584	2	1318
WB6BBO	17	618	611	23	1269
W6RSY	24	672	505	37	1238
K3NSN	175	402	492	83	1152
WA4SCK	18	550	566	13	1147
W5OBD	23	539	537	2	1101
K6IBI	95	498	437	61	1091
W6EOT	4	529	524	0	1057
W7BA	11	503	457	43	1014
W7ZIW	27	466	451	2	946
WB6FCQ	18	430	398	20	866
W2OE	137	389	326	11	863
KH6GEZ	346	256	234	22	858
W6BGF	46	394	363	34	837
W6IRU	20	407	344	63	834
WØINH	110	361	353	7	831
W3EEB	34	368	360	54	816
WØIES	26	386	386	4	802
K4YSN	8	406	365	19	798
WA1EYY	38	376	319	51	784
WB2RKK	45	375	323	21	764
WA9OTD	11	362	5	376	754
W8RYP	43	372	313	23	751
W6MLF	127	316	304	1	748
W7KZ	9	361	341	21	732
WA2IGQ	91	315	264	51	721
W1EFW	46	360	303	10	719
WA2GPT	113	295	220	44	672
K1PNB	79	293	163	130	665
W1OJM	3	332	326	3	664
K7NHL	8	337	275	38	658
WA3BLE	59	307	257	26	649
W6KVQ	28	258	258	100	644
W6QAE	20	316	284	23	643
K3PLE	21	314	287	17	639
K7PXA	172	274	168	20	634
WB6GGL	23	304	300	4	631
WB6OLD	94	261	256	12	623
WA2TBS	292	168	111	44	615
WA9MHU	111	255	178	67	611
W2SEI	30	281	280	15	606
W4FOE	7	289	226	70	592
W3FGQ	205	211	126	47	589
W8IWF	52	272	166	97	587
K9IVG	10	310	256	5	581
K7NQX	27	276	4	272	579
WA4WWT	24	278	267	3	572
K7KPA	93	236	221	18	568
WB2GAL	13	275	266	4	558
W7PI	5	290	224	33	552
K9FZX	15	263	261	7	546
WB2UHZ	21	261	249	8	539
WAØMLE	159	206	152	5	522
KØYBD	24	262	168	68	522
K5BNH	38	251	128	104	521
K7RQZ	7	235	187	48	517
WA5INZ/5	19	246	234	14	513
WA4NEV	24	232	167	85	508
WB4BGL	12	259	224	10	505
K2KDQ	114	203	172	14	503
Late Reports:					
W3CUL (Oct.)	434	1692	1490	96	3712
KH6GHZ (Nov.)	137	318	104	214	773

More-Than-One-Operator-Stations

WA9LTI	335	377	150	15	877
K6QEH	50	400	375	25	850
KINQG/1	684	0	0	0	684
K6MCA	140	377	45	0	562

BPL for 100 or more *originations-plus deliveries*

WB2YEM 440	WA8VOG 129	WA4VEK 111
W8IV 370	K4PUZ 128	W7OCX 111
W6BHG 314	WA3EEC 127	W3CBG 109
W3WAJ 254	K4TSJ 123	W9DYG 109
WA7DMA 227	WA8TYF 123	WA9RSN 109
K3WEU 226	WA1FVH 122	WB2DZZ 105
K4LEC 203	W3MPX 121	WB4GTG 105
WA6BYZ 193	WA1HXF 120	KØAKK 105
W3ELI 187	KH6BZF 120	WB2OYE 104
W6MLZ 184	W2URP 119	WA3AOJ 104
WA3ATQ 181	WA3BSV 119	WAØHRM 103
K3VBA 159	WN8WHG 119	W5DTR 102
WA9CCP 159	K7CTP 118	WB6HVA 101
W4BAZ 155	WB2BGH 117	WN4HQX 100
WA9IKT 152	WB2QIL 116	K4YZU 100
W3TN 143	W6DSC 116	Late Reports:
W9EVJ 143	WA9QXT 116	WB2BDJ (Nov.) 315
WA4UQC 136	WB2VLC 115	W6DSC (Sept.) 157
WB4FDT 135	WA4NBE 115	W6DSC (Oct.) 132
W1TXL 134	WB2ZGP 114	WB2DZZ (Nov.) 128
WB6SQZ 134	WA3EMO 114	WB6TYZ (Oct.) 115
WA4SMS 131	WA9QNI 112	W6DSC (Nov.) 107
WA5KZA 130	WB2TNB/3 111	WA2GPT (Nov.) 102

More-Than-One-Operator-Stations

W9ODD 448	K4CG 164	W7AIA/7 110
WA8VRN 309	W4RKH 133	W1YA 109
	WA4PWF 115	

BPL Medallions (see Aug., 1954, p. 64) have been awarded to the following amateurs since last month's listing: WB2NKN, K5BNH, WA6BYZ, WA8MCQ.

The BPL is open to all amateurs in the United States, Canada and U.S. Possessions who report to their SCM a message total of 500 or a sum origination 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.

Soon you start hearing it as di-dah, with the dit and dah sort of hanging together like a unit. After more practice, the di-dah becomes a single sound, like the letter I (ah-ee) does in speech, and it directly triggers your reflexes as the letter A.

Some learners stall at this point. They think this is as far as they need to go. For 13 w.p.m., even 15 w.p.m., maybe it is. If your mind is particularly alert, you can even go faster by this method. But sooner or later *everyone* reaches the point where he cannot progress in speed any faster unless the process of "storing" these sounds as single units can take place.

Try this: instead of copying a word letter by letter, wait until the whole word is sent, *then* write it down. Start doing this at a slow speed which you can copy easily. Once you can copy solidly this way, increase the speed until you have difficulty, practice until you master it, then increase the speed again. (On long words, take a syllable at a time.) You will find there is almost no limit to your progress once you have mastered this method. Your mind can work faster than your hand; the ultimate limit is the physical one of putting it down. Twenty per is duck soup, if you can write that fast. Forty per comes with coordinating your typing to copying code. And brother, when you have mastered the code you are getting the full measure of benefit and pleasure out of amateur radio. — *W1NJM.*

HIGH SPEED CODE, ANYONE?

It's about that time again. On March 18 at 0130 GMT (remember, you guys who *still*, in spite of everything we have said, insist on using local times, this is Sunday evening, March 17 at various times by your clocks), W1EIA, club station of the Connecticut Wireless Assn., along with four volunteer stations, will transmit the Nineteenth Semi-Annual High Speed Code Test. Frequencies used by W1EIA will be 3637 and 7120 kc.; by W5QMJ, 3665 kc.; by K6DYX, 3690 kc.; by W6EOT, 3640 and 7115 kc.; by WØFA, 3653 kc. The same text will be used in all transmissions, which will be synchronized.

Call-up for the test will commence at 0115 GMT, with a plea for a clear channel while prospective copiers are finding the station with the best signal at their locations. At 0130 GMT, important instructions and rules will begin, transmitted at about 30 w.p.m. (if that's too fast, you won't be much interested in the rest of the test anyway!).

This time, we begin with high speed first. At 0150 GMT, five minutes of text will come at you, at 60 w.p.m. This will be followed by similar five-minute transmissions at speeds of 55 w.p.m. at 0200, 50 w.p.m. at 0210, 45 w.p.m. at 0220 and a measly 40 w.p.m at 0130, by which time all but the novices will have stopped copying.

This test and program are intended to supplement the ARRL-W1AW program which leaves off at 35 w.p.m., but it is not put on or sponsored by ARRL; all work is done and arrangements made by W1NJM (in his own time!), and the volunteer stations mentioned above.

If you don't think you can copy 40 w.p.m., try it anyway. What can you lose?

ARRL CERTIFIED AT 35-W.P.M. — JANUARY TO DECEMBER 1967

K1AJ	WA2KXX*	WA3IBI*	W4KMA/-	WA5GVB*	WB6PCQ*	WA8MCQ*	WA9KYE	WØLCX
WA1CYT*	W2LQP*	WB4CTD	W3DWM*	W5JAW	WB6RMX*	WA8OML	WA9MMT*	WAØMWJ
W1DWA*	WB2MOQ*	WB4CUA*	K4MSK*	WA5JMK*	W6TN*	W8QXQ*	WA9MUP	WØNWX*
WA1DXB*	WB2OHK	WA4FSC/3	K4PUZ*	WA5PKO	WB6UTC*	WA8TAO	W9NSF	WAØOUC
K1ESG*	WB2RKK*	W4GEF*	W4RZL	K6EC*	WA7BYP*	W8WSK	K9OHI*	VE2BVY
K2AGZ/-	WA3AUS*	K4IGJ*	K4WWY*	W6EOT	WA7FYW	K8YSO*	WA9RAK*	DJ8FW
K3WOO	WA3BYW*	W4IYB	W4YAK*	W6IBI	W8EEV	K9CDD*	WA9SEO	Kresno Genari
W2KAT/3	W3EDQ*	WA4KDI*	WA4YKL*	K6KPV	W8HSK	W9DSC	WA9VFA*	Astoria, N. Y.
W2KCB	W3WHL*	WA4KJR*	WA4YSX	WB6KVA*	WA8KME	K9JDK*	K9WRL*	Michael Zielke*
						K9JWF*	KØJPJ*	New Britain, Ct

* Endorsement Sticker

C. D. ARTICLE CONTEST

This Communications Department article contest, a continuation of the very successful *QST* Article Contest during the 1964 anniversary year, needs your best ideas (in 800–1200 words) relating to League organization, clubs, training exercises, and operating techniques. Periodically, the best articles submitted for the "CD Contest" will be chosen to appear, with the winner electing to receive (a) a bound *Handbook* or (b) a *QST* binder, League emblem and the ARRL DX map. Our winner this month is Stanley R. Babcock, WB6HVA, and his article appears below.

DIVERSIFICATION IN AMATEUR RADIO

Stanley R. Babcock,* WB6HVA

Some amateurs find themselves in a rut, doing the very same thing pertaining to amateur radio every day. Soon they get tired or bored with their activities. But there are so many different modes, operating opportunities and endeavors in amateur radio for us to take advantage of, if we would only diversify our activities.

For instance, on Monday we could be chasing DX using International Morse. Tuesday might be DX chasing on phone. Wednesday could be your night for the traffic nets. This could branch out from Section to Regional then Trans-Continental Corps (TCC) which is the trunk line of the National Traffic System. Thursday could be spent working locals on v.h.f. Friday might be spent building a favorite project. Saturday you could operate radio teletype. Sunday you might get on the Novice bands and work the new people who need a little help in procedure and operating habits.

This is only the beginning of diversity. Other things that can be done are: code practice sessions nightly or weekly; handling messages for the boys overseas (or on the ships at sea) and for missionaries in remote areas. For that matter, for *any* remote place where commercial means just aren't available. You might also join the Military Affiliated Radio Service, network participation, club activity, Amateur Radio Emergency Corps, Radio Amateur Civil Emergency Service, satellite or moon-bounce, amateur TV, or help a new amateur with any problems he might be having. If you want still other things to try, get a spot as net control station, relay station between nets — or write an article such as this for possible publications!

Hamfests, conventions, portable operation, and hidden transmitter hunts are also fine. No doubt there are both young and older people in your church group, scouts or CB clubs who would appreciate help in getting started in amateur radio. Helping these people is fun. Invite a group over for a demonstration. (What better way could we find to keep the younger generation busy and out of mischief!) It is just possible you may get an electronic genius started on his way.

Change habits, bands, frequency — study propagation. **BE DIFFERENT.** Then, enjoy yourself while being helpful to others.

* 1714 West Fedora, Fresno, California 93705.

Meet Your SCM

Oklahoma SCM Cecil C. Cash, **W5PML,** was first bitten by the amateur radio bug in Japan in 1947 while with the army. After returning to Korea in early 1948 he was licensed to operate HL1AQ and received his current call in 1949. In 1956 he operated DL4SS in Germany and was active as president of the Heidelburg Amateur Radio Club. W5PML retired from the service in 1961 returning to Lawton, Oklahoma. He's currently serving as a radio instructor for the U. S. Government.

This active SCM is principally interested in net operation and traffic handling and, additionally, holds the appointments of PAM, OPS and OVS. He is an active member (and past president) of the Lawton-Fort Sill Amateur Radio Club. His activity is principally on 80-40-20 with a transceiver. When time permits, Cece enjoys camping, hunting and fishing.

DX CENTURY CLUB AWARDS

From December 1 through December 31, 1967 DXCC Certificates based on contacts with 100-or-more countries have been issued by the ARRL Communications Department to the Amateurs listed below.

New Members

WB2BEE...161
WB6UJO...145
W8MGQ....130
WB2VAE...122
ZP5JB.....122
WA8PAW...120
W4CZS....119
W1VAH....117

I1FHA.....116
WA4RGL...114
W9RGB....114
VU2LE.....113
JA9OP.....111
DM2AOA...110
DJ4XC.....109

OK1ADH...107
DL1GA.....106
DM3YPA...104
OK3KFV...103
W7PTF.....103
DJ9OZ.....102
VE2BUW...102

YU3KN....102
W4LF.....102
W4VON....102
W6EJJ.....102
K8VSH.....101
K9GZS.....101
WA2WGS...101

W5HCJ.....101
DM4PKL...100
HH9DL.....100
K5GUZ.....100
OK1KCB...100
WA1DRC...100
W2IPR.....100

WA2VSQ...100
WB2HBV...100
WB2HNO...100
W4RXT....100
WA9NTC...100
W7GYF....100
W9KDF....100
YO4CS.....100

Radiotelephone

XE1EEI....150
VK5OL.....128
DL1MD....120
WA1GIA...120
W5FFW....119

WA8LML...119
ZP5JB.....119
W9BGX....118
W4CZS.....115

DU1FH.....114
WB2VAE...114
WA5CBE...110
YA1HD....108

WB2CDF...106
W8GKM....105
DJ1AM.....104
I1BH.....104

WB2MWW.104
WA8GPX...103
DL1EQ.....102
DL5NJ.....100

K3CAP.....100
W1BGD....100
WA4RGL...100
W5LJT.....100
WA9LBK...100

Endorsements

Endorsements issued for confirmations submitted from December 1, through December 31, 1967 are listed below. Endorsement listings through the 300 level are given in increments of 20, above the 300 level they are given in increments of 10. The totals shown do not necessarily represent the exact credits given but only that the participant has reached the endorsement group indicated.

320
W4VPD

310
K6CYG
VE2YU
WA2RAU
W3DJZ
W8QNW

300
DL1DC
K2UKQ
WB2CKS

W4DLG
W4UKA
W5QVZ
W5VA
W9NLJ

280
JA3UI
K5GOT
W4THZ

260
K2JWM
W3PVZ

W4BRB
WA5CBE
W6GAJ
W8RCM
W9MZP

240
G6GC
I1EVK
W1YRC
W6KNH
XE2YP

220
JA4CNS

WB2UKP
WB6EED
W8NPF
W9OW

200
G3RFE
HB9TU
I1YRK
K5QHS
SM4CMG
VE3FAW
W2BAI
WA4HTR

W4ORT
W6FB

180
DL3CM
JA1LQC
KR6UD
VE3HL
WB2CDZ
WB2YQH
W6AEM
W8GGE
ZD8HL

160
K1EIN
K3BSY
K4AVC
OE5CA
OK2OQ
ON4NM
ON4OR
SM2CXU
W2TKG
WB2PWU
WA6AJB
WA8NDL

140
DL1EQ
DL9OK
GM2DPW
K2DNL
K4ORQ
K5KYD
K9GCE
K9WEH
OK2PO
VK5OL
WA2CCF
WA2HLH
W3QZA

W4JJX
WA4FJM
WA4MCV
W5KWY

120
GM2HCZ
GM5AFF
K1IEM
VE2BGJ
WA4EKF
WA4JTI
W5TXN
W7GGG

Radiotelephone

300
K6CYG
W3DJZ

280
I1AA
K5GOT
ZL3NS

260
JA3UI
PY2CYK
W4BBL
W4DLG

240
W6ZKM
W7MKI

W9CPM
XE2YP

220
I1EVK
K2POA
K2ZFA
KØBUR
W6KNH

200
CX9CO
I1KDZ
OE3SAA
SM5YV
W1OHJ
WB2WOU
WA4HTR

XE1YG

180
CT1IK
GW3NWV
K5QHS
W8GGE
W9ABM
XE1MMM

ZD8HL

160
K3RPY
ON4OR
WB2IEC
WB2PWU
W3ABI
W4PC

W8CFG
W8FOV

140
DL9OK
K2GPL
W2OEH
WA2CCF

WB2VZM
W4KOU
WB6UJO
WA8OUM

120
VE7JF
W6OMR

W1AW SCHEDULE, MARCH 1968

The ARRL Maxim Memorial Station welcomes visitors. Operating-visiting hours are Monday through Friday 3 P.M.-3 A.M. EST, Saturday 7 P.M.-2:30 A.M. EST and Sunday 3 P.M.-10:30 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.

*GMT**	*Sunday*	*Monday*	*Tuesday*	*Wednesday*	*Thursday*	*Friday*	*Saturday*
0000	.....	.....	.....	.....	RTTY OBS[3,7]	.....	.....
0030			**Code Practice Daily[1] 10-13 and 15 w.p.m.**				
0100	.....	C.W. OBS[1]	C.W. OBS[1]	C.W. OBS[1]	C.W. OBS[1]	C.W. OBS[1]	C.W. OBS[1]
0120-0200[4]	.....	.....	7.080	3.555	7.080[6]	3.555[6]	7.080
0200	.....	Phone OBS[2]	Phone OBS[2]	Phone OBS[2]	Phone OBS[2]	Phone OBS[2]	Phone OBS[2]
0205-0230[4]	.....	.....	3.945	50.7	145.6	1.82	3.945
0230			**Code Practice Daily[1] 15-35 w.p.m. TThSat., 5-25 w.p.m. MWFSun.**				
0330-0400[4]	.....	.....	3.555	7.080	1.805	7.080	3.555
0400	RTTY OBS[3]	.....	RTTY OBS[3]	RTTY OBS[3]	RTTY OBS[3]	RTTY OBS[3]	RTTY OBS[3]
0410-0430[4]	.....	.....	3.625	14.095	7.045	14.095	3.625
0430	Phone OBS[2]	.....	Phone OBS[2]	Phone OBS[2]	Phone OBS[2]	Phone OBS[2]	Phone OBS[2]
0435-0500[4]	.....	.....	7.255	3.945	7.255	3.945	7.255
0500	C.W. OBS[1]	.....	C.W. OBS[1]	C.W. OBS[1]	C.W. OBS[1]	C.W. OBS[1]	C.W. OBS[1]
0530-0600[4]	.....	.....	3.555[6]	7.080[6]	3.555	7.255	3.555
0600-0700	.....	.....	7.080	3.945	14.100	3.555	7.080
0700-0800	.....	.....	14.280	7.255	3.945	14.100	14.280
2000-2100	.....	14.280	21/28[5]	14.095	21/28[5]	14.280	.....
2100-2200	.....	14.100	14.280	14.100	14.280	14.100	.....
2300-2345	.....	7.255	21/28[5]	21.1[6]	21/28[5]	7.255	.....

[1] C.W. OBS (bulletins, 18 w.p.m.) and code practice on 1.805, 3.555, 7.08, 14.1, 21.075, 50.7 and 145.6 Mc.
[2] Phone OBS (bulletins) on 1.82, 3.945, 7.255, 14.28, 21.41, 50.7 and 145.6 Mc.
[3] RTTY OBS (bulletins) on 3.625, 7.045, 14.095 and 21.095 Mc. 170/850 cycle shift optional in RTTY general operation.
[4] Starting time approximate. Operating period follows conclusion of bulletin or code practice.
[5] Operation will be on one of the following frequencies: 21.075, 21.1, 21.41, 28.08 or 28.7 Mc.
[6] W1AW will listen in the novice segments for Novices on band indicated before looking for other contacts.
[7] Bulletin sent with 170-cycle shift, repeated with 850-cycle shift.
Maintenance Staff: W1s QIS WPR.* Times/days in GMT. General operating frequencies approximate.

CODE PROFICIENCY PROGRAM

Twice each month special transmissions are made to enable you to qualify for the ARRL Code Proficiency Certificate. The next qualifying run from W1AW will be made Mar. 16 at 0230 GMT. Identical tests will be sent simultaneously by transmitters on listed c.w. frequencies. The next qualifying run from W6OWP only will be transmitted Mar. 7 at 0500 Greenwich Mean Time on 3590 and 7129 kc. *CAUTION!* Note that since the dates are given per Greenwich Mean Time, Code Proficiency Qualifying Runs in the United States and Canada actually fall on the evening previous to the date given. *Example:* In converting, 0230 GMT Mar. 16 becomes 2130 EST Mar. 15.

Any person can apply. Neither ARRL membership for an amateur license is required. Send copies of all qualifying runs to ARRL for grading, stating the call of the station you copied. If you qualify at one of the six speeds transmitted, 10 through 35 w.p.m., you will receive a certificate. If your initial qualification is for a speed below 35 w.p.m. you may try later for endorsement stickers.

Code practice is sent daily by W1AW at 0030 and 0230 GMT, simultaneously on all listed c.w. frequencies. At 0230 GMT Tuesday, Thursday and Saturday, speeds are 15 20 25 30 and 35 w.p.m.; on Monday, Wednesday, Friday and Sundays, speeds are 5 7½ 10 13 20 and 25 w.p.m. For practice purposes, the order of words in each line may be reversed during the 5 through 13 w.p.m. tests. At 0030 GMT daily, speeds are 10 13 and 15 w.p.m. The 0230-0320 GMT runs are omitted four times each year, on designated nights when Frequency Measuring Tests are made in this period. To permit improving your fist by sending *in step with W1AW* (but not on the air!) and to allow checking strict accuracy of your copy on certain tapes note the GMT dates and texts to be sent in the 0230-0320 GMT practice on those dates:

Date Subject of Practice Text from January *QST*
Mar. 1: *It Seems to Us*, p. 9
Mar. 5: *Toroidal-Wound Inductors*,* p. 11
Mar. 14: *The W5OMX Communications Receiver*,* p. 22
Date Subject of Practice Text from *Understanding Amateur Radio*, First Edition
Mar. 22: *Overmodulation*, p. 83
Mar. 27: *Voice Power*, p. 84

*Speeds will be sent in reverse order, highest speed first.

Strays

Happy faces depict the occasion at the dedication of the Lake Success Radio Club station, W2YKQ, at the Sperry-Rand Facility at Long Island, N. Y. The 100-percent ARRL club is active in contest work and is a perennial high-scorer in the annual Field-Day Contest. Shown (l. to r.) are W2AXL (V.P. and General Manager of Sperry Gyro Div.); K2JWT (V.P. of the radio club); K2IDB (SCM, NYC-LI); W2TUK (Hudson Div. Director); Mr. Acheson (Director Industrial Relations, Sperry-Rand); and seated is W2NBI (President of the radio club).

• 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, John L. Penrod, K3NYG—RM: W3EEB. PAM: W3DKX. K3GKF closed out the year with 500-plus OO notices. WA3GSM received a new Galaxy transceiver for Christmas. W3DEO is showing films on his recent trip to Australia. Because of my leaving to attend the funeral of my father in Kansas I had to write this column early and will complete the traffic report next month. Traffic: W3EEB 816, K3MPZ 65, WA3GSM 7, K3KAJ 3.

EASTERN PENNSYLVANIA—SCM, George S. Van Dyke, Jr., W3ELI—SEC: W3AES. RMs: W3EML, K3MVO, K3YVG, W3MPX. PAM: K3MYS. V.H.F. PAM: W3FGQ. EPA, QNI 448, QTC 681. PFN, QNI 528, QTC 1115. PTTN, QTC 457. EPA V.H.F., QNI 301, QTC 334. OO reports were received from W3KEK, W3NNC, K3RDT, K3MYS, K3HNP and K3PSW; OVS reports from K3VAX, K3MSG, WA3BIV, W3ZRR and WA3CQO; OBS reports from K3WEU and WA3AFI. FMT results (p.p.m.): W3BFF 0.6, K3HNP 18.2, K3MYS 9.7, K3PSW 47.1. The following made the BPL: WA3EMO, W3ELI, W3MPX, W3CUL, W3VR, W3EML, K3WAJ, K3MYS, K3WEU, K3VBA, K3PIE, WA3ATQ, WA3EEC. W3FGQ and WA3AOJ. K3NPC is ex-K2GZV. WA3CQO is doing a real bang-up job on the EPA V.H.F. Net. W3MPX reports that PTTN has broken all previous records for QNI and QTC. W3KJJ is going completely solid state. WA3EMO built a t.r. s.w. K3YVG now gets his back. WA3AFI passed the Advanced Class exam. WA3IPR is ex-WB2UZB. WA3BLZ was really WA3ATQ in the Poconos. K3DCB made his annual report while home from school. K3NSN is working hard with the handicapped. W3YPF is getting a taste of DX. W3ID finally is operational. WA3CFU will be operating from Penn State battery rig, too. W3VR reports he is working harder now that he is retired. W3CUL is leaning heavily on RTTY to unload traffic. W3EU has a new DX-100. WA3GAT is awaiting warmer WX for installation on a tower and quad. W3FAF is closing in on that Ph.D. The PFN is now on 3960 kc. Welcome to K3ONW, back from RVN. WA3BSV wants dope on QRP rigs. K3MVO and W3EML are busy. W3NNC really is busy OOing. Santa brought WA3GUL a new v.t.v.m. W3HNK adds PZICF to his QSL listing. K3VAX is now located at RCA Lancaster. K3WEU wants to thank all who assisted in the handling of traffic to the boys in RVN from the Philadelphia pick-up point. WA3FVK is taking part in a school science fair. K3YVG reports 1967 EPA, QNI 565, QTC 1798. New officers of the Philmont Mobile Radio Club are W3MHR, pres.; W3OWK, vice-pres.; W3JKH, secy.; K3NYL, treas.; W3ADV, dir. Check the nets for the latest information on our spring dinner meeting and plans for a joint picnic. Traffic: (Dec.) W3CUL 9114, K3MYS 1809, W3VR 1394, W3EML 1318, K3NSN 1152, K3PIE 639, W3FGQ 589, K3WAJ 346, WA3EEC 340, WA3ATQ 327, W3MPX 309, WA3EMO 304, K3VBA 289, K3WEU 287, W3ELI 248, K3YVG 227, WA3AOJ 223, WA3AJT 218, WA3EXW 176, WA3AFI 174, WA3JCA 166, W3MVO 166, WA3BSV 147, W3FPC 134, WA3CQO 122, WA3GLI 121, WA3HGX 112, W3NNL 108, WA3CKA 83, W3BUR 76, K3DCB 74, WA3ENQ 70, K3TNL 67, W3KJJ 65, WA3CND 53, W3OY 50, WA3BLZ 49, K3RUA 45, WA3AIB 44, W3RV 44, K3MDG 42, WA3GAT 37, K3ONW 37, WA3EXB 36, K3KTH 36, K3HKW 35, W3AXA 32, WA3HIT 32, WA3IPR 32, K3KKO 26, K3PSO 24, WA3FVK 20, K3UZO 20, WA3EIO 17, K3BHU 14, W3JKX 11, W3KQE 11, W3ADE 10, WA3ATZ 8, W3OML 7, K3FOB 6, K3SLG 6, W3BFF 2, WA3BJQ 2, W3FAF 2, WA3GYT 2, WA3BIV 1, W3CL 1, W3EU 1, WA3FCP 1, WA3GUL 1, W3HNK 1, WA3IAZ 1, W3ID 1, W3KEK 1, W3NNC 1, K3NPC 1, K3VAX 1, W3YPF 1, W3ZRR 1. (Oct.) W3CUL 3712.

MARYLAND-DISTRICT OF COLUMBIA—SCM, Carl E. Andersen, K3JYZ—SEC: W3LDD.

Net	*Freq.*	*Time*	*Days*	*Sess.*	*QTC*	*QNI Ave.*	*Mgr.*
MDD	3643	0000Z	Daily	31	418	13.2	K3OAE, RM
MDDS	3643	0130Z	Daily	31	68	5.7	W3CBG, RM
MEPN	3920	2300Z	M-W-F	21	52	25.0	K3NCM, PAM
MTMTN	145.206	0100Z	W-Th-S-S	7	6	5.2	K3NOQ
CVTN	145.615	0200Z	Sn-F	10	5	4.4	WA3CFK
AREC	3820	2300Z	Sn	5			W3LDD, SEC

Effective Jan. 1 W3ZNW retired as the RM of MDDS after 7 years of effective leadership. He did an outstanding job in keeping MDDS training new operators and as NCS for MDD. W3CBG is stepping in to fill his rather large shoes on MDDS. New appointees: W3CBG, RM of MDDS, ORS; WA3HTQ, ORS; W4TFX/3, ORS; WA4QLP/3, ORS. Endorsed appointments: K3OAE, RM of MDD, ORS. W3TXQ has completed and tested his homebrew transistor station. W3GKP reports active stations on 1296 Mc. include W3AHQ, W4EXS and W4API. WA3CFK has received the WAC award. The cool weather and XYL chores are retarding W3MCG's antenna farming. W3CBG and W3TN made the BPL on originations and deliveries. W3ADO, Naval Academy station, reports beating Army in the SS contest 58K to 49K. W3ZNW is on 6 meters. WA3CBC will be /6 on 6 meters for the next month. W3EOV reports activity on the Weather Net. K3NCM was on the sick list. WA3CCN reports the first new Advanced Class license in MDC. In addition WA3CCN, cautions "watch lowering towers" as he mashed both hands and feet while trying to free the top section with muscle power. W3CDQ reports DX work on 20 meters. W3SRC placed a lighted cross on his tower for the Christmas season which was visible for 8 miles. K3QDD was home for the holidays and, of course, was to be found on MDD. W3WV was honored by the PVRC membership at its Annual Christmas Party for his outstanding contribution to the electronic state of the art over the past half century. W3TMZ is organizing PVRC for an all-out effort in the coming ARRL DX Contest. Your SCM passed the Extra Class exam. Traffic: (Dec.) W3CBG 308, W3TN 302, W3SRC 153, WA3HTQ 130, K3OAE 128, W3MCG 114, WA3CFK 107, W3ZNW 99, W3ATQ 67, W3PRC 60, W3EOV 56, K3GZK 55, K3JYZ 53, K3QDC 53, K3LFD 51, W3ADO 49, WA3CEK 26, WA3CBC 18, K3LFN 16, WA3CCN 13, WA3ERL 8, K3VHS 7, K3QDD 6, W3BWT 3, WA3GLP 1. (Nov.) W3SRC 46, K3LFD 33, W3ZNW 26, K3LFN 24, WA3GLP 23.

SOUTHERN NEW JERSEY—SCM, Edward G. Raser, W2ZI—Asst. SCM: Charles E. Travers, W2YPZ. SEC: W2BZJ. PAM and NJPN Net Mgr.: W2ZI. RMs: WA2KIP, WA2BLV. Note to all Jersey Phone Net members: We have had to move frequency again because of a complaint from the Mich. Phone Net. Look for us now on 3928 kc. instead of 3930 kc. NJN reports a traffic total of 452 with QNI of 407. NJPN reports a traffic total of 292, QNI of 531. W2YPZ fled to Florida after our zero WX. WA2DKE is a new station in the Trenton area. W2SDZ scored 4.9 p.p.m. in the recent FMT. SJRA officers for 1968: K2BG, pres.; W2FYS, vice-pres.; WA2EMB, treas.; K2ICO, rec. secy.; K2BPX, corr. secy. The Princeton YMCA Radio Club, K2PWK, meets at 7:30 P.M. Fri. at Avon Place. WB2BGH is a new ORS. WB2VMQ now is OPS. Both of these stations are giving us net coverage in the Camden-Haddonfield area. Santa brought W2ZI a new Collins 32S-3 transmitter. VE7AAF, Victoria, B.C., and F2PO, in France were worked on 75 meters first crack out of the box! W2TLO is now going to college. The SJRA won first place with its FD score. W2PU is the new call of the Princeton U. Radio Club, on the air with both s.s.b. and c.w. WB2MNF is lining up the AREC in the Haddonfield area. WA2UPC is attending McGill U., Montreal, and is chief operator of the club station. VE2UN, also secy. of the university radio club. He works VE2UN TCC terminal station for EAN. K2ARY

sent 6 Official Bulletins in Dec. K8JLF made a good score in the SS Contest from university station W2PU. Traffic: (Dec.) WA2KIP 234, WB2BGH 179, WA2ANL 90, W2ZI 89, WA2BLV 88, WB2UVB 62, K2SHE 53, W2-BZJ 35, W2ZVW 31, WB2VMQ 28, W2ORS 21, WA2KAP 20, WB2TEN 18, K2JJC 12, WB2FJE 11, WB2MINF 6, WB2APX 4. (Nov.) WB2UVB 74.

WESTERN NEW YORK—SCM, Charles T. Hansen, K2HUK—SEC: W2RUF. PAM: W2PVI. RMs: W2EZB and W2FEB. NYS C.W. Net meets on 3670 kc. at 1900. ESS on 3590 kc. at 1800, NYSPTEN on 3925 kc. at 2200 GMT, NYS C.D. on 3510.5 and 3993 kc. (s.s.b.) at 0900 Sun. and 3510 kc. at 1930 Wed., TCPN 2nd Call Area on 3970 kc. at 0045 and 2345 GMT, NYS County Net on 3510 kc. at 1400 GMT and 2345 GMT on Mon. Congratulations to BPLers W2OE, W2SEI, WB2GAL and WB2OYE. Endorsements: K2AYQ as EC Glens Falls Area, W2PZI as OO, WA2PZD/WB2NNA as ORS and WB2NZA and WB2GAL as OPSs. From information received here it looks like everyone is studying to upgrade his license—which is as it should be. K2AAS, WA2UZK, W2MXH and WB2AEK have been elected 1968 officers of the NYSPT&EN. W2PVI, K2CZN and WB2HCT are the elected officers of the Erie County Emergency Net. Lewiston-Porter HS ARC secretary WN2DFS sent in a fine picture of the club and the report that advisor K2AMI has 43 students obtaining FCC licenses. WB2-SER, secy. of the Fulton ARC, sent in a copy of its new constitution to ARRL. The ARATS elected K2-KAM, pres.; WA2BYN, vice-pres.; and K2RTQ, perennial secy. W2WUX, the Utica ARC, has a new QTH in the Civil Defense room at City Hall. WB2VSL was appointed editor of the *EATN Bulletin*. The RARA collected 110,654 pennies for a local radio station Christmas fund which buys toys for hospitalized Rochester children throughout the year. There were 175 calls handled and about 1000 man hours by hams went into the project. The annual Western New York Hamfest date is set for Sat., May 11 at Vinces 50 Acres on West Henrietta Road. W2ICE continues as program chairman and W2UTH will chair the v.h.f. conference part of the program. Reserve the date now for one of the biggest affairs in the east. In case you didn't know the affair is sponsored by the Rochester ARA, which now has over 400 members. It's not too early to start thinking about Field Day. Traffic: (Dec.) W2OE 863, W2SEI 606, WB2-GAL 558, WB2OYE 464, W2MTA 169, WA2NDC 168, W2FEB 130, W2RUF 119, WB2VSL 116, K2RYH 71, W2HYM 69, K2JBX 51, W2RQF 51, W2FCG 48, WB2-SMD 48, WB2RHJ 45, WB2YUT 41, K2IMI 25, WB2VND 21, WA2ANE 19, K2DNN 19, W2AFB 18, K2EQB 18, K2KIR 13, WA2PZD 12, WA2AWK 8, W2BLO 7, W2-PNW 6, W2PVI 5, WA2GLA 3.

WESTERN PENNSYLVANIA—SCM, Robert E. Gawryla, W3NEM—SEC: K3KMO. PAM: K3VPI (v.h.f.). RMs: W3KUN, W3MFB, W3UHN, K3SOH. Traffic nets: WPA, 3585 kc. daily at 7 P.M. local time; KSSN, 3585 kc. Mon. through Fri. at 6:30 P.M. local time. W3GJY now has 313/313 countries worked and confirmed for DXCC. W3KUN has 129 countries confirmed on 80 meters. K3GSJ and WA3AWI are in Oxnard, Calif., waiting for new 6 area calls. K3VLQ, K3-HFL and W3FVH are new Swan owners in the Erie area. *Kilo Watt Harmonics* reports W3ZGI put the club station, W3KWH, on top during the Sept. (1967) V.H.F. Contest; W3NKM has 315 countries confirmed for DXCC. The *Radial* reports that ex-WN3GKY is now WA3JFL and WA3GKL got his old call back. *Spark Gap* reports the McKeesport Hospital emergency station is on the air; WA3HHC is sporting a new T-4XB; K3CHD has his RTTY equipment going; WA3GUN passed the General Class exam; K3RQV is home from the hospital. WA3HUU has a new HA-1 keyer. Ex-WN3EVP is now General Class with the call WA3JFK. K3NJZ has left WPA for W7-Land. *QST de K3HKK* reports that ice-loading and wind storms have wiped out its mountain-top antennas including the ten-element 50-ft. boom 6-meter antenna, the 2-meter stacked array, the 220- and 440-meter antennas plus the Mosley T33-40 four band beam. Traffic: (Dec.) WA3BLE 649, WB2TNB/3 282, W3BLZ 194, WA3AKH 191, W3NEM 188, W3KUN 171, W3LOS 142, K3HKK 89 (W2KAT and K3AHT ops), WA3EPQ 84, K3PYS 70, WA3GPK 47, WA3HAL 39, K3SOH 35, W3KPJ 28, K3HCT 27, K3ASI 24, W3YA 24, K3SMB 20, K3RZE 8, K3SJN 8, WA3IPU 6, W3LOD 6, K3AEZ 5, WA3HUU 3, K3SJS 3.

CENTRAL DIVISION

ILLINOIS—SCM, Edmond A. Metzger, W9PRN—SEC: W9RYU. RM: W9EVJ. PAMs: W9VWJ, WA9CCP, WA9RLA (v.h.f.). Cook County EC: W9HPG.

Net	*Freq.*	*Times*	*Days*	*Tfc.*
IEN	3940 kc.	1400Z	Sun.	392
ILN	3760 kc.	0000Z	Daily	No report
NCPN	3915 kc.	1300Z	Mon.-Sat.	331
NCPN	3915 kc.	1800Z	Mon.-Sat.	289
Ill. PON	3925 kc.	1700	Mon.-Fri.	742
Ill. PON	50.25 Mc.	2000	Mon. & Thurs.	0
Ill. PON	145.5 Mc.	2000	M.W.F.	146
TNT Net	145.36 Mc.	2100	Sun.-Fri.	268

K9DQU, W9GFF, K9HDZ, W9JUV/K9OSO, K9WMP, W9WYB, W9HSD, K9RAS, W9REC and W9HPG participated in the recent ARRL FMT. W9OIJ graduated from Northwestern with a PhD and is operating WA5-TOS from Houston. W9DBO spent Christmas in the hospital with a heart ailment. WN9SNM received his General Class ticket. W9WB was elected pres. of the Starved Rock Radio Club. Make reservations now for the Central Division Convention to be held in Springfield, Ill., Aug. 3 and 4, 1968. Contact Convention Headquarters at Springfield, Ill., 104 North Sixth Street, 62701. New Novices heard are WN9UIG and WN9VQM. W9KMN passed the Extra Class exam. W9KNT (formerly K9EGG) is the new call for WØJMS, who has returned from Iowa. K9HKJ's new QTH has a new dipole and tri-band beam. K9DZF has been operating with a TR-4. New officers of the SRO (Society Radio Operators) are W9BUB, WA9PNS, W4FQM/9, WA9JON, K9CGI and K9QJI. WA9IWU, WA9MOS, WA9TWA, WA9OBQ, K9OZY and WA9NWK were elected officers of the Hamfesters. WA9QBM worked 90 countries with 90 watts to a I4AVQ vertical in one year. WN9WNR is a new Novice in the Evergreen Park area. W9CGC (5th Avenue Ham Club) is QRT until further notice. W6-BXB (W9MAK) was home in Lansing during the holidays. MRHA Radio Club station W9EUN is back in operation after ice storm damage to the antennas. The Argonne ARC's new officers are W9BYD, W9DJR, WA9-KQD and W9UHO. K9RZN went deer-hunting. K9-QVA has moved to Arlington Heights. WAØKVC is now WA9VPP. W9OUS, K9AUA, W9OVI, K9CZA, W9-EKB, W9VQC, K9IFO. K9YZW and K9YNI were elected officers of the Kankakee Amateur Radio Society. New appointments include K9KOI as OBS and ORS; WA9KQD as OVS. W9LNQ is working the DX band with a new TR-4. W9QKK received his Old Timers Club certificate. W9FLH is now WB4IGL. W9DNP, W9REA, WA9QNU and W9KPC head the JARS (Joliet Amateur Radio Society). W9USR received her Extra Class license and also 1st-class phone. W9GBT is using a new GSB-2 on 2-meter s.s.b. W9QXR is building a TC-6A. WA9ITT joined the ranks of the Silent Keys. K9LMY was in the hospital during Dec. WA9UUK is serving on the USS *Frontier*. W9HWG, WA9ENA, WA9TKO and W9DRN were elected officers of the Northwest Amateur Radio Club. WA9STI and WA9UHA are interested in starting a countrywide teenager 15-meter net. WA9EPS is serving with the USN at Guam. For information on the Illinois Sesquicentennial QSL cards write Mr. L. A. Wollen Jr., Myers Bldg., Springfield, Ill. 62701. WA9-OTD, WA9MHU, W9EVJ, WA9CCP, WA9QXT and WA9RSN are recipients of the BPL award. Traffic: (Dec.) WA9OTD 754, WA9MHU 611, W9EVJ 336, W9-JXV 332, WA9CCP 237, W9NXG 194, WA9QXT 179, K9-KZB 176, K9AVQ 173, K9KOI 165, WA9RSN 165, W9-DOQ 105, W9HOT 105, WA9PPA 100, W9YCH 75, WA9-FSB 73, W9LDU 68, W9PRN 60, WA9VKX 60, WA9SPA 54, K9BTE 53, W9EET 52, W9EUN 51, K9WMP 48, WA9LDC 40, WA9UHA 21, W9IDY 19, WA9QBM 16, WA9FIH 15, W9LNQ 10, K9HKJ 9, K9TXJ 7, K9HSK 6, WN9VLK 5, K9HRC 4, W9YYG 4, W9DBO 2, WA9-POZ 2, K9RAS 1. (Nov.) WA9RSN 56, WA9PIJ 18, W9IDY 14, WA9HVQ 4, K9RAS 3, WA9QBM 2.

INDIANA—SCM, William C. Johnson, W9BUQ—Asst. SCM: Mrs. M. Roberta Kroulik, K9IVG. SEC: WA9-LTI.

Nets	*Freq.*	*Time*	*Dec. Tfc.*	*Mgr.*
IEN	3910	1330 Daily 2300Z MF	453	K9IVG
ISN	3910	0000Z Daily 2130Z M-S	986	K9CRS
QIN	3656	0100Z Daily	337	W9HRY
Ind. PON	3910	1245Z Sun.		K9EFY
Ind. PON VHF	50.7	0200Z Thurs.-Fri.	328	WA9NLE

Silent Key: W9TNP. W9RMT. mgr. of the V.H.F. Net reports Dec. traffic 63. WA9KAG, mgr. of RFN Net, reports Nov. traffic 44 and Dec. traffic 41. W9ILU, mgr. of the Great Lakes Emergency Net reports Nov. traffic 76. W9HCQ worked CO2DL on 50 Mc. Dec. 12. W9HAV is back on the air with an HW-12. WA9WME is a new Technician at Jeffersonville. K9GEL is running a kw. mobile. WA9BNX, W9CLF and W9DOK are vacationing in Florida. Santa Claus visited W9MM with a Drake R4B, WA9FGT with a scope, K9KFN with a Drake and bug, WA9ELY with a new rig and WA9LLE with an Eico keyer. K9FZX is the new HAWK president. On 3910 kc. after the 1330Z net W9FMJ has been conducting a question-and-answer session on the Advanced and Extra

Class licenses. W9DUD will give a talk to the Martinsville High School ARC. WA9QAA has joined Army MARS. Clark Co. ARC's new officers are WA9IMT, pres.; W9HRY, vice-pres.; WA9WME, secy.; K9QWK, treas. QIN Honor Roll: WA9MTY 31, K9VHY 23, W9-BDP 21, WA9KAG 19, WA9KOH 16, WA9FDQ 15, W9-UQP 15 and K9WWJ 15. *Amateur radio exists because of the service it renders.* BPL certificates for Dec. traffic went to WA9LTI, K9IVG and K9FZX. Traffic: (Dec.) WA9LTI 877, K9IVG 581, K9FZX 546, W9HRY 312, WA9FDQ 286, K9HYV 221, W9JUK 194, K9STN 167, WA9ZBK 142, WA9KAG 126, W9BUQ 115, K9CBY 81, K9CRS 76, K9HZY 70, W9SNQ 59, W9CMT 55, K9EOH/9 54, W9YYX 46, K9EFY 41, K9VHY 40, WA9BHG 37, K9RWQ 36, W9AUM 34, K9YST 32, WA9GJZ 30, W9-UQP 29, W9LG 27, W9FWH 25, K9JQY 25, WA9TKZ 24, WA9AXF 22, W9DZC 22, W9CUC 20, WA9BGI 19, W9PMT 19, WA9CHY 16, K9ILK 15, W9DOK 13, W9-FJI 13, K9FUJ 11, W9BDT 10, W9UUE 10, WA9CAW 9, K9WGN 9, W9HRW 8, K9UEO 8, W9ZZR 8, K9IIV 7, WA9DBK 6, K9UHQ 6, K9FPA 2. (Nov.) WA9UZM 90, WA9KAG 67, K9FUJ 12, W9UOZ 3, WA9UUE 1.

WISCONSIN—SCM, Kenneth A. Ebneter, K9GSC—SEC: W9NGT. RM: WA9MIO. PAMs: W9NRP, WA9-QNI and WA9QKP.

Net	*Freq.*	*Time*	*Days*	*QNI*	*QTC*	*Mgr.*
BWN	3985 kc.	1300Z	Mon.-Sat.	379	232	W9NRP
BEN	3985 kc.	1800Z	Daily	732	229	WA9QKP
WSBN	3985 kc.	2315Z	Daily	1298	426	WA9QNI
WIN	3662 kc.	0115Z	Daily			WA9MIO
SWRN	50.4 Mc.	0300	Mon.-Sat.	262	2	K9DBR

Net certificates went to W9GXU and K9TBY for WSBN. Renewed appointments: W9WJH and K9DKU as ORSs. W9ODD now is running a kw. on 80-10. A CAN certificate was earned by WA9NVY. BPL certificates for Dec. traffic were earned by W9DYG and W9ODD. W9-JQW has a new Galaxy V. K9KSA has a new HW-12A. K9UTQ has a new long-wire antenna up. K9GDF led the OOs with 23 notices sent, and found time to earn the YLCC, WAVE and WACAN awards. FMT results: W9KCR 31.9, W9RKP 47.5 and K9GDF 226.1 p.p.m. error. The Wisconsin QSO Party will be held Apr. 27 and 28. The WNA Picnic will be held July 7 at Fond Du Lac. The Central Division Convention will be held Aug. 3 and 4. Traffic: (Dec.) W9DYG 464, W9ODD 453, WA9NVY 334, W9CXY 333, W9DND 332, W9AOW 298, WA9QKP 288, W9IFS 183, WA9QNI 171, WA9NPB 168, WA9RAK 128, W9ABH 119, WA9SYD 109, WA9PKM 107, W9ESJ 106, W9DXV 94, WA9NDV 84, K9FHI 78, K9-CPM 71, W9YT 57, K9TBY 51, K9KSA 49, W9NRP 48, WA9SSN 45, WA9TBQ 45, W9RTP 42, W9AYK 40, W9-CBE 35, WA9OMO 32, K9JPS 31, K9GSC 26, W9BCH 25, WA9OFF 18, W9IRZ 14, W9IQW 13, WA9LRW 11, WA9NBU 11, K9DBR 10, W9KRO 6, WA9EZU 4, W9-ONI 4, K9UTQ 4, WA9WKJ 1. (Nov.) K9JPS 21.

DAKOTA DIVISION

MINNESOTA—SCM, Herman R. Kopischke, Jr., WØ-TCK—SEC: WAØIEF. RMs: KØORK, WAØEPX. PAMs: WAØMMV, WAØJKT. MSN meets daily on 3685 kc. at 0300Z. MJN meets Tue.-Sun. on 3685 kc. at 0100Z. Noon MSPN meets Mon.-Sat. on 3945 kc. at 1805Z, Sun. and holidays at 1500Z. Evening MSPN meets daily on 3945 kc. at 2315Z. Minn. WX Net meets daily on 3830 kc. at 2400Z and on 3690 kc. at 0100Z. WAØDAS, WAØEZQ and KØVMW renewed their EC appointments, and KØ-ZRD renewed as OPS. Congrats to WAØHRM and WAØJKT, who received BPL awards for Dec. traffic. It is with deep regret we report the passing of KØIGZ, of Rushford. During 1967 a total of 373 traffic reports were received, with a total traffic count of 16,169. High traffic was in Dec. with a 1729 total and low in Nov. with an 846 count. Five BPL awards were issued. Minn. Section Nets reported a total of 1374 net sessions for the year, 21,990 check-ins and 5394 pieces of traffic handled. Active appointments include 28 EC, 17 OPSs, 7 ORSs, 6 OOs, 4 OBSs and 2 OVSs, plus our SEC, 2 PAMs and 2 RMs. Our thanks to these active operators. WAØPAN reports having a three-element 10-meter beam up now. We envy WAØIDB, WAØIDA and WØUMX who, we understand, vacationed in warmer climes over the holidays. Traffic: (Dec.) WAØEPX 240, WAØJKT 238, KØZRD 212, KØ-ORK 165, WAØHRM 153, WAØIAW 73, WØPAN 60, WAØODR 53, WAØMMV 46, WØTCK 44, WAØPUH 34, WAØIYM 33, KØFLT 30, WAØLVK 30, WAØQAK 30, KØSRK 30, WØHEN 29, WØATO 26, WØSZJ 22, WAØ-PKD 20, WØBUC 19, WAØDFT 19, WAØDOT 16, WØ-KNR 14, WAØPPY 14, KØIGZ 13, WAØJPR 12, WAØ-EZQ 11, KØLWK 10, WØBUO 9, KØMGT 7, WAØOEJ 6, KØZBI 5, WNØRRA 4, WAØSSN 2.

NORTH DAKOTA—SCM, Harold L. Sheets, WØDM—SEC: WAØAYL. OBS: KØSPH. New appointments: WAØELO as EC for McLean Co. and KØRSA as EC for Grand Forks Co. WØDM in Kansas City spent the holidays with his daughter and granddaughter. KØSPH went to the West Coast for three weeks. KØOVE has to return to Texas and do some more installation work. He has a new linear built up with 572s. WØGFE is working on a super duper burglar alarm for a car. WAØEWW has moved to the Twin Cities. WAØMSJ reports WNØRSS has a new DX-35, WNØRSR has a new 15-meter beam going, WNØRST has a new HW-16. WØDXC has the amplifier perking from all reports. WAØAYL was off for awhile but is on some again. We hear that he has had other pressing engagements than school work to take up his time. K7YGW and XYL K7YGV have been initiated to the rigors of the N.D. winter. He is stationed at the GFAFB after a tour of duty in Thailand. WAØTBR went to Fargo for eye surgery. WAØOAT is on more now that school work is lessening. WAØHUD and WAØELO could use some help on the C.W. Net to pass some of the traffic to destinations.

YL WX Net: Sessions 21	Ck-ins 438	Tfc. 12	WAØMND-WAØGRX
CW Net:	12	60	49 WAØELO
ND PON Net:	9	170	44 WAØHUD
ND RACES:	17	651	125 WAØEFJ-WØHJU-KØPZK-WØGFE

Traffic: WAØHUD 257, WAØELO 148, W9NQI/Ø 46, WØJPT 30, KØPZK 21, WØDM 12, WØGFE 12, WØ-DXC 10, WAØMND 8, WAØTBR 6.

SOUTH DAKOTA—SCM, Seward P. Holt, KØTXW—SEC: WØSCT. RM: WØIPF. Net Manager Phone: KØBSW. We are all saddened by the death of WØYQR, of Black Hawk. The SDN meets at 0045 and 0400 GMT, Mon., Wed. and Fri. starting Feb. 1, 1968. RM WØIPF has completed arrangements for NCS. Certificates will be awarded to those who QNI at least 10 times in 3 months, frequency 3645 kc. WØZWL reports an average 16.6 QNI on the WX Net. The NJQ Net reports 220 QNI, 40 QTC, 38 informal; the S.D. Phone Net, 1169 QNI, 86 QTC, 86 informal; the Sioux Falls 2-Meter Net, 18 QNI 3 QTC, 3 sessions; SDN C.W., 57 QNI, 19 QTC, all for Dec. Traffic: WØZWL 459, WAØLLG 136, KØVYY 123, WØSCT 63, WAØMYS 55, WAØPNB 49, WAØRIQ 32, WØIPF 25, WAØMWN 25, WAØQMV 17, WØDVB 13, WAØFJZ 10, WØRWM 6, KØTNM 5.

DELTA DIVISION

ARKANSAS—SCM, Curtis R. Williams, W5DTR—SEC: WA5IIS. PAM: WA5PPD. RM: W5NND. Congratulations to W5OBD on making the BPL eleven times in 1967. Welcome to new Russellville Novices WN5TJB, WN5TIZ and WN5TIY. Many are showing a lot of interest in the new Advanced and Extra Class exams. Net activity for Dec.

Net	*Freq.*	*Time*	*Sess.*	*Traffic*	*QNI*	*Mgr.*
OZK	3790	0100Z	31	155	279	W5NND
RN	3815	0030Z	31	120	822	WA5PPD
APN	3885	1200Z	26	31	660	K5ABE
APON	3825	2130Z	20	175	353	W5MJO

Arkansas needs more c.w. operators to help with liaison to RN5. Thanks to W5NND, Arkansas missed only 4 sessions of RN5 during all 1967—our best year ever! Your help is needed in the Amateur Radio Emergency Corps. Won't you give a little operating time to prepare for emergency communications? Your local club can use your support also. Traffic: W5OBD 1101, W5NND 278, W5DTR 251, WA5KEF 171, W5MJO 78, WA5PPD 50, WA5QPI 45, WA5TLS 40, WA5BQI 28, WA5PKO 26, WA5LYA 19, WA5OSC 19, W5LZU 11, WA5KQU 9, K5-TYW 7.

LOUISIANA—SCM, J. Allen Swanson, Jr., W5PM—SEC: W5BUK. RM: W5CEZ. V.H.F. PAMs: WA5DXA, W5UQR.

Net	*Freq.*	*Days*	*Times (GMT)*	*Net Mgr.*
LAN	3615	Daily	0030/0400	W5MBC
DELTA 75	3905	Sun.	1330	WA5EVU
LaPON	3870	Sun.	1300	W5KC
CGCH	3845	Daily	0015	WA5GOH

There is interest in forming a La. RTTY net. If interested, please contact W5GHP. The Delta 75 is booming with an average check-in of over twenty-four stations in each session. We regret to hear that W5JYA is moving out of the state. W5EA is very active these days on 40! WA5OJG is CHC-seeking with lots of 21-Mc. activity. WA5LGO reports the Winnsboro High ARC is holding code classes. Please note correction in time of 2nd session of LAN! W5CEZ has his HT-45 Loudenboomer back in service. W5NYN, now Advanced Class, says the

Jesuit High ARC station is WA5SCH. K5ANS/5 can be heard with OBs at 0000 GMT on 3625. WA5JVL reports that WA5CST has been reelected pres. of GNOARC. Bruce also says that the La. Tech. ARC, W5HGT, will get a radio room in a new dorm with the antenna up some 11 stories! W5BUK was the La. winner of the WØ District QSO Party. Lafayette ARC's new officers are WA4NDW, pres.; W5EXI, vice-pres.; WA5QQB, secy.; W5VAQ, treas. W5NQQ will remain as editor of *LARK*. W5GHP has joined Navy MARS and is active in a special area RTTY network. The 1968 National Convention will be held in San Antonio June 7, 8 and 9. K5JXH traded his NCX-3 for a Swan 500. The ARC of Southwest La. elected K5CXB, pres.; WA5HCU, vice-pres.; WA5LJB, secy.; K5HAH, treas. It is with deep regret we note the passing of K5MKE, of Shreveport. WA9NEW/5 recently gave the CLARC gang a fine talk on weather and radio. Again, fellows, my term as your SCM expires in June so get your nominations to Headquarters. Traffic: W5KRX 468, W5CEZ 292, K5ANS/5 125, W5MXQ 88, W5MBC 76, WA5OHH 41, W5EA 18, WA5NYN 17, W5PM 16, W5BUK 6, WA5KLF 2, WA5LGO 2, WA5OJG 2, W5JYA 1.

MISSISSIPPI—SCM, S. H. Hairston, W5EMM—SEC: W5JDF. The Mississippi Emergency Net "T" was originated Dec. 27, 1967, with WA5RXV as net mgr., with an assist from WA5RRE. This is a teenage net and the first of this type in our section. The net meets on 3888 kc. at 1730 CST. I was glad to attend the Jackson ARC yearly banquet and election of K5OFH, pres.; K5PJY, vice-pres.; W5QDC, secy.; WA5RKP, treas. WA5KEY sent me a very good report of the Mississippi Sideband Net activity. Thev are really handling traffic, as WA5OKI can agree. Our old friend K5RUO is back in the States. He operated TF2WJQ in Iceland. His XYL is now WN5TQC. The Mississippi C.W. Net has had added impetus, with W5JDF, W5BW and W5WZ making this possible. Marty, with her new call WA5SKI, is doing a fine job from Columbus. I can't praise W5WMQ and WA5KEY enough for their fine cooperation in the operation of the Miss. Sideband Net. Check into our nets: Miss. Sideband Net, daily 1815 CST, 3888 kc.; Gulf Coast Sideband Net, daily 1730 CST, 3925 kc.; Miss. C.W. Net, daily 1845 CST, 3647 kc.; Miss. Teenage Net daily 1730 CST, 3888 kc. Traffic: WA5SKI 149, W5BW 94, K5ZFM 25, WA5RXV 12, W5EMM 5.

TENNESSEE—SCM, Harry A. Phillips, K4RCT—Asst. SCM: Lloyd Shelton, WA4YDT. PAMs: W4PFP, WA4CGK, WA4EWW.

Net	*Freq.*	*Days*	*Time*	*Sess.*	*QNI*	*QTC*	*Mgr.*
TSSB	3980	Tue-Sun.	0030	26	1811	311	WA4CGK
TPN	3980	M-Sat.	1245	31	1043	173	W4PFP
		Sun.	1400				
ETPN	3980	M-F	1140	21	430	56	WA4EWW
TN	3635	Daily	0100	30	182	147	
TCN	3980	Thurs.	0200	(Wed. night CST)			W4OGG

Appointment: W4WLH as EC. W4PFP reports that for 1967 the TPN had 13,126 station check-ins and handled 1962 messages. WA4CGK reports a record-breaker for Dec. report for the TSSB Net with a QNI of 1811 and QTC of 311. Following are the top ten Tennessee traffic-handlers during 1967: W4FX, W4OGG, W4RUW, K4UWH, W4DIY, WA4YEM, W4PQP, W4SQE, WA4YDT, W4WBK. The Tenn. Council of ARC chairman, W4OGG, announces the Kingsport ARC as winner of the first place Field Day '67 plaque and the Radio Operators Club of Oak Ridge as second. Everyone is welcome on the Tenn. Teenage Net, which meets daily at 4 P.M. CST on 7270 kc. W4WQZ, of Kingsport, is available for 2-meter sporadic meteor skeds most mornings from 1130 to 1230Z, c.w. or s.s.b. Traffic: W4OGG 285, W4FX 276, W4RUW 224, W4DIY 162, K4PUZ 152, W4SQE 148, WA4YEM 138, WA4YDT 104, WB4DJP 64, W4WBK 58, WA4GLS 47, W4PFP 34, W4TYV 29, WB4EKI 28, K4MQI 25, WB4ANX 20, W4GQM 20, WA4YHO 20, WB4GHL 19, W4PQP 18, WA4ZBC 17, WA4EWW 16, WB4FCE 15, WA4AJB 12, WA4NEC 9, K4OUK 8, W4SGI 8, K4UMW 8, K4FKO 6, WA4CGK 5, K4BTY 4, WB4ESE 4, WA4HGN 4, K4TAX 4.

GREAT LAKES DIVISION

KENTUCKY—SCM, Lawrence F. Jeffrey, WA4KFO—SEC: W4OYI. Appointments: WB4FOT as OBS, WA4SMS as ORS.

Net	*Freq.*	*Days*	*GMT*	*QNI*	*QTC*	*Mgr.*
KRN	3960	M-F	1130	374	58	K4KIS
MKPN	3960	Daily	1330	398	141	K4TRT
KTN	3960	Daily	0000	813	581	WA4AGH
KYN	3600	Daily	0000/0300	458	613	W4BAZ

The Lexington Six-Meter Emergency Net has reactivated and WA4GHQ, V.H.F. PAM, reports a QNI of 47, QTC of 8 and 8 sessions in Dec. K4YZU handles oversens traffic on RTTY. WA4WWT took advantage of vacation to take first place in Ky. traffic totals again. K4KLB is the new pres. of the Greater Cincinnati Amateur Radio Association. The Blue Grass Amateur Radio Club toured WKYT-TV in Dec. W4OYI and K4UDZ are building hand-held 6-meter rigs for AREC use. WA4RTI, WA4SWV and WA4BRD are now on 2-meter f.m. from the Central City area. W4TOY reports that Louisville has a 2-meter repeater going on 146.34/146.94. W4YOK's XYL is now WN4IIF. Traffic: WA4WWT 572, WA4DYL 404, WB4AIN 366, K4YZU 325, WA4AGH 263, W4BAZ 246, W4NBZ 174, WA4SMS 154, WA4GHQ 132, WA4UAZ 130, WA4KFO 122, K4MAN 99, WA4WSW 96, W4RCE 74, WB4ACQ 52, K4TRT 52, WA4WQZ 47, WA4UIH 44, W4CDA 42, WA4VUE 42, WB4FOT 36, WB4BTM 33, W4OYI 24, WB4EOR 16, WA4OMH 16, WA4UHR 15, W4KJP 14, W4MWX 12, K4TXJ 12, W4BTA 7, W4KKG 7, K4VDO 7, W4YOK 6, WB4AFH 4, K4FPW 3, W4JUI 2, WB4BKG 1.

MICHIGAN—SCM, Ralph P. Thetreau, W8FX—SEC: K8GOU. RMs: W8FWQ, W8RTN, WA8OGR, K8KMQ. PAMs: W8IWF, K8JED, V.H.F. PAMs: W8CVQ, W8YAN. Appointments: W8GAI as EC; W8SS as OPS; W8FX, W8SCW, W8SJF, W8TBP, W8WXO as ORs; W8SS as OBS; WA8EOW, W8FWF as OVSs. Silent Key: W8IDC. W8NOH is coming along much better.

Net	*Freq.*	*Time*	*Days*	*QNI*	*QTC*	*Sess.*	*Mgr.*
QMN	3663	2300	Dy.	979	741	62	W8FWQ
WSSB	3935	0000	Dy.	842	174	31	K8AYJ
PON-DAY	3935	1600	M-Sat.	448	507	25	WA8OGR
UPEN	3920	2230	Dy.	482	105	31	K8ZSM
PON-CW	3645	2400	M-Sat.	192	89	26	VE3DPO
B/R	3930	2230	M-F	700	89	21	W8JED
M6MTN	50.7	2400	M-Sat.	304	37	26	WA8LRC
LENEWEE	145.36	0200	Dy.	268	72	30	WA8UWQ
NOON	50.418	1700	M-Sat.	201	8	25	WA8FXR
WAYNE Nov.	7160	2230	M-W-F	42	150	15	WA8VOG
SW Mich	145.26	0100	Tue.	51	00	4	W8CVQ
MEN	3930	1400	Sun.	310	50	5	K8JED

New officers: Pictured Rocks RC—WA8FSV, pres.; W8ZDF, vice-pres.; W8CQU, secy. Saginaw Valley ARA—WA8ORO, pres.; K8OIC, vice-pres.; W8GAI, secy.; K8LNR, treas. Central Mich ARC—K8BZV, pres.; W8BCI, vice-pres.; K8ETU, secy.; K8HKM, treas.; K8NOP and K8UDJ, board. The CMARC has started an upgrading school as has the SMARA. Wyandotte ARA—WA8VOG, pres.; WA8WQS, vice-pres.; WA8VRJ, secy.-treas. BPLers: W8IWF, WA8VRN, W8IV, WN8WHG and WA8VOG. W8UM (U. of M.) finished modification with 75S-1, 32S-3, HA-10 and all antennas over 100 feet high. The Fordson High School station is really go-go. W8IHD is hot on c.w. WA8VHG now is on 432 Mc. W8SS skeds McMurdo, KC4USV, for the U. of M. The Eve Bank Net's 5th anniversary, shows total eye transplants at 2192! WA8VGA bought a home in Florida. W8RX joined the ranks of antique wireless collectors. W8FX is running a p.p. 4X150A final with a 310B exciter. Traffic: (Dec.) W8IWF 587, K8KMQ 467, WA8VRN 451, W8IV 384, W8UM 343, W8JTQ 314, WN8WHG 264, WA8OGR 260, WØGXQ/8 232, WA8VOG 212, W8IHD 189, W8QQK 180, K8MXC 157, W8IUC 156, W8RTN 155, WA8SQC 152, K8ZJU 128, WA8WOS 119, WA8IAQ 118, WA8LRC 113, W8BEZ 91, WA8MCQ 82, W8TDA 79, W8PRO 78, WA8LXY 74, K8GOU 68, WA8ORC 65, WA8KME 61, W8FX 58, K3KRX/8 50, WN8VRJ 45, K8ETU 43, WA8GTM 40, WA8DSB 38, W8FWQ 37, WA8UWQ 36, K8JED 34, WA8KRH 34, W8MRM 34, W8YAN 28, K8VDA 22, W8UFS 21, W8TRP 19, WA8PII 15, W8AUD 12, W8WVL 12, W8EU 11, W8HKT 10, W8ILP 9, WA8VHG 9, WA8TSB 8, W8MGQ 7, W8GAI 6, WA8NGM 6, K8SWW 6, W8ZHB 6, W8DSE 5, W8SS 4. (Nov.) WA8LRC 100, WA8VOG 75, K8HLR 20, WA8KRH 18, WA8UWQ 14, W8WVL 14.

OHIO—SCM, Wilson E. Weckel, W8AL—Asst. SCM: J. C., Erickson, W8DAE. SEC: W8OUU. RM: WA8CEJ. PAMs: W8VZ and K8UBK. The Sixteenth Annual Ohio QSO Party will be held Apr. 27 and 28. This Ohio intrastate contest is sponsored by the Ohio Council of ARCs and the logs must be submitted to K8HDO by May 30. K8HKB reports the Northern Ohio AR Society's 1968 officers are K8MLI, pres.; K8HKB, vice-pres.; WA8AIZ, secy.; W8QXF, treas. K8HKB did some horse-trading and now has a T4XB and an R4B, W8OHN has an SB-101 and an SB-200, K8MLI has an SB-101 and WA8AIZ built a Heath SB-301 receiver. K8BXT reports W8HCL, WA8ABE and WA8KIG received their Worked Trumbull County certificates, WA8VSJ has a Swan 500 and W8KJE moved to Kenton. West Park Radiops' 1968 officers are K8GVK, pres.; W8IPA, vice-pres.; WA8YWX, secy.; WA8VNW, treas.; K8RKF, trustee.

WA8AJZ reports that K8DGI has a new Drake R-4B and a rhombic. K8PJH is in the hospital. W8QXQ has a new harmonic. Appointments made in Nov. and Dec.: W8-WDU, WA8GRR and WA8LVT as ORSs; WA8PQL and WA8SHP as OPSs; W8UAI as OBS; WA8UYN as OVS. W8BZX reports WA8LSR was on duty at channel 22 TV Dayton when Hawaii reported good video and audio there. The Amateur Radio Editors Association's 1968 officers are W4NOK/WA2RMC, pres.; VE3MJ, 1st vice-pres.; W8BAH, executive vice-pres. and secy.-treas. The *Buckeye Net Bulletin* is now edited by W8GOE, with WA8CFJ as net mgr. and W8IMI and K8DDG printing and typing. Toledo's *Ham Shack Gossip* tells us WA8-ZCP received his General Class license; WA8ZCD received his Technician Class license, K8DMU is home from the hospital and well on the road to recovery; WA8WCB is home on leave; the Toledo RC held its Annual Area Ham Award Dinner with the award going to K8LFI; Genoa RC's 1968 officers are K8VVH pres., W8KDK, vice-pres.; K8LRJ, secy.; WA8GTS, treas.; W8JWM and WA8RCK, trustees. From the *Dayton RF Carrier* in a round-about-way we learn Ohio has 869 Novices, 5769 Technicians, 712 Conditionals, 6448 Generals, 1893 Advanced, 181 Extra, with 505 of them ladies. The Ohio Six Meter Net meets at 0000Z daily on 50.6 Mc. From the Treaty City ARA's *The Beam* we learn that the club's 1968 officers are W8LRE, pres.; WA8KZR, vice-pres.; WA8KQQ, secy.-treas.; WN8ZKY and WN8ZKZ new Novices. W8RYP, W8IXZ and WA8TYF made the BPL in Dec. South East ARC's *Ham-Fox* says the club has started classes for training its members in Advanced and Extra Class license examinations. Queen City Emergency Net's *The Listening Post* informs us the club's 1968 officers are W4PII pres.; WA8GRR, vice-pres.; K8JZA, secy.; WA8STX treas.; WA8COA, comm. mgr.; and WA8CFJ, WA8JXM and WA8PMN spoke to the Boy Scout troop in Finneytown. Traffic: (Dec.) W8RYP 751, WA8TYF 445, WA8VNU 437, WA8AUZ 313, WA8UPI 293, W8IMI 227, W8QZK 206, WA8PQL 198, WA8SED 167, WA8OCG 164, W8NAL 158, WA8NTA 148, K8UBK 146, W8GOE 129, WA8FSX 113, W8UDG 110, WA8ZGC 106, WA8LAM 102, W8DAE 101, K8ONA 98, W8FGD 89, W8-TV 88, W8OUU 87, WA8LVT 80, W8GVX 70, W8QCU 70, W8PMJ 64, WA8PPK 59, W8WDU 56, WA8FHP 55, W8OE 52, WA8UNE 50, WA8MHO 39, W8HII 27, K8BYR 26, K8DHD 25, W8FRV 25, K8DDG 23, WA8MTS 23, K8YCW 23, WA8MVV 22, W8TNF 20, K8LXA 19, WA8KPN 18, K8LFI 18, W8CXM 17, W8LZE 17, W8YGR 14, W8LT 12, WA8WJR 12, K8QYR 11, W8CHG 10, W8-QXQ 10, WA8AJZ 8, W8BZX 7, K8DHJ 7, W8IBX 7, W8EEQ 5, K8ONQ 2, W8WEG 2. (Nov.) W8AEB 18. (Oct.) K8HKB 4. (Sept.) K8HKB 1. (Aug.) K8HKB 3.

SIXTEENTH OHIO QSO PARTY

April 27-28, 1968

All Ohio amateurs are invited to take part in a QSO party, sponsored by the Ohio Council of Amateur Radio Clubs.

Rules: 1) The party will begin at 2300 GMT Saturday April 27 and end at 2300 GMT April 28. 2) All types of emission and all bands may be used, but a station may be worked only once regardless of mode. A maximum of ten stations may be worked in a single county. 3) The general call will be "CQ Ohio." 4) *Scoring:* Multiply the number of Ohio stations worked by the number of Ohio counties contacted. Logs should include calls of stations worked, time, date and the county in which the station is located. 5) Suggested frequencies are: 3545, 3740, 3860, 7095 and 7250 kc. On the other bands, take your choice. 6) A cup and four appropriate certificates will be awarded to the highest scoring stations. 7) All contest logs must be postmarked not later than May 30, 1968, and should be sent to the contest manager, Miss Karla Hambel, K8HDO, rear 1111 West Main Street, Zanesville, Ohio 43701.

HUDSON DIVISION

EASTERN NEW YORK—SCM, George W. Tracy, W2EFU—SEC: W2KGC. RM: WA2VYS. PAM: W2IJG. Section nets: NYS on 3670 kc, nightly at 2400 GMT; NYSPTEN on 3925 kc, nightly at 2300 GMT; ESS on 3590 kc, nightly at 2300 GMT. Endorsements: W2VP as OO, WA2WGS as ORS and WB2HZY as OPS. Our congrats are extended to WB2UHZ, WB2YEM and W2URP on making the BPL in Dec. During the month, the ESS Net handled 310 messages. The new officers of the Albany Club include WA2WSY, pres.; WB2OGN, vice-pres.; WB2MOX, secy.; WA2JWO/WB2MHH, treas. The Schenectady Club held family night in Dec. with W2ZCV, as guest speaker, showing movies of winter in Yellowstone Park. K2LNG is the new PR Supervisor for Eastern Region of Air Force MARS. At the Albany Club, W2SOO, demonstrated the new ETV network of the State University to the members. WA2WGS reports a new DXCC certificate was received in Dec. Among the new Advanced Class is K2YJL. Plenty of European DX with a new vertical on 80 is reported by W2URP. WB2WUS, WB2WAG and WB2VUK are building 2-meter transverters for s.s.b. K2ALX is active on 432-Mc. ATV. K2YJL reports 25 states and 12 countries worked on 10 meters during the winter. W2FWU, WB2ZEC and WB2WBA are forming a Katonah Indian Ham Club. Co-chairmen for the Albany Club's mid-season dinner were K2BUF and WA2DTE. Operation "Goodwill," recorded messages to our servicemen, was very successful, according to W2-APF, for its eighth consecutive year. Traffic: WB2UHZ 539, WB2YEM 447, WA2VYT 177, W2EAF 176, W2URP 176, WA2VYS 148, WB2VVS 111, K2SJN 38, W2BXC 24, W2ANY 33, WB2HZY 32, WA2HGB 31, W2UC 31, WA2-WGS 25, WB2VUK 12, K2HNW 9, WB2UEQ/1 8, K2YJL 2.

NEW YORK CITY AND LONG ISLAND—SCM, Blaine S. Johnson, K2IDB—Asst. SCM: Fred J. Brunjes, K2DGI. SEC: K2OVN. PAM: W2EW.

NLI*	3630 kc.	1915 Nightly	WA2UWA — RM
NLI VHF*	145.8 Mc.	1900 Nightly	WB2RQF — PAM
NLI Phone*	3932 kc.	1600 Daily	WB2UQP — PAM
NLS Slow*	3715 kc.	1845 Nightly	WB2UQP — RM
Clear Hse	3925 kc	1100 MTWTF	WA2GPT — Mgr.
Mic Farad	3925 kc.	1300 Ex. Sun.	K2UBG — Mgr.
Mic Farad	3610 kc.	0001 Nightly	K2UBG — Mgr.
All Svc	3925 kc.	1300 Sun.	K2AAS — Mgr.
NYSPTEN	3925 kc.	1800 Daily	K2AAS

**Section Nets.* All times shown above are local. WA2VEA, treas. of Amateur Radio Society, W2HJ, of CCNY announces that Bachelor of Amateur Radio certificates will be issued to anyone working 5 CCNY ARS members at their home stations. Other officers of CCNY ARS are WB2VIZ, pres.; WB2EGR, vice-pres.; WB2TJE, secy. WB2UQP picked up a Heath 2-meter converter for the SB-300 which promises to be the first step toward liaison with the V.H.F. Net. W2GKZ is the new editor of the L.I. DX Assn. bulletin. WB2DZZ made a *Handbook* type keyer and has now started on a transistorized rig for 80 meters. WB2QIL has a new PR-100 crystal calibrator and an 80-meter dipole made of 14-gauge copperweld. New officers of the NYSPTEN are K2AAS, mgr.; WA2UZK, 1st asst.; W2MXH, 2nd asst.; WB2AEK, secy.-treas. WB2PJH sashayed down to the local FCC office and passed the Advanced Class test. He met WA2ECF, WB2SOA and WB2UUD on the way out. The Rockaway ARC holds theory classes every Tue. on 146.1 Mc. at 2030 (except the 3rd Tue. of the month which is club meeting night) for those interested in pursuing a higher class license. WA2LJS reports the RTTY Net meets every Sun. at 1030 on 146.52 and welcomes all comers! W2PF handled a bunch of traffic from Viet Nam via Army MARS. The Nassau 10M AREC Net has expressed its thanks for the fine jobs turned in by W2GPQ and WA2HUF during the brief absence of W2-ZAI. In addition, attendance awards were presented to W2GPQ, WA2HUF, WB2HAV, WB2QIO, W2AML, W2-BLH, K2UPA, WB2JJW and WA2JZX. WB2PTS has been doing some QRP work with a homebrew 10 watter, as well as some DX on 10-meter s.s.b. W2BCB got a crewcut and lost all his standing waves! Since he got his telephone gadget, lovable Ole W2DBQ hasn't stopped relaying that overseas type traffic. Dulcet-toned WB2-EUH of Ye Ole Notre Dame was home for Christmas and picked up a new Drake R4B from the jolly old gentleman! WB2AWX is another who passed the Advanced Class exam, but he also advises that Kings 10-Meter AREC needs more guys. K2DDK worked 125 countries in 1967 with 97 of them on 20 meters, which isn't bad for a vertical. According to K2DGI, the Hudson Division Convention takes place next Oct. 12-13 at Tarrytown. New officers of the Tu-Boro RC are WB2-IPO, pres.; W2YSM, vice-pres.; W2LXC, secy.; WA2-SOX, treas. The Amateur V.H.F. Institute of N.Y. changed its call from W2WCR to W2KU. Looks like WB2-UZU is beating OM W2TUK to DXCC! WB2DIN reports the JFK High School ARC of Bellmore has its station, WB2RCF, up to 54 countries already. Officers of the JFK HSARC are W2GND, pres.; WN2DBA, vice-pres.; WB2ZMM, secy.; K2PGR, advisor. A new Novice over Valley Stream way is WN2DVS. Traffic: (Dec.) WA2UWA 5222, WA2GPT 672, K2UBG 374, WB2UQP 219, W2GKZ 200, WB2DZZ 189, WB2QIL 150, WB2HYK 97, K2AAS 86, WB2RQF 84, W2EW 81, WB2AEK 61, WB2PJH 60,

EIMAC 15 kW tetrode offers high power gain for advanced transmitters

Most new high-power 20 kW FM transmitters use the EIMAC 4CX15,000A tetrode for service as a Class-C amplifier. The tube features a new internal mechanical structure which minimizes rf losses, and is capable of operation at full power ratings to 110 MHz. EIMAC also recommends the 4CX15,000A for 220 MHz operation at lower power levels for VHF-TV transmitters. ■ EIMAC's long experience in tube technology and ceramic-to-metal sealing leadership have combined to produce a tetrode of optimum design and structural integrity. That's why the 4CX15,000A is used in more new transmitters than any other ceramic tetrode with similar characteristics. For more information write Product Manager, Power Grid Tubes, or contact your nearest EIMAC distributor.

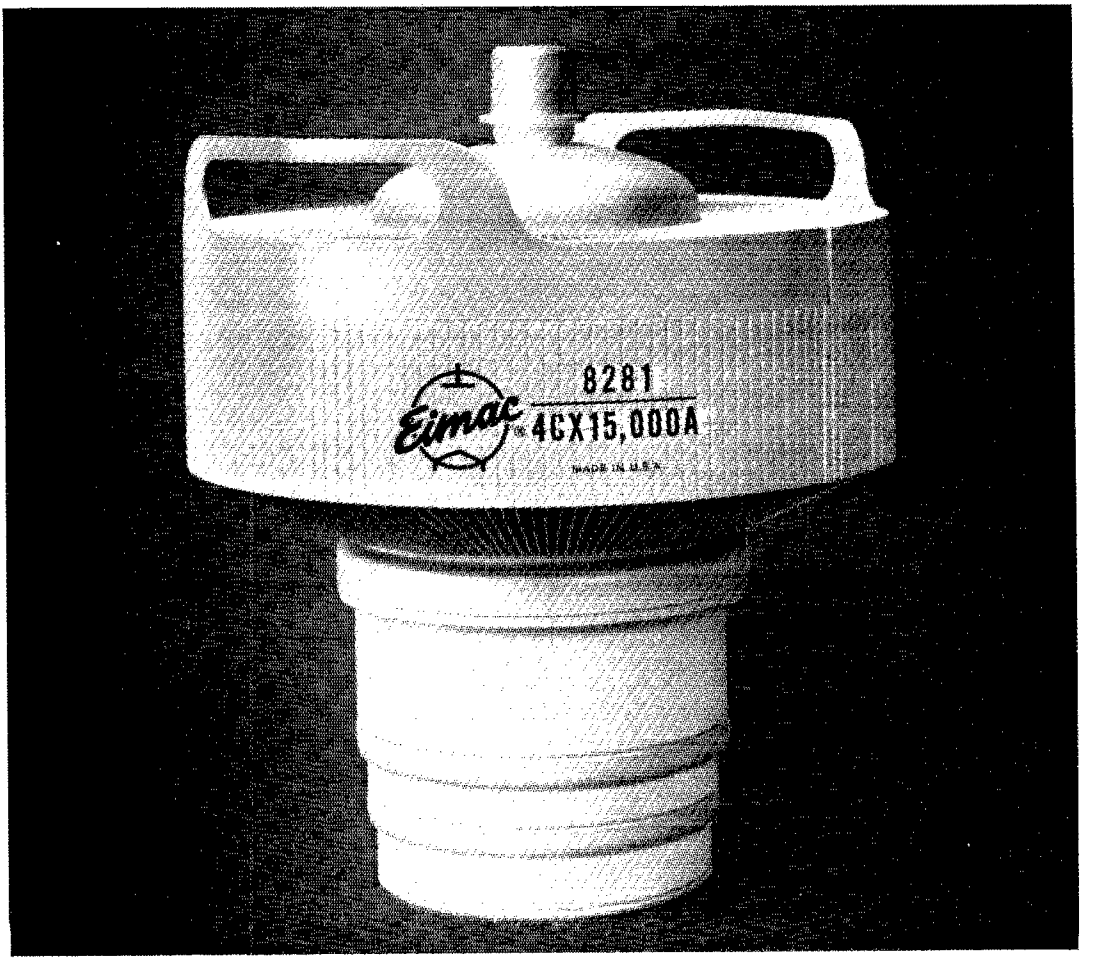
RADIO-FREQUENCY POWER AMPLIFIER OR OSCILLATOR

Class-C Telegraphy or FM Telephony (Key-down conditions)

MAXIMUM RATINGS

DC PLATE VOLTAGE	10,000 MAX. VOLTS
DC SCREEN VOLTAGE	2,000 MAX. VOLTS
DC PLATE CURRENT	5.0 MAX. AMPS
PLATE DISSIPATION	15,000 MAX. WATTS
SCREEN DISSIPATION	450 MAX. WATTS
GRID DISSIPATION	200 MAX. WATTS

EIMAC
Division of Varian
San Carlos, California 94070



One reason why your amplifier may be unstable...

by Jack Quinn, W6MJG

Some hams dropped in the other day and we got to talking about dynatron oscillation and what effect it has when you are trying to stabilize an amplifier. We agreed that it is a common form of self-oscillation; most of us have experienced its effect as noise interference, or distortion on a carrier—even unwanted side bands. We agreed that it produces thermal strain on elements. But some hams didn't know that the voltages can get quite high and can reduce the tube life. In a runaway condition, the tube can be destroyed.

We said that dynatron oscillation is caused when any electrode in a vacuum tube has negative resistance. But how this is caused wasn't clear to everyone. And perhaps, more important, what can be done to eliminate it. If you were to look inside a tetrode, you would see some electrons flowing from the cathode to the plate hitting the screen grid. This collision would knock loose low energy electrons which are called secondary electrons. Most of them return to the screen grid because of the relatively low screen-to-plate potential. If they try to get very far from the screen, the plate will attract them. The result is an uncontrolled electron flow from the screen to plate. This is secondary emission. And during part of the operating cycle of the tube it is possible that more electrons will leave the screen grid than will arrive. Thus causing dynatron oscillation and possibly a runaway condition.

Now that we had a better understanding of how this oscillation occurs, we began to come up with suggestions of how to eliminate it. One ham suggested that we change the operating line so it doesn't pass through the tube's negative resistance region. In this way, the oscillation would never have a chance to get started. I suggested that we reduce the alternating current impedance in the screen grid circuit so that the voltage could not be developed across it. A very large capacitor across the screen grid power supply (say up to 1000 microfarads) should work well.

Why don't you let me know if you have had this problem—and solved it in another way? I'm always glad to get into discussions like this. I think we all learn a little more.

Jack Quinn
Division Marketing Manager

Eimac
Division of Varian
San Carlos, California 94070

WB2DVK 55, WA2LJS 26, WA2RUI 25, WB2MZE 21, W2PF 18, WB2JJW 16, W2EC 14, WB2PTS 10, W2BCB 9, WB2TWH 8, W2DBQ 7, WB2ZNZ 5, WB2CHM 4, WB2EUH 1. (Nov.) WB2BDJ 315, WA2GPT 243, WB2-DZZ 215.

NORTHERN NEW JERSEY—SCM, Louis J. Amoroso, W2LQP—Asst. SCM: Edward F. Erickson, W2CVW. SEC: K2ZFI.

ARPSC Section Net Schedules

NJN	3695 kc.	Daily	7:00 P.M. W2BVE RM
NJ Phone	3930 kc.	Ex. Sun.	6:00 P.M. W2PEV PAM
NJ Phone	3930 kc.	Sun.	9:00 A.M. W2ZI PAM
NJ PON	3930 kc.	Sun.	6:00 P.M. WA2TEK PAM
NNJ AREC	50,300 kc.	M thru F	8:00 P.M. WA2KZF PAM
ECTN	146,700 kc.	Daily	9:00 P.M. WB2IYO PAM
PVETN	145,710 kc.	Daily	7:30 P.M. K2KDQ Mgr.

All times shown local in effect. New club officers of the East Coast V.H.F. Society are K2OJD, pres.; K2MHP, vice-pres.; W2DLT, secy.; WB2LIJ, treas.; WB2FBJ, sgt. at arms. New officers of the Land Rovers ARC are W2BVE, pres.; WA2GTO, vice-pres.; K2ZOQ, secy.; WA2FGZ, treas. The Central N.J. V.H.F. Society's club officers are WB2DDJ, moderator; WA2ZZF, vice-moderator; WB2MMM, secy.; WA2WIL, treas.; WA2OOD, sgt. at arms. The Knight Raiders V.H.F. club will continue code classes through the spring. Contact K2KDQ. K2-BMI passed the Extra and K2EIF the Advanced Class exams. WN2BVN is on with a DX-35 and has the NC-183D receiver. The W2BSC group added a Ranger 2 and the 6 & 2 for v.h.f. work. WN2CWV is on 40 meters. W2CVW has a new 220-Mc. converter. WB2UFV claims he doesn't need the high power and is selling his SB-200. WB2REE attends MIT. WB2RUM is working on his M-28 KSR. W2BVE spent a week in England on business. W2NVA has a new 10-meter beam. WB2VLC added a Cheyenne transmitter to his shack. W2LWP worked 96 stations in a recent Telephone Pioneer QSO Party. WN2CWP worked his first DX on 15. K2GPK received QSL No. 100 for DXCC. WN2DOU is a new ham in Glen Rock and is in the 2-meter traffic nets. WN2DPV is a new ham in Upper Saddle River and WN2DPX is a new ham in Paramus. WA2RFB is with the Navy in Vietnam. WB2PXW is on his way to the Philippines for 2 years. WB2VFW is now operating mobile. WB2HJW attends the U. of Dayton. WN2DRJ is a new ham in Bergenfield. He has a DX-60B and an HQ-129X and is using the W2LQP antenna system. Enough said. W2LQP visited ARRL Hq. during the Christmas vacation. 1967 gave NNJ two new nets on 2 meters and a new 6-meter net. How about an RTTY traffic net and a Novice traffic training net for 1968. Anyone interested in these RM jobs? WA2IGQ made BPL six times and WB2RKK three during 1967. Traffic: (Dec.) WB2RKK 764, WA2IGQ 721, WA2TBS 615, K2-KDQ 503, WB2VLC 266, WB2SEZ 255, WB2NZU 193, WA2ACJ 186, WB2DDQ 130, WB2BXK 125, WB2ZGP 115, WB2NSV 106, W2PEV 74, WB2ZSH 73, W2CVW 62, ASM 39, WA2NJB 38, WB2WUC 38, WB2SJH 35, WA2-CCF 33, W2BVE 28, WB2PXO 28, WA2KZF 26, WB2WFO 26, WB2CGI 25, W2BSC 23, WA2TAF 23, K2DEL 22, WB2REE 21, WA2WGR 18, WB2BCS 16, K2EFN 15, WA2GLI 15, WB2JWB 12, K2JSJ 10, WB2UFV 10, K2-MFX 9, W2TFM 8, K2EQP 7, WB2ZCI 5, WB2RUM 2, WN2DRJ 1, W2JDH 1. (Nov.) WB2NSV 75, W2DRV 31, W2ABL 2, WB2FUW 1. (Sept.) WB2FUW 130.

MIDWEST DIVISION

IOWA—SCM, Owen G. Hill, WØBDZ—Asst. SCM: Bertha V. Willits, WØLGG. SEC: KØBRE. PAM: WØNGS. RMs: WØTIU, WØSCA. The time is near for nominating your SCM for the next two years. Because of the pressures of business and other commitments I will not be a candidate for another term. It is up to you, the ARRL members, to nominate and elect my successor. Officers for the Ia. 160-Meter Net for the forthcoming year are WØGSQ, pres.; KØQWO, vice-pres.; KØTDO, secy.-treas.; KØZCA, act. mgr. KØGAZ returned Dec. 21 from HC7-Land where he had been visiting. HC7RT, ex-WØZMU, plans a visit to the states soon. WØEMA is now manager of the TLCN (Tall Corn Net). WØNTI spent several weeks on the West Coast during the holidays. WØPFP was active during Dec. working stations via Es and scatter. Silent Key: WNØ-RGN, Dale Jacobsen.

Ia. 75	Meter Net	26 Sessions	QNI	1382	QTC	137
Ia. 160	Meter Net	31 Sessions	QNI	875	QTC	15

Traffic: WØLCX 1528, WØLGG 258, WØCZ 213, WAØ-DYV 27, KØEVC 24, WØJPJ 24, KØTDO 20, WØOYP 16, KØBRE 15, WAØJUT 15, WØNGS 14, WAØOTE 13, WAØAIW 8, WAØDUB 6, WAØDAG 5, WAØBSF 4, WAØMIT 1.

KANSAS—SCM, Robert M. Summers, KØBXF—SEC: KØEMB. PAM: KØJMF. RM: WAØMLE. V.H.F. PAMs: WAØCCW, WØHAJ, WAØLSH. The QKN Kansas Novice Net is open to all class amateur radio operators. Novices especially. Report into 3735 at 1600 CST. WAØJFV, net mgr., will be looking for you. WØKKS is sporting a new TR-4 and an outboard v.f.o. WAØJOG is the proud papa of a twoer. Coffeyville and NCK Nets report 36 sessions, 182 QNI, 35 QTC. Zone 11, under the able leadership of KØJDD as EC, conducted a pre-SET exercise Dec. 17 with 28 stations taking part. The Tee-Ni-Chat Club, Wichita, has elected WØMRI, pres.; WAØKQW, vice-pres.; KØJJR, secy.-treas.; WØKQM, board member. The Jayhawk Amateur Radio Society, Inc., K.C., elected WØWNX, pres.; WAØHZS, vice-pres.; WAØHSK, secy.; WAØPKG, treas.; KØBXF, KØCZT, WAØOQD, WAØPPN, WAØOST and WAØ-PUL, board members. WAØDZI still is off the air because of college activity. AREC Zones 7, 10, 11, 13 and 15 report QNI 211, QTC 22 on the low band nets. Stations in AREC zones with 75% participation in net activity are: Zone 7—KØFIG, WØFII, WAØCVR, WAØ-NDZ. Zone 15—WØINH, WØKHQ, KØDIP, MXU, RXT, UVH, WAØCAM, DAV, DZA, PMC, NGS. Zone 10—WØVFP, VZB, PSN, WAØBRK, KPG. Top 25% stations of the Kansas EC Net are KØEMB, WAØLLC, KØNL, KØJDD, KØFIG, WAØKHW and WAØCCW. Zone 13—KØAOQ, LPE, WAØKEC, WØFDJ, FMP, WØPLN, WØWXY, WAØCCW, KØLIQ and his XYL celebrated their 59th wedding anniversary Nov. 23. Stations working the *Queen Mary* were WØBUL, WØFDO, WAØHWJ, WAØFQL, KØWUI, KØDVN, KPON, QNI 698, QTC 290; KSBN, QNI 612, QTC 149, 21 sessions; KPN, QNI 257, QTC 47, 16 sessions; KWN, QNI 720, QTC 47; Kansas EC Net, QNI 77, QTC 18; QKS 1st, QNI 268, QTC 163; 2nd, QNI 212, QTC 97; Kans. PI Net, QNI 118, QTC 17; HBN, QNI 750, QTC 230. Traffic: WØINH 831, WAØMLE 522, WAØLIC 177, WØLXA 153, KØLPE 129; KØJMF 108, KØHGI 97, KØBXF 93, WAØCCW 82, WAØKPE 75, KØMRI 65, WØZJY 65, WØAVX 58, KØYRQ 58, WØCWJ 55, WWØFII 44, KØJDD 38, WØPSN 38, WAØJOG 37, KØEMB 34, KØUVH 31, WAØJQV 30, WØCGZ 24, WAØKDJ 22, WØVZG 14, KØJID 12, WØKSY 10, WØFDJ 9, KØGII 9, WAØKDQ 9, WAØJQV 7, KØKED 6, WAØPSF 6, WØILB 3, WNØ-RQG 3, WNØTCM 2, WNØTAS 1.

MISSOURI—SCM, Alfred E. Schwaneke, WØTPK—SEC: WØBUL. WAØRMW is a new OPS. WAØLOG renewed as OPS and WØOUD as ORS. New officers of the Lees Summit RC (WØGWX) are KØRWL, pres.; WØ-SJE, vice-pres.; WNØRMA, secy.; WAØHGU, treas.; KØAHC, act. mgr. WNØSBP is pres. of the Lees Summit High School ARC. New pres. of the HARC (K.C.) is WAØAPG. The new call of the Ruskin H.S. ARC (K.C.) is WAØTKV. WAØSDO is the new call of the ARC of Central Mo. (Sedalia). WAØRFD and WAØSHC are new Gen. Cl. in K.C. New officers of the St. Louis ARC, Inc. (KØLIR), are WAØEFB, pres.; WAØCNS, vice-pres.; WAØKMF, secy.; KØHUO, treas. WAØPFU has a new Heathkit keyer. WAØHTN is a new regular on MON. KØJPJ was active in the Nov. FMT. WAØITU reports 6-meter f.m. skip opened to the East Coast during Dec. WØEEE, KØENH, WAØKNW, WAØLOG, WAØ-QIA, KØRWL, KØRPH and WØZLN qualified for Section Net certificates for the Teenage Traffic Net (MTTN). WØSJE and the Lees Summit ARC need help from clubs and individuals on the radio observance of Missouri's 150th anniversary. Your offer of help can be passed through the MoSSB Net. Net reports for Dec.:

Net	*Freq.*	*Time*	*Days*	*Sess.*	*QNI*	*QTC*	*Mgr.*
MEN	3885	2330Z	M-W-F	13	171	26	WØBUL
MON	3585	0100Z	Daily	30	222	215	WØTDR
MNN	7063	1900Z	M-Sat.	25	94	75	WØOUD
MoSSB	3963	2400Z	M-Sat.	23	668	169	WØRTO
MoPON	3810	2100Z	M-F	18	225	143	WØHVJ
QMO	7075	2200Z	Sun.	5	19	19	WAØFKD
PHD	50.4	0130Z	Tue.(GMT)	3	57	10	WAØKUH

Traffic: KØONK 5724, KØYBD 522, KØAEM 314, WØOUD 143, KØYGR 132, WAØCXG 106, KØJPJ 67, KØJPS 67, KØRPH 66, WAØJIH 64, WØHTN 52, KØ-REV 51, KØVVH 50, WØRTO 49, WØHVJ 39, WØZLN 30, WAØKUH 29, WØBUL 28, WAØPZI 23, KØORB 16, WAØOZO 16, WAØPFU 13, WAØRMW 13, KØGOB 12, WØBVL 11, WAØHQR 10, WAØQLN 8, WNØSBP 8, WAØLOG 2.

(Continued on page 108)

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.

NEBRASKA—Acting SCM, Tony Cashon, KØOAL—SEC: KØOAL. Monthly net reports for Dec.: Nebr. Emergency Phone Net, WAØGHZ, QNI 1392, QTC 117. Nebr. Morning Phone Net, WAØJUF, QNI 1209, QTC 87. West Nebr. Phone Net, WØNIK, QNI 677, QTC 64. Nebr. C.W. Net (NEB), KØAKK, 1st session QNI 111, QTC 95; 2nd session QNI 123, QTC 90. AREC C.W. Net, WAØEII, QNI 10. AREC Phone Net, WØIRZ, QNI 228. Dead End Net, WAØMCX, QNI 260, QTC 84. Nebr. Storm Net, WAØLOY, 2330Z session, QNI 1199, QTC 136; 0030Z session QNI 1409, QTC 105. 160-Meter Phone Net, WAØCBJ, QNI 521, QTC 2. PAMs: WAØJUF, Morning Net, WAØLOY, Storm Net, WAØOHO, asst., Noon Net WAØGHZ. The Pine Ridge ARC's most valuable member trophy went to KØTPK. WAØBBS was elected pres. ECs are reminded to mail in SET reports. Traffic: KØAKK 354, WAØGHZ 347, WØLOD 215, KØJTW 126, WAØQMZ 69, WAØIBB 63, WØGEQ 59, WAØOCW 53, WAØIBL 48, WAØPEJ 43, KØUWK 41, WØBFV 28, KØJFN 28, WAØBOK 26, WØHTA 26, WAØIXF 25, KØKJP 24, WAØGVJ 17, KØDGW 15, KØYDS 15, KØODF 14, KØFRU 12, WAØKHE 12, WAØPIF 11, WAØDXY 10, WAØIXD 8, WØWHY 8, WØVEA 7, KØHNT 6, WØLJO 6, WAØMHW 6, WØNIK 6, WAØIKG 5, KØECH 4, WAØEEI 4, WØHOP 4, WAØJUF 4, KØOAL 2, WØPHA 2.

NEW ENGLAND DIVISION

CONNECTICUT—SCM, John J. McNassor, W1GVT—SEC: W1PRT. RM: W1ZFM. PAM: W1YBH. Net reports for Dec.:

Net	*Freq.*	*Days*	*Time*	*Sess.*	*QNI*	*QTC*
CN	3640	Daily	1845	31	488	542
CPN	3880	Daily	1800	31	504	268
		Sun.	1000			

High QNI: CN—W1ZFM, WA1HSN, W1MPW and WA1EJU. CPN—W1GVT 27, W1YBH 26, W1LUH 25, WA1EEJ 23, WA1FVH 22, K1BOP 21, WA1FZE, W1MPW 19, K1EIC 17, WA1BDA 16. Our SEC, W1PRT has worked hard to develop state-wide EC facilities. Please give him your full support. W1KAM: E A Slo Net (3740 at 6 P.M.) reports 31 sess., 248 QNI and 110 QTC for Dec. E A Traffic Net, 0030Z on 3930 kc., requests more check-in stations. The Nutmeg V.H.F. Traffic Nets meet nightly at 9 P.M. on 50.6 and 145.4 Mc. Clubs and individuals are reminded that our Director, W1QV, appreciates reports on your activity and progress. Please keep him informed. The Conn. Council offers a newsletter to all club presidents. Contact W1WHQ. The Talcott Mountain U.H.F. Society, WA1IOX, is active on 2 and 6 meters. A club newsletter second to none is published by W1ADW for the Candlewood ARC. Best of luck to K1BXG, who has been succeeded by K1YEE as the Navy MARS coordinator for Conn. Our continued support goes to K1YEE. My inaccurate typing in the Jan. report transposed the call letters of W1VW, who holds the record of 36 years as Class I Official Observer and is still active at it! Congratulations to: W1EFW (719 total!) and WA1FVH on Dec. BPL; W1CSM, Extra Class license; WA1HMC, General Class license; WN1IVE and WN1IVG, new Novice tickets; and WA1FGN, Conn. QSO Party rating. We urge all stations to include 2- and 6-meter equipment. Make use of these wide open spaces for experimenting and operating. There's lots of room and its lots of fun! Traffic: (Dec.) W1EFW 719, WA1HSN 314, WA1FVH 307, W1YU 272, W1EEN 162, WA1HEW 149, K1QPN 143, K1RQO 139, K1EIR 127, WA1CYV 126, W1KAM 126, WA1FGN 120, W1AW 113, W1WCG 111, WA1FNJ 107, K1SXF 89, W1GVT 78, WA1GGN 69, W1MPW 65 K1TKS 56, WA1GIX 50, K1EIC 47, WA1IUL 42, W1YBH 36, WA1GFW 35, W1QV 32, K1SRF 28, WA1FJU 26, K1LMS 19, W1BDI 17, W1CHR 16, K1BOP 13, W1CUH 11, K1PJO 11, WA1GEK 9, W1CSM 8, K1YGS 8, W1BNB 7, K1CEC 3, WA1IEG 3, W1ZL 3, WA1GOI 2, WN1IQJ 2, WN1IVG 2, W1CTI 1. (Nov.) W1CTI 18, K1TKS 18.

EASTERN MASSACHUSETTS—SCM, Frank L. Baker, Jr., W1ALP—W1AOG, our SEC, received reports from these ECs: K1s HHN, PNB, MPD, ERO, DZG, WA1DXI. W1s BGW, DAL, ZLX and W2AZO/1 took part in the Nov. FMT. W1HAU is the new EC for Whitman; he is also Alt. RO, K1UMP is RO. K1ORE is C.D. Director. K1WYS will be on 6-meter s.s.b. in Montana. The EM2MN had 22 sessions, 83 QNI, 153 traffic. Ex-W1VJC is now a K7 in Nevada. W6YWQ, ex-W1LXU, is working the gang around here. The South Shore Amateur RC will hold an auction Apr. 18 at the Viking Club in Braintree. W1DVA, ex-K1CBL-WA4KSO, now in Chelmsford, has an NCX-5. WA1EYY, K1PNB, WA1HXF and W1OJM made the BPL. W1HWC moved to Braintree. WA1DGH is Contest Manager of W1AF, Harvard Wireless Soc. WN1HPA is on 80 c.w. WA1GBT has a new HA-350 receiver. W9MIJ/1 is on 10/15/20. WA1HWA, ex-WA1DOD, WA1DZJ and WA1IOB are now

the Novice rig with built-in incentive . . .

Heathkit HR-10/DX-60 . . . Novice now, General later

Heathkit HR-10B . . . the receiver you never out-grow. Tunes amateur bands only AM, SSB, CW, on 80 through 10 meters. Solid stability for solid copy of CW and SSB; separate RF and AF gain controls; BFO tuning; "S" meter; AVC on/off; automatic noise limiter; RF amplifier; crystal lattice filter; lighted slide-rule dial; optional 100 kHz crystal calibrator; 7-tube superheterodyne circuit; pre-built a aligned tuning unit.

Kit HR-10B, 20 lbs., no money dn., $8 mo. **$79.95**
Kit HRA-10-1, plug-in 100 kHz crystal calibrator, 1 lb. . . **$8.95**

Heathkit DX-60B . . . for Novice & General operation. Run 75 watts CW input for Novice operation . . . run full 90 watts 'phone or CW for General class operation; 80-10 meters; neutralized 6146 final for stable operation on all bands; built-in low-pass filter; grid-block keying; four crystal sockets (or use HG-10B VFO below); drive-level control; grid-plate current meter; drive-tune control; pi-network output for 50-75 ohm load.

Kit DX-60B, 24 lbs. (less crystals) . . . no money dn., $8 mo. **$79.95**
GH-12, PTT mike, 2 lbs. **$6.95**

Heathkit HG-10B VFO . . . when you are ready for General. Calibrated for 80-2 meters; provides 5 volts RMS in the 3.5-4, 7-7.425, and 8-9 MHz ranges; 28-to-1 dial drive; "spot" switch for off-the-air tuning; powered by transmitter.

Kit HG-10B, 12 lbs. . . no money dn., $5 mo. **$37.95**

FREE 1968 CATALOG

Describes these and over 300 kits for stereo/hi-fi, color TV, amateur radio, shortwave, test, CB, marine, educational, home and hobby. Save up to 50% by doing the easy assembly yourself. Mail coupon or write Heath Company, Benton Harbor, Michigan 49022.

HEATHKIT®

HEATH COMPANY, Dept. 9-3
Benton Harbor, Michigan 49022

☐ Enclosed is $_____, plus shipping.
Please send model (s)._____
☐ Please send FREE Heathkit Catalog.
☐ Please send Credit Application.

Name_____
(Please Print)
Address_____
City_____ State_____ Zip_____

Prices & specifications subject to change without notice. AM-193

hallicrafters ...key to the world over

Every twelve minutes, somewhere in the world, another new Hallicrafters transmitter begins to speak the universal language of better communications among men.

ADEN
Rahimtulla, Ebrahim M., & Son, Inc.
Aden

ARABIAN GULF
Green Salon—Bahrain

ARGENTINA
Telsa S.A.C.I.F.I.—Buenos Aires

ARUBA
Casa Electronica
Dutch West Indies

AUSTRALIA
Encel Electronics—Richmond, Victoria
WFS Electronic Supplies Co.
Rydalmere, N.S.W.

AUSTRIA
Pi-Mo Technical Industrial Products & Electronics Distributor, Inc.
Vienna

BAHAMAS
Besco Ltd.—Nassau
Forsythe's Radio Serivce—Nassau
John S. George Co.—Nassau

BELGIUM
Belram S.A.—Brussels
Ineico S.A.—Brussels

BERMUDA
Pearman, Watlington & Co.
Hamilton

BOLIVIA
Casa Bustamante—Santa Cruz
Corp. Electro Boliviana S.A.—La Paz
International Machinery Co., S.A.
La Paz

BRAZIL
Comercial L. Carvalho Ltda.
Sao Paulo

BURMA
Singh, G. B.—Chandigarh

CAMEROONS
Paterson, Zochonis & Co., Ltd.
Paris, France

CEYLON
Queens Radio & Television Corp.
Colombo

CHILE
Raytronics S.C.—Santiago

COLOMBIA
Erdle & Cia Ltda.—Bogota

COSTA RICA
Ing. Hans Schulze Ltda.—San Jose

THE CONGO
Bureau Technique Huguet
Brazzaville
Luso—Kasai—Leopoldville

DENMARK
Radio Magasinet—Copenhagen
Tage Olsen A/S—Copenhagen

ECUADOR
B. Aviles Alfaro & Co.—Guayaquil
Ing, Al Horvath—Quito

EL SALVADOR
Televox S.A.—San Salvador

ENGLAND
ELECTRONIQUES—Harlow, Essex

FINLAND
Nores & Co. Oy—Helsinki
Orbis Oy—Helsinki

FRANCE
Tele-Radio-Commercial—Paris

GERMANY
Ing. Hannes Bauer—Bamberg

GIBRALTAR
Machinery Ltd.

GREECE
Atha Electronics—Athens

GUADELOUPE
Ets Andre Haan—Point-A-Pitre

GUAM
TERCCO—Television Electronics & Radio Components Company—Agana

GUATEMALA
Electronica Guatemalteca
Guatemala

HOLLAND
Compagnie Generale D'Electricite
The Haag
INELCO—Holland N.V.—Amsterdam
Sarnecki Brother International Ltd
Rotterdam/Pernis

HONDURAS
Accesorios Electronicos
Tegucigalpa

HONG KONG
Oriental Engineering Co.—Hong Ko

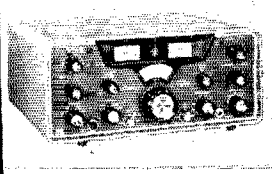
ICELAND
Sjalfvirkni, Sveinn Gudmundsson
Reykjavik

INDIA
Singh, G.B.—Chandigarh

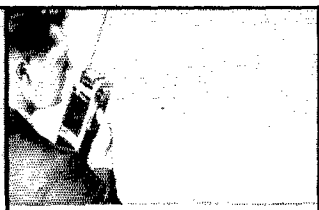
INDONESIA
Paymand Trading Company, Ltd.
Djakarta-Kota

IRAN
Niala Co., Ltd.—Teheran

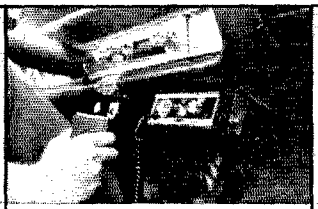
IRAQ
Abdulkader M. Adamji Co.—Baghd



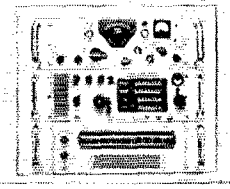
amateur radio equipment



FM industrial communications



citizens two-way radio



military communications

superior communications

IRELAND
I.T.G.
International Trading Group Ltd.
Dublin

ISRAEL
Supply & Development Co., Ltd.
Tel-Aviv

ITALY
Doleatto, Bernardo—Torino

JAMAICA
Finzi & Gadpaille—Kingston

JAPAN
Blackwell Electronics Ind. Co. Ltd.
Kyoto

JORDAN
Near East Engineering Co.—Amman

KENYA
Safari Air Services Limited
Nairobi

KUWAIT
Mohamed Saleh & Reza—Kuwait

LEBANON
Boulos Freres—Beirut

LIBERIA
F. & F. Electronics Service
Monrovia

LIBYA
Libyan Electronics Company
Benghazi

MALTA
Paramount Trading Company—Sliema

MEXICO
Jose Y. Canedo—Monterrey

NEW CALEDONIA
Menard Freres—Noumea

NEW ZEALAND
John Gilbert & Co., Ltd.—Auckland

NICARAGUA
Octavio Rocha & Cia., Ltda.
Managua

NIGERIA
Mandilas & Karaberis Ltd.—Lagos

NORWAY
Norsk Radio Surplus—Oslo

PAKISTAN
Modern Trading Co.—Karachi

PANAMA
Electronico Balboa, S.A.
Panama City
Halman, S.A.—Panama

PERU
Elecsa S.A.—Lima
Comercial Pacifico, S.A.—Lima

PHILIPPINES
Radiowealth, Incorporated—Manila

PORTUGAL
Ondex-Representacoes Electronicas
Lisbon

PUERTO RICO
G.A.P. Dist. Corp.—San Juan
Cerra T.V. Inc.—Santurce
Electronic Center Corp.—Santurce

SAUDI ARABIA
Abdulrahman Algosaibi—Riyadh

SOUTH AFRICA
Chenik & Barnett—Johannesburg

SOUTHERN RHODESIA
C. S. McIntosh—Causeway

SPAIN
Cominex S.A.—Madrid

SUDAN
Cine & Photo Supply Co.—Khartoum

SURINAM
Handelmaalschappij I. Fernandes &
Son N.V.—Paramariba

SWEDEN
Bejoken Import—Malmo
Sky-Way Teleradio—Sodertalje

SWITZERLAND
Equipel, S.A.—Geneve

SYRIA
The Syrian United Corp.—Damascus

TAIWAN
MacKarl and Company—Taipei

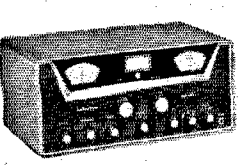
THAILAND
United Industry Limited
Partnership—Bangkok

TRINIDAD
Sabga Bros—Port-of-Spain

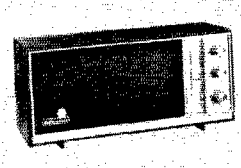
TURKEY
Metya Limited Sirketi—Ankara

the **hallicrafters** *co.*

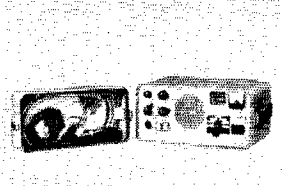
A Subsidiary of Northrop Corporation
600 Hicks Road, Rolling Meadows, Ill. 60008 U.S.A.



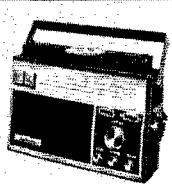
short wave
receivers



special frequency
receivers



ruggedized AM/FM/SSB
communications



marine
communications

SWAN AND THE SUN GOT TOGETHER

AND MADE 6 METERS BETTER THAN EVER!

WITH THE SWAN 250 SSB-CW-AM TRANSCEIVER

With sun spot activity now on the increase, 6 meters is rapidly becoming one of the most interesting bands to operate, and the next few years will undoubtedly see tremendous activity on this band. Sporadic E openings are occurring several times each week over all parts of the country, making excellent contacts possible from Coast to Coast and over intermediate paths. With long F2 skip and trans-equatorial propagation to look forward to, plus the consistent ground wave and tropospheric scatter contacts made possible with the power of the Swan 250, there is practically no limit to the operating pleasure you can find in the VHF world above 50 mc.

The Swan 250 is at its best in the SSB mode, for which it was primarily designed. With 240 watts PEP input and an average beam antenna, its talk power does an outstanding job. To work your AM friends, you simply insert carrier to 75 watts input, and they will read you loud and clear. AM reception is provided for by the receiver function switch. Also, a noise limiting circuit is effective on both AM and SSB.

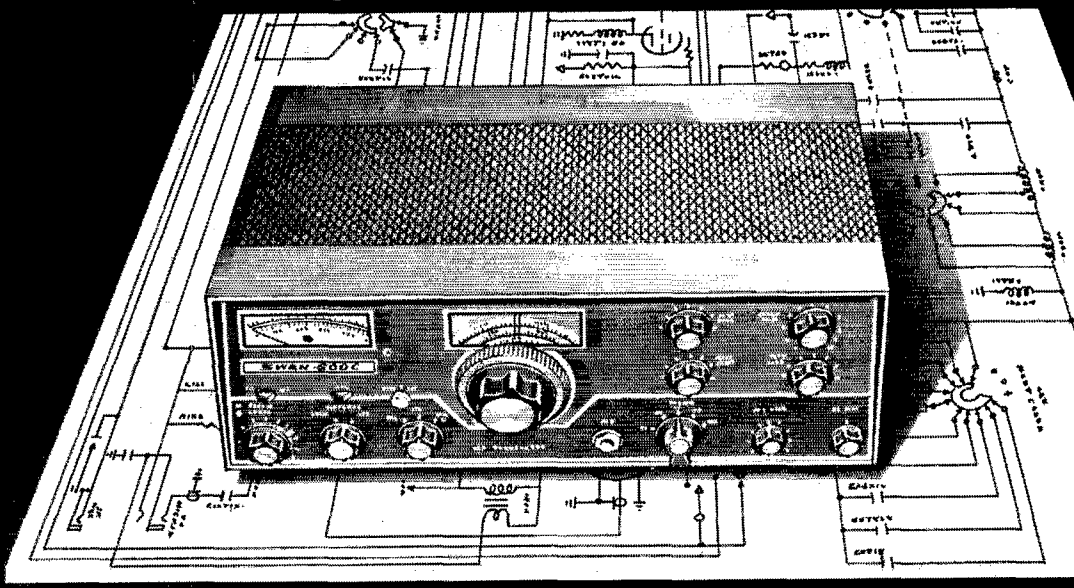
If you are seriously interested in working 6 meters, see the new Swan 250 at your dealer.

$325

MATCHING AC POWER SUPPLY	$95
EXTERNAL VFO	$120
12 VOLT DC POWER SUPPLY	$130
PLUG-IN VOX UNIT	$35

SWAN ELECTRONICS
Oceanside, California

...EVOLUTION!



THE NEW SWAN 500C

5 BAND—520 WATT TRANSCEIVER

SSB-AM-CW HOME STATION-MOBILE-PORTABLE

The new model 500C is the latest evolutionary development of a basic and well proven design philosophy. From the very beginning, with the introduction in 1961 of the first single band SSB Transceiver, Swan has followed a steady course of improvement by evolution. You might think that we would finally reach the point of leaving well enough alone, but with some 18 licensed hams in the engineering, sales and production departments of our organization, it just isn't possible. Thus, the new model 500C, with greater power and additional features for even more operator enjoyment.

RCA recently introduced a new heavy duty "blast rated" tetrode, the 6LQ6. With a pair of these rugged tubes the final amplifier operates with increased efficiency and power output on all bands. PEP input rating of the 500C is conservatively 520 Watts. Actually, an average pair of 6LQ6's reach a peak input of over 570 Watts before flat-topping!

Further refinement of the famous Swan VFO results in even greater mechanical and thermal stability and more precise dial calibration. Custom made planetary drives, machined to extremely close tolerance, provide velvet smooth tuning.

The 500C retains the same superior selectivity, of course, that we have been offering. The filter is made specially for us by C-F Networks, and it's no secret that it is a better filter than is being offered in any other transceiver today. By moving the I.F. to 5500 KC, and increasing the number of tuned circuits in the receiver, we have achieved substantial improvement in image and spurious rejection. These improvements, coupled with additional TVI filtering, result in what we believe is the cleanest transceiver on the market.

For the CW operator the 500C includes a built-in sidetone monitor. Also, by installing the Swan Vox Accessory (model VX-2) you will have break-in CW operation. Thus, the model VX-2 now fulfills a dual function, both automatic voice control and break-in CW keying. Grid block keying of a pure CW carrier is employed with off set transmit frequency.

The 500C embodies Swan's well known dedication to craftsmanship, performance and reliability, with a service policy second to none. When you visit your Swan dealer and look over the 500C, we are sure that you will be glad we couldn't 'let well enough alone.' **$520**

SWAN 350C Our improved standard model, now in production, and still only $420

ACCESSORIES

MATCHING AC POWER SUPPLY
Model 117XC $95

12 VOLT DC POWER SUPPLY
Model 14-117 .....$130

MODEL 410 FULL COVERAGE EXTERNAL VFO.....$95

MODEL 22 DUAL VFO ADAPTOR.....$25

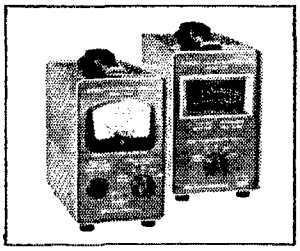
MODEL 405X CRYSTAL CONTROLLED MARS OSCILLATOR $45

MODEL VX-2 VOX and BREAK-IN CW UNIT.....$35

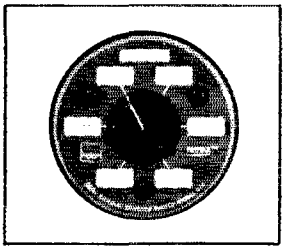
SEE IT AT YOUR SWAN DEALER

SWAN ELECTRONICS
Oceanside, California
A SUBSIDIARY OF CUBIC CORP.

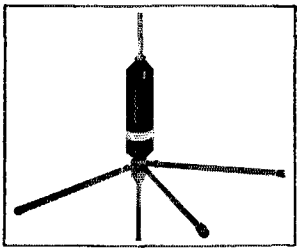
Order Waters fine ham gear *direct*



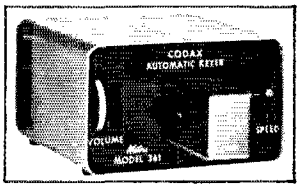
DUMMY LOAD/WATTMETERS
An effective means of measuring and peaking RF power into a dummy load. Four calibrated scales permit accurate readings of RF watts. Protective warning light.
MODEL 334A
1000 watts.
2 to 230 MHz ..... **$135.**
MODEL 374
1500 watts.
2 to 30 MHz ..... **$135.**



PROTAX™ ANTENNA SWITCHES
Unique coaxial selector switches that automatically ground entire antenna system when station is not in use. Handle 1000 watts; complete with hardware.
MODEL 375 SP6T
Rear Axial Connectors $13.95
MODEL 376 SP5T
Side Radial Connectors $12.50
MODEL 380 SPDT
Rear Axial Connectors $12.45



MOBILE BAND-ADDER™
Add 10, 15 and 20 meters to any standard mobile antenna with 40 or 75 meter coil. Pretuned for full coverage on each band. Will carry 500 watts PEP . . . lightweight and installs in seconds.
MODEL 370-3 ..... **$19.95**
AUTOMATCH ANTENNA . $42.85
Rugged — efficient. (Mast, stainless steel tip and 75 meter coil. Complete)



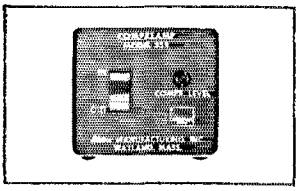
CODAX KEYER
Automatic spacing and timing from 5 to 50 WPM . . . built-in double-paddle key adjusts to any fist. Solid state with sealed "Reed" relay . . . keyed audio output at microphone level allows use of VOX circuit on either sideband. Self-powered — operates with any rig.
MODEL 361 ..... **$92.50**
(Less 1.35 volt batteries)

Your QSL card will bring you the NEW

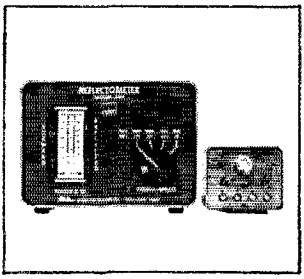
Waters Catalog

•

Complete data on the entire Waters line



COMPREAMP
Add definite "talk power" to your signal with Compreamp! Self-powered and solid state, it is easily installed in the mike line of either fixed or mobile station. Great for the added punch when QRM and band conditions are tough.
MODEL 359 ..... **$27.95**



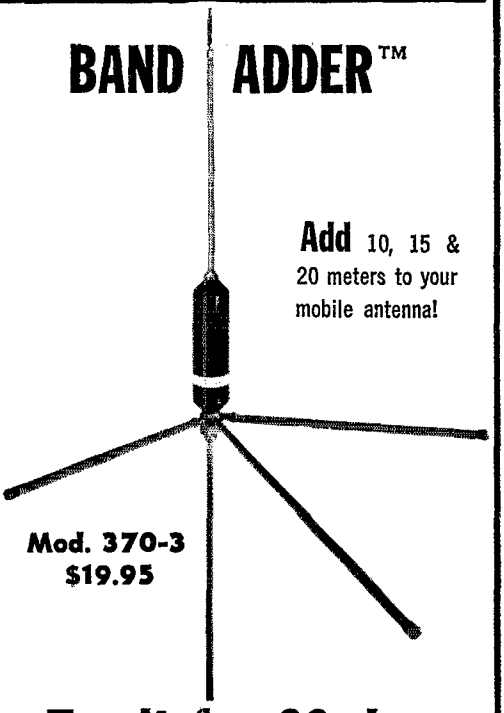
REFLECTOMETER
Measures both forward and reflected power simultaneously on unique double meter. Covers 3 to 30 MHz at 52 ohms on two separately set forward scales of 200 and 1000 RF watts (20 and 200 watts reflected) to insure accurate readings. Complete with directional coupler.
MODEL 369 ..... **$120.00**

ATTENUATOR
Gives stepped attenuation to 225 MHz from 0 to 61 DB in 1 DB steps. 50 ohms.
MODEL 371-1
(UHF Connectors) ... $29.95
MODEL 371-2
(BNC Connectors) ... $32.50
MODEL 371-3
(N Connectors) $38.95

USE THIS CONVENIENT ORDER FORM

...from Waters

BAND ADDER™



Add 10, 15 & 20 meters to your mobile antenna!

Mod. 370-3
$19.95

Try it for 30 days

Your money back if you're not satisfied!

Use the Band-Adder 30 days in your mobile operation. If it doesn't fulfill every claim we make and satisfy you completely . . . return it for full refund of the purchase price! Remember — Band-Adder installs in a jiffy, never requires adjustment and handles 500 PEP in a walk. Great for marine mobile, too! Don't miss this no-risk opportunity. Order your Band-Adder today!

***Band-Adder installs instantly on Waters Auto-Match or other standard antennas employing 3/8-24 coil threading.**

or...

order from the exclusive Waters Distributor nearest your QTH

The complete Waters line is always in stock at all of these exclusive Waters distributors.

AMATEUR ELECTRONIC SUPPLY
Milwaukee, Wisconsin 53216

AMRAD SUPPLY, Inc.
San Francisco, California 94121
Oakland, California 94607

ARROW ELECTRONICS, Inc.
Farmingdale, Long Island, N.Y. 11735
Norwalk, Connecticut 06850
Totowa, New Jersey 07512
Mineola, New York 11501
New York, N.Y. 10007

ELECTRONICS CENTER, Inc.
Dallas, Texas 75204

ELECTRONICS DISTRIBUTORS, Inc.
Wheaton, Maryland 20902

HARRISON RADIO CORPORATION
Jamaica, Long Island, N.Y. 11435
New York, N.Y. 10007
Farmingdale, Long Island, N.Y. 11735

HENRY RADIO, Inc.
Butler, Missouri 64730
Anahiem, California 92801
Los Angeles, Calif. 90064

STERLING ELECTRONIC SUPPLY
New Orleans, Louisiana 70112

WORLD RADIO LABS, Inc.
Council Bluffs, Iowa 51501

PAYETTE RADIO Limited
Montreal 3, Canada

This order form may be sent direct to the factory or to your nearest Waters Distributor.

WATERS MANUFACTURING, Inc., Wayland, Mass. 01778 Dept. Q-3

Send ..... Model ..... @ ..... each ..... $ .....

Send ..... Model ..... @ ..... each ..... $ .....

Total Order (Mass. Deliveries Include Tax) Check/Money Order Enclosed .....$.....

NAME ..... CALL .....

ADDRESS .....

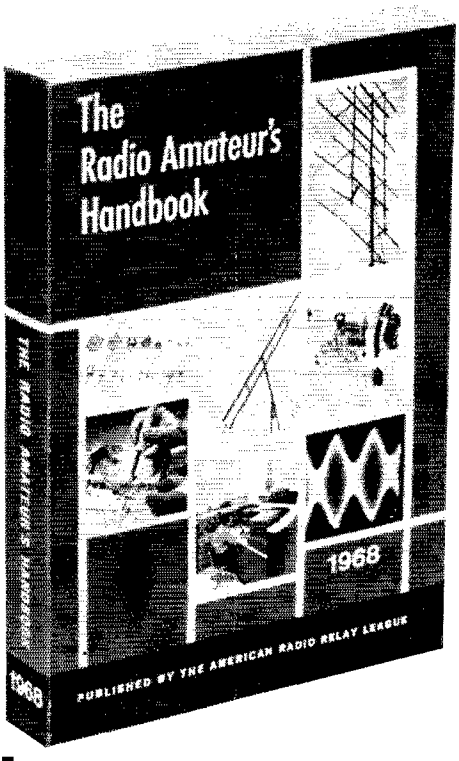
CITY ..... STATE ..... ZIP .....

General Class. K1VGM has gone back to N.U. K1CCL is Advanced Class. W1ALB has an SB-101. W2AZO/1 has an antenna 250 ft. long. The South Shore Club had a Christmas party. WA1BFD is on 10/15. The EMNN had 11 sessions, 72 QNI, 42 traffic. W1FJI has a trap doublet for 10/80. WA1AJN has a tower and beam for DX. WA1ACD worked Ariz. on 6. K1FJM heard some good DX on 6. K1WKG and his XYL, WA1GRV, moved to Lowell. His father and mother are K1WGR and WA1AGR. WA1AWJ is on many bands. W1NJL is a first-year student at B.C. Law School. Appointments endorsed: K1WVW, W1UJF, W1JVZ ,W1PSG as ECs; K1OJQ as OVS; Wis NJL and PEX as ORSs; WA1EYY and W1NJL as OPSs. K1CCW is going to make a map of the New Eng. Div. area showing the location of the most active 75-meter phone stations. Temporary officers of the New Eng. Chapter of the OOTC are W1DFS, chairman; W1HIL, secy.; W1AOG, treas. W1KJ will be contact man with the National OOTC, a net on 3980 kc. at 8 P.M. Wed. The Massasoit ARC had an MARA night with the XYLs and YLs. W1KGU is editor of the bulletin. W1BHD has been endorsed as OVS, OBS and EC for Everett; K1CLM as OPS; W1HPV as EC for the New Eng. Emergency Phone Net. W1OFK is busy working around his new QTH. W1OJQ is working on a kw. for 2. W1BVP is on a Coast Guard cutter telephone relaying with W1FQA, K1VJI and K1ZJW. The Capeway RC met at K1MAK's. New officers are K1MAK, group manager; K1HGT, asst.; K1LOE, rec. secy.; W1ZST, treas.; K1HGT, corr. secy. The Quannapowitt RA held a meeting and showed a movie on the Alaskan earthquake by W1HKG. WA1DOK spoke at the meeting. W2BUW is ex-W1TZR. The Yankee RC held a meeting and K1CMS showed movies on tower erection. W1JPI had a nice write-up in a Boston paper about his work in Navy MARS. The 6-Meter Cross Band Net had 21 sessions, 167 QNIs, 26 traffic. W1IFI has a new Heathkit reflected power meter. WA1DJC says his radio club is entering the Science Fair in March. WA1ETC is building RTTY gear. K9AQP/1 has a 220-Mc. converter using FETs. Traffic: (Dec.) WA1EYY 784, K1PNB 665, W1-OJM 664, W1EMG 312, K1CLM 271, WA1HXF 260, W1FJI 230, W1DOM 189, W1DAL 104, W1OAG 100, WA1DPX 100, WA1FSI 72, WA1AJN 64, W1JDP 45, WA1CLR 38, WA1DEC 35, K1LCQ 35, WA1GCH 33, W1DKD 31, WA1DED 29, W1PEX 26, K1OKE 20, W1CT 9, WA1IOB 9, K1YUB 8, W1AAR 3, WA1DJC 3, W1IFI 3. (Nov.) W1IAU 26, W1MX 25, W1PEX 17, K1YUB 4.

MAINE—SCM, Herbert A. Davis, K1DYG—SEC: K1DYG. RM: W1BJG. PAM: WA1FLG. Traffic nets: Sea Gull Net, Mon. through Sat. on 3940 kc. at 1700; Pine Tree Net, daily on 3596 kc. at 1900, e.w. W1IDA is active with the Cumberland County RACES Net. He works 6 through 80 meters with the NCX-5 and Swan 250; also he will be with Air Force MARS soon. The PAWA still holds meetings Tue. nights at 7:30. K1RQE and K1OYB went to Boston in Nov. and passed the Advanced Class exam. K1RSA has moved to his new home in Westbrook. Just for the record the small but dedicated crew of the PTN down on c.w. had 306 sessions with no misses, also reported into IRN 541 sessions out of 550. W1BJG had a good traffic count of 469. Very good show. W1UDD reported the Barnyard Net is active with a good group. Traffic: (Dec.) W1BJG 469, K1WQI 193, W1GU 133, W1NND 114, W1YA 109, K1SOW 53, K1TMJ 4, W1IDA 3. (Nov.) W1BJG 159.

NEW HAMPSHIRE—SCM, Robert C. Mitchell, W1-SWX/K1DSA—SEC: K1QES. PAM: K1APQ. RM: Open. Endorsements: K1APQ as PAM; K1RSC as EC (Rockingham County); K1WKP/K1QLZ as OVS; W1JB as OO; W1JB and W1AIJ as OPSs; W1EVN, W1MHX, W1AIJ and K1BGI as ORSs. K1APQ reports 807 check-ins and 108 traffic for GSPN. Welcome to new hams: WA1IWX and W1NJG's son, WA1IVR. K1DWK reports 133 check-ins and 16 traffic for MVAREC. W1ARF and XYL K1GUJ report a new addition to the family. K1UZG reports 104 traffic and 94 checkpins for VTNHN. K1MOZ packed up and left for California and works for the Link Company. W1BXM was active in the recent V.H.F. Contest and worked 12 sections on 2 meters. Traffic: WA1EUJ 103, WA1HXH 80, K1PQV 67, W1MHX 66, K1-QES 5, W1SWX 4.

RHODE ISLAND—SCM, John E. Johnson, K1AAV—SEC: K1LII. PAM: W1TXL. RM: W1BTY. V.H.F. PAM: K1TPK. Endorsements: WA1EEJ as OBS, K1PAM as OO and OVS. A Section Net certificate was issued to K8SYG/1. The Fidelity ARC, K1NQG, set up a station at the Midland Shopping Mall and handled over 684 messages during a recent exhibit. The club had excellent publicity on TV and in the local newspapers. W1YUT is back on the air after a long period of no activity because of repairing and remodeling his home. He has a TX-1, an NC-300 and a new fiberglass 10-15-20-meter cubical quad. He hopes to install a 10-through 80-meter



1968 EDITION

EXTENSIVELY REVISED !

THE STANDARD reference work and text for everyone—radio amateurs, students, experimenters, engineers, lab men, technicians.

The *1968 Edition*, through this extensive revision, continues its tradition of presenting the soundest and best aspects of current practice. Containing 35 new construction projects, *The Handbook* has more new material than ever before! Considerable emphasis has been placed on solid-state devices, with revised chapters on their theory and also on their practical use in construction projects. Every important aspect of amateur radio is covered: transmitting, c.w., a.m., sideband, radioteletype; receiving; mobile; v.h.f.; propagation; antennas; construction; theory; charts; diagrams; transistors; vacuum tubes; station assembly and operation. *It is the up-to-date and complete Handbook.*

$4.00 U.S.A. and Possessions, **$4.50** Canada, **$5.50** Elsewhere. Cloth-bound Edition, **$6.50** U.S.A. Possessions and Canada, **$7.00** Elsewhere.

The AMERICAN RADIO RELAY LEAGUE, INC.
NEWINGTON, CONN., U.S.A. 06111

vertical soon. The Newport County RC elected WA1CSO, pres.; WA1FFL, vice-pres.; WN1HXJ, secy.; WA1BLC, corr. secy.; Norman Anderson, treas. The W1AQ Club of Rumford will hold its Annual Meeting and Pres. W1FNH announces that the building will be discussed at that meeting. A successful building program fund drive was announced and it is hoped that the building will start this spring. Traffic: WA1EEJ 1821, K1NQG/1 684, W1TXL 343, W1YKQ 199, W1BTV 111, K1VYC 59, K1TPK 26.

VERMONT—SCM, E. Reginald Murray, K1MPN—

Net	*Freq.*	*Time*	*Days*	*QNI*	*QTC*	*Mgr.*
Gr. Mt.	3855	2230Z	M-S	848	84	W1VMC
Vt. Fone	3855	1400Z	Sun.	222	—	W1UCL
VTNH	3685	2330Z	M-F	104	94	K1UZG
VTCD	3990½	1500Z	Sun.	38	10	W1AD
VTSB	3909	2230Z	M-S	544	115	W1CBW
		1330Z	Sun.			

The Vt. Trading Post Net is active again on 3855 after the Vt. Fone Net. We welcome new Novices WN1IYZ (Bellows Falls) and WN1IWK (Bridgeport). Congrats to new Generals WA1IUC (Burlington) and WA1IXS (Hancock). Hope you had a chance to be in the Vt. QSO Party. Don't forget to send your logs to K1MPN. The W-Vt certificates has been redesigned. W1FPS, Ray Flood, is custodian and his address is 2 Marlboro Ave., Brattleboro, Vt. Traffic reports: (Dec.) K1BQB 443, W1-FRT 31, K1MPN 20, WA1GUV 6, WA1GKS 5, W1KJG 2. (Nov.) K1UZG 27, WA1GUV 4.

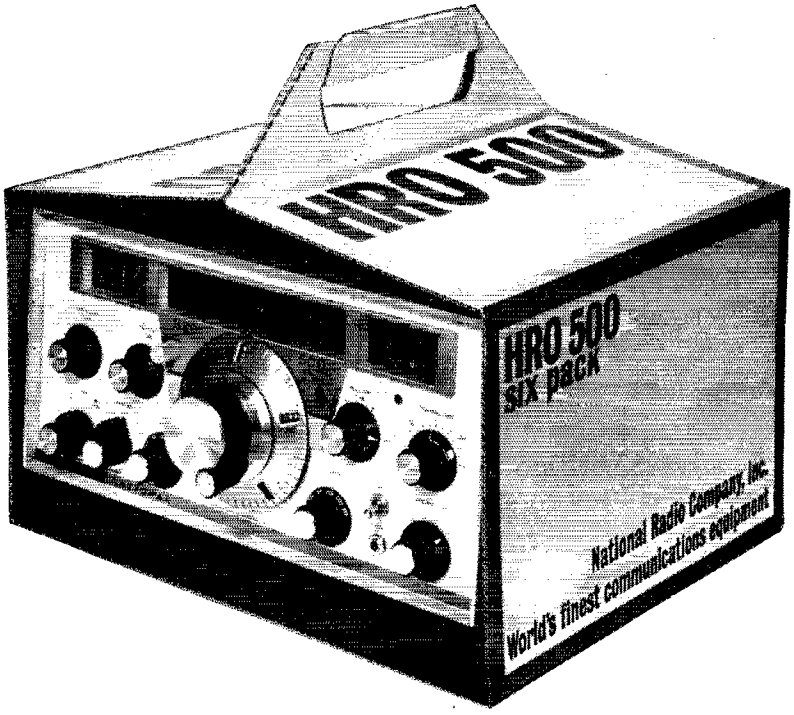
WESTERN MASSACHUSETTS—SCM, Norman P. Forest, W1STR—RM W1DWA reports 28 sessions and 122 pieces of traffic handled. Total for the year is 1298 with a 5.7 average. The average QNI is 6 stations. PAM K1DGQ reports 30 sessions, 230 check-ins with a QNI of 129. Excellent for the first month of operation for the WMPN. The HCRAI Phone Net continues to have lively sessions Wed. (28.990 Mc.) at 9 P.M. The Connecticut Valley V.H.F. Net has an increasing number of stations calling in Mon. evening (145.350 Mc.) at 9 P.M. Stations up and down the valley are invited to call in and pass traffic. The HCRAI, which recently took over the New England QSL Bureau, is making use of these nets to notify members who have unclaimed cards at the bureau. K1DGQ recently sent out 68 messages to notify hams of cards in the file. Reports on the 1967 Phone SS were received from W1EOB, 16,800, and K1KNQ, 97,-601. New appointments: WA1GAB, WA1EYF, K1DGQ as OPSs. Endorsements: W1NLE, W1DWA, W1AMI as ECs. W1DWA as RM. W1ALL and W1IUB are conducting classes for would-be hams in Southwick. Traffic: K1AEC 129, K1DGQ 120, W1DVW 108, W1EOB 73, WA1EYF 56, K1WZY 47, W1DWA 32, WA1GAB 27, W1ZPB 26, WN1HHA 12, W1MNG 11, WA1ABW 8, W1BVR 4, WA1-DNB 4.

NORTHWESTERN DIVISION

ALASKA—Acting SCM, Albert F. Weber, KL7AEQ—SEC: KL7GEF. OBS: KL7CAH. During December the Haines undersea cable break kept the boys in S.E. Alaska mighty busy. KL7FRZ, who is now Extra Class, informs us the communications outage lasted 8 days, 9 hours and 10 minutes by official count. We regret to report that KL7DIG was killed in a helicopter crash at Port Snettisham. Via the *Ground Wave* we learn of the retirement of KL7EIP, vice-pres. of the Juneau Club. KL7DRZ devoted most of the summer to handling RTTY traffic from Antarctica. Newcomers to Juneau are KL7KW, KL7GDF, KL7FJB and KL7GFO. KL7EKZ reports lots of 2-meter activity in the Sitka area. *Short Circuit* reports the Alaska Lassies Net meets Tue. at 0000Z on 3866. KL7DP has a new VW squareback with a 75-meter whip that looks for all the world like the tail wagging the dog. Anyone wanting information on "NOREC" should get in touch with KL7EWH. Note to KL7FRV: Any antenna erected in Alaska when the temperature is above minus 30 is doomed to failure. KL7-EWH is looking for pictures of hams in action during the floods, and we still are looking for movies of any ham activities to incorporate into a feature film. If you need forms for reporting traffic just let me know. Traffic: KL7CAH 254, KL7FRZ 34.

IDAHO—SCM, Donald A. Crisp, W7ZNN—SEC: K7-THX. The FARM Net meets Tue. through Sat. at 0200 GMT on 3935 kc. WA7HOX has installed a new Hornet 3-band beam and has ordered an HT-37. WA7ETO is working a lot of DX with a new three-element 20-meter beam. W7HKK is sporting a new mobile transceiver. W7IUO is studying for the Extra Class exam. New appointments: WA7ETO as ORS and OO. Endorsements: WA7EWV as OBS; K7HLR as ORS. New EC members

six pack



National offers six of the world's finest receivers to meet *your* particular requirement.

Receiver number one provides greater amateur band performance and features than any amateur receiver ever built. ■ Receiver number two has the widest frequency range (from 5 Kc to 30 Mc) of any general coverage communications receiver ever built for lab or commercial application. ■ Receiver number three is *completely* solid-state for high reliability, versatility and portability. It operates from 12/24 V.D.C. or 115/230 V.A.C. This receiver draws less current than a couple of dial lamps (when its dial lamps are switched off), and provides instant-on operation. ■ Receiver number four incorporates specific features for high selectivity and has a six-pole filter to provide built-in steep-skirted 500 cps, 2.5 Kc, 5.0 Kc, and 8 Kc bandwidths with *passband tuning* for CW and SSB. Also *AGC threshold control* to knock out background QRM. Also a 50 db notch filter. ■ Receiver number five has a phase-locked frequency synthesizer to replace conventional high frequency oscillator crystals for superior stability and over-all calibration. ■ Receiver number six offers frequency meter performance with 1 Kc dial calibration and accuracy over its entire tuning range, 24 feet of bandspread per megacycle, and 10 Kc per turn tuning rate.

Each of these receivers is called the HRO-500. National's new HRO-500, at $1675, is the finest *total* receiver you can buy . . . at any price. Interested in trying out National's new sixpack? See your National dealer for an opener.

NATIONAL RADIO COMPANY, INC. 37 WASHINGTON STREET, MELROSE, MASS. 02176

in the Lewiston area: W7HDT, W7YRX, WN7HPX. WN7HPY. ISN report: 22 sessions, 96 check-ins, 19 traffic handled. FARM Net report: 22 sessions, 557 check-ins, 96 traffic handled. Traffic: WA7BDD 198, K7OAB 56, K7OQZ 22, WA7ETO 21, WA7EWV 12, W7GGV 10, W7-ZNN 5, W7IY 3.

MONTANA—SCM, Joseph A. D'Arcy, W7TYN—Asst. SCM/SEC: Harry Roylance, W7RZY. RM: WA7DMA. PAM: W7ROE.

MTN	3910 kc.	1800 MST	M-F
MSN	3950 kc.	1700 GMT	Sun.
Mont. RACES	3996.5 kc.	1600 GMT	1st and 3rd Sun.
Mont. PON	3915 kc.	1600 GMT	Sun.

Endorsements: W7LBK, W7CJN, W7TYN, W7JRG. Appointment: K7OEK as OVS. New officers of the Butte Amateur Radio Club are WA7FOB, pres.; WA7FLG, vice-pres.; W7ROE, secy.; K7NDV, treas.; W7FLB and W7CJN, board. New officers of the Anaconda Amateur Radio Club are W7TQC, pres.; W7VNE, vice-pres.; K7-YNZ, secy.; W7BKB, treas.; W7EQP, act. mgr. WA7-DMA came within 55 points of making the BPL. W7CJN has a new SB-101 in the works. WA6MDL/7, with the Air Force in Lewiston, has been checking into RN7. W7ROE has his 2-meter f.m. rig going. WA7HDD is on with his new s.s.b. rig. WA7IAL has his HW-32A going in the Bozeman area. Adult education classes in the Bozeman school district include one entitled "Introduction to Amateur Radio." WA0ATY is teaching this one for a Novice Class license. We still are in need of more c.w. stations for the net on 3680 kc. Traffic: WA7-DMA 445, W7TYN 139, K7DCH 129, K7EGJ 35, W7WYG 11, WA7DBN 8.

OREGON—SCM, Dale T. Justice, K7WWR—RM: W7ZFH. PAM: K7RQZ. Section nets:

Net	*Freq.*	*Time*	*Days*	*Net Mgr.*
AREC	3875 kc.	0300Z	Daily	WA7AHW
AREC	145.35 Mc.	0400Z	Tue.-Sat.	??
OSN	3585 kc.	0200Z	Tue.-Sat.	W7ZFH
BSN	3875 kc.	0130Z-200Z	Daily	K7IFG

WA7AHW reports for the AREC Net for Dec., sessions 31, check-ins 744, contacts 80, traffic 30, QSTs 4 and maximum number of counties 19. W7ZFH reports for OSN for Dec., sessions 22, check-ins 105 and traffic 98. K7OUF was in the hospital for ten days in Dec. and also in Jan. New General Class stations are WA7IUB and WA7HJV. New Novices in the Grants Pass area are WN7IJQ and WN7ITW. Congratulations to K7RQZ on making the BPL. New appointment: W7WHY as ORS. Vacancies now exist in the OO and OBS appointments. Applications can be obtained by sending an s.a.s.e. to your SCM. Traffic: (Dec.) K7RQZ 517, W7WHY 222. W7ZFH 174, W7ZB 165, K7IFG 154, WA7BYP 115, K7-WWR 93, K7NTS 70, WA7CIP 32, K7OUF 23, W7BNS 22, K7KPT 20, W7DEM 19, WA7AHW 18, W7MLJ 13, WA7GLP 12, WA7DPK 9, W7KTG 8, WA7EES 6. (Nov.) W7ZB 96, K7NTS 47, K7KPT 22, WA7EES 20.

WASHINGTON—SCM, William R. Watson, K7JHA —SEC: W7UWT. RM: K7CTP. PAM: W7BUN.

NTN	1930Z	3970 kc.	Daily	QNI	1062	QTC	891	Sess. 31
WSN	0215Z	3590 kc.	Daily	QNI	362	QTC	881	Sess. 31
WARTS	0200Z	3970 kc.	Daily	QNI	1350	QTC	227	Sess. 25
NSN	0300Z	3700 kc.	Daily	QNI	362	QTC	89	Sess .31

The list below under "Traffic" represents the handling of over 12,000 traffic points and 11 BPLs, believed to be an all-time record for the Washington section. W7-AIA/7, operating from the Vet's Hospital in Vancouver, again took formal messages from the patients' bedsides in a fine public service operation. The Clark County Amateur Radio Club staff manned the equipment in a relaying operation through the NTS. The Yakima Club is well underway in the planning for the Washington State Hamfest to be held in July. NW Dir. W7PGY, SCM K7JHA and SEC W7UWT attended the BEARS Dinner Meeting Dec. 20. EC W7ETR had his gang activated on the new AREC frequency, 3930 kc., when the Snohomish area was flooded. New officers of the Tacoma Club are K7CZM, pres.; W7BUN, vice-pres.; K7NKZ, secy.; WA7AKW, treas.; W7AZI and K7CYZ, board members. New appointments: W7AXT and W7JHR as ECs; WA7HKR and WA7DBQ as OPSs. W7PGY attended the planning meeting in N.Y. Dec. 1 and 2. WA7CXD finally got the TH6 beam up. W7UU now is backed up with a linear. W7OEB is fixing up the shack at the new QTH. The Richland Club is starting Novice and Advanced classes. New officers of the club are W7OEB, pres.; WA7FFM, vice-pres.; WA7GCW, secy.; K7PVG, treas.; WA7CBN, trustee. K7MXE reports from Japan and Vietnam and operates KA2NY when in port.

Join "THE TROUBLESHOOTERS"

who get paid top salaries for keeping today's electronic world running

Behind today's microwave towers, pushbutton phones, computers, mobile radios, television equipment, guided missiles, etc., stand THE TROUBLESHOOTERS—the men who inspect, install, and service these modern miracles. Here's how you can join their privileged ranks—without having to quit your job or go to college to get the necessary training.

JUST THINK how much in demand you would be if you could prevent a TV station from going off the air by repairing a transmitter...keep a whole assembly line moving by fixing automated production controls...prevent a bank, an airline, or your government from making serious mistakes by servicing a computer.

Today, whole industries depend on electronics. When breakdowns or emergencies occur, someone has got to move in, take over, keep things running. That calls for a new breed of technicians—The Troubleshooters.

Because they prevent expensive mistakes or delays, they get top pay—and a title to match. At Xerox and Philco, they're called Technical Representatives. At IBM they're Customer Engineers. In radio or TV, they're the Broadcast Engineers.

What do you need to break into the ranks of The Troubleshooters? You might think you need a college degree, but you don't. What you need is know-how—the kind a good TV service technician has—only lots more.

What You Need to Know

As one of The Troubleshooters, you'll have to be ready to tackle a wide variety of electronic problems. You may not be able to dismantle what you're working on—you must be able to take it apart "in your head." You'll have to know enough electronics to understand the engineering specs, read the wiring diagrams, and calculate how the circuits should test at any point.

Learning all this can be much simpler than you think. In fact, you can master it without setting foot in a classroom or giving up your job!

For over 30 years, the Cleveland Institute of Electronics has specialized in teaching electronics at home. We've developed special techniques that make learning easy, even if you've had trouble studying before. Our AUTO-PROGRAMMED™ lessons build your knowledge as easily and solidly as you'd build a brick wall—one brick at a time. And our instruction is personal. Your teacher not only grades your work, he analyzes it to make sure you are thinking correctly. And he returns it the same day received.

Get FCC License or Money Back

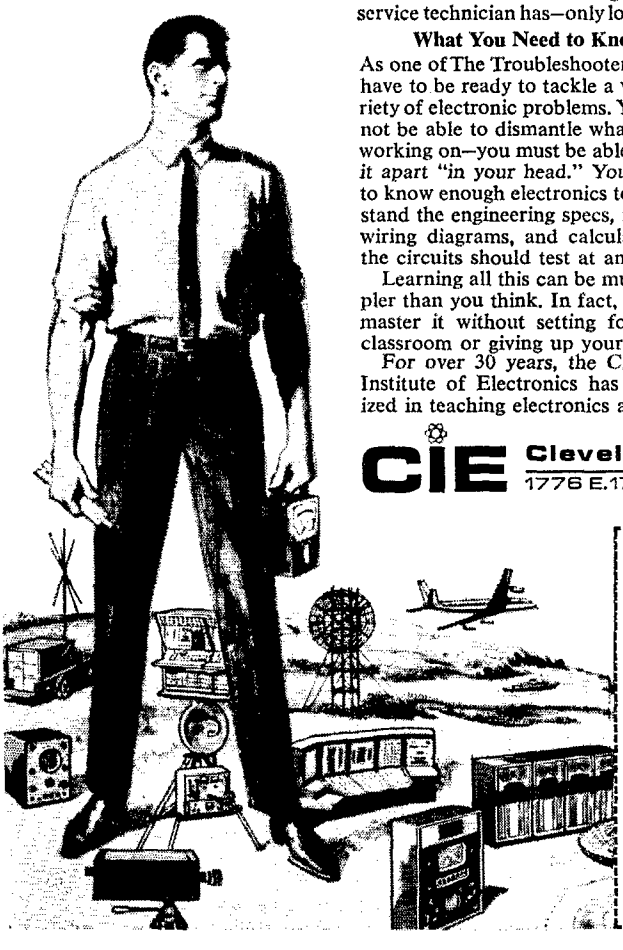
Two-way mobile work and many other types of troubleshooting call for a Government FCC License. Even if your work doesn't require a license, it's a good idea to get one. It will be accepted anywhere as proof of good electronics training.

The licensing exam is so tough that two out of three non-CIE men who take it fail. But 9 out of 10 CIE graduates pass. That's why we can offer this warranty. If you complete one of our license preparation courses, you will be able to get your FCC License—or your money back.

Mail Coupon for 2 Free Books

Want to know more? Mail coupon for our 40-page catalog describing CIE courses and special book on how to get a Government FCC License.

ENROLL UNDER NEW G.I. BILL
All CIE courses are available under the new G.I. Bill. If you served on active duty since January 31, 1955, or are in service now, check box in coupon for G.I. Bill information.



CIE Cleveland Institute of Electronics
1776 E.17th St., Dept. QT-62, Cleveland, Ohio 44114

Cleveland Institute of Electronics
1776 E.17th St., Cleveland, Ohio 44114
Please send me without cost or obligation:

1. Your 40-page book "How To Succeed In Electronics" describing the job opportunities in electronics today, and how your courses can prepare me for them.
2. Your book on "How To Get A Commercial FCC License."

Name_____ Age____
(Please Print)
Address_____
City_____
State_____ Zip____

☐ **Check here for G.I. Bill information**
Accredited Member National Home Study Council QT-62

K7JRE has an application in the Peace Corps. Secy. WN7GYR reports new officers of the Grays Harbor ARC are W7AVM, pres.; K7AJT, vice-pres.; K7DVE, act. mgr.; W7AVM, WA7BLW and W7HF, trustees. Traffic: WA7DXI 1662, W7DZX 1420, W7HMA 1407, W7BA 1014, W7ZIW 946, W7KZ 732, K7PXA 634, K7KPA 568, W7PI 552, WA7DZL 436, K7CTP 316, W7BTB 283, K7JHA 274, W7AXT 272, W7JEY 251, WA7BZY 150, WA7BTZ 136, W7AIA/7 110, K7VNB 96, W7APS 94, WA7EDQ 80, W7MCW 72, W7IEU 62, K7TCY 61, K7THG 55, W7OEB 39, W7UU 32, W7BUN 30, K7SUX 30, WA7HKR 29, WA7CXD 26, W7GYF 25, WA7HSJ 23, W7AIB 20, K7MGA 20, WA7DBQ 19, W7RXH 13, K7EFB 11, WA7DMF 8, W7PGY 8, W7SYE 8.

PACIFIC DIVISION

EAST BAY—SCM, Richard Wilson, K6LRN—Appointments as of Jan. 1 are: WB6PCQ, W6TYM, W6YKS, WB6FHH, W6UZX as ORSs; WA6RRH as OVS and V.H.F. PAM; W6LGW, W6UB, WA6UFW and WA6RRH as OBSs; W6EY, W6CBF, W6OJW, K6LRN, W6JKY and WA6AGA as OOs. To keep your appointment current you must send in monthly reports. WB6PCQ made the BPL again. Bill Sr., WB6OKQ, and son Bill Jr., WB6OKR, are recovering from an accident involving their 60-ft. crank-up tower. Bill, Sr., suffered torn shoulder muscles and a badly bruised hand and Bill Jr., received a broken finger, some severe cuts and badly bruised toes while climbing the tower to remove a coaxial cable. The Northern Calif. Amateur Radio Association's officers for 1968 are WA6TNL, pres.; WB6CUL, vice-pres.; WB6CUM, secy.-treas.; and WB6PUE, operations officer. NORCAL's repeater call is WB6QEO with n.b.f.m. input at 51.2 and output at 51. W6OJW is active with OO work and has snagged 17 new phone countries in two months. W6UXZ turned over the asst. managership in charge of NCN/2 to WA6LFA so he can spend more time with his son, who is returning from overseas. K6JZR and XYL WA6DOO spent the holidays in Arizona. Traffic: WB6PCQ 866, W6TYM 270, K6LRN 198, W6UZX 197.

HAWAII—SCM, Lee R. Wical, KH6BZF—SEC: KH6GHZ. PAM: KH6EEM. RM: KH6GGR. RACES Nets (40, 10, 6 and 2) coordinate with KH6GG.

Net	*Freq.*	*Time (GMT)*	*Days*
League Appointees	7.290 Mc.	0700Z	Wed.
Friendly Net	7.290 Mc.	2030Z	M-F
Pacific Interisland	14.330 Mc.	0830Z	All

I'm sad to report that KH6ATS has joined the Silent Keys. Bill, formerly of Waikapu, was Hawaii's PAM for several years. K3JJG passed through town visiting the Honolulu ARC prior to heading for Indonesia for several years with the Peace Corps. KH6CU passed the Extra Class exam. Ditto for KH6EEM as well as the Advanced Class. A solar flare which occurred on Dec. 30 yielded an exceptional 6-meter opening Jan. 1. KH6NS and KH6EEM worked California, Nevada, Arizona and Texas. Then on Jan. 2 and 3, 1968 KH6NS was able to work Oregon, Washington, Idaho, California, New Mexico, Texas, Florida and Costa Rica. Later KH6EEM, Hawaii's OVS and V.H.F. PAM, worked KH6CH, Wake Island, which is a first on 50 Mc. WA2JWV, who was out here in the Islands during the holidays, writes, "Thanks from WA2JWV to KH6BVS, Larry, and all the other KH6 fellas who helped to make my stay in our 50th state so enjoyable." Earl extends his Hawaiian hospitality to anyone visiting Buffalo, N. Y. I'd like to hear from all of you interested in a League appointment. Traffic: (Dec.) KH6GHZ 858, KH6BZF 139, (Nov.) KH6GHZ 773.

NEVADA—SCM, Leonard M. Norman, W7PBV—SEC: WA7BEU. The Nevada Amateur Radio Association is conducting free courses on c.w. and theory leading to an amateur license. WA7BEU, W7PBV and W7PRM have put the finishing touches on the "SAROC" Convention. The Southern Nevada 2-Meter f.m. group has its repeater W7DDB, input 146.94, output 147.5, operational with 50 members on the roster. WN7GXK has an NC-300 to pull the DX in. Nevada governor Paul Laxalt proclaimed the first week of 1968 as Amateur Radio Week in Nevada. K7ZOK and K7RKH are building new HB v.h.f./u.h.f. gear. WA7DUF and WA7DUG are active on the Novice band. WA7BEU has a new beam for 20 and 40 meters. W7KOI reports not much activity in the Elko area. The "SAROC" Convention dates are Jan. 8-12, 1969, at the Hotel Sahara's new Convention Center, Las Vegas, Nev. Traffic: WA7BEU 4, W7PBV 3, W7PRM 1.

SACRAMENTO VALLEY—SCM, John F. Minke, III, WA6JDT—RM: W6LNZ. ECs: WB6MXD, K6RHW, W6SMU, WB6RSY, WA6TQJ.

Net	*Freq.*	*Time*	*Days*	*Mgr. or NCS*
NCN	3630	0300Z	Daily	WB6HVA

Coming to your dealer soon.

Introducing

The Hammarlund HQ-215

The solid state receiver for those who want to be one-up.

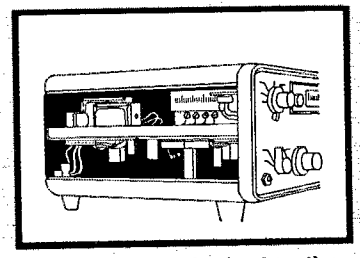
The Hammarlund HQ-215 brings to amateur radio a fully transistorized receiver offering a new high in sensitivity, selectivity and drift-free operation. Revolutionary unitized I-beam construction coupled with modularized design provides an unusually high degree of electrical and mechanical stability. A unique carousel dial with 22" of frequency calibrations means easy reading and resetability to within 100 cycles. And heat free operation gives you long set life at peak operating condition. Here are the facts:

FREQUENCY COVERAGE: Complete ham band coverage, 80-15 meters; 28.5—28.7 mcs on 10 meters. Provision for 13 optional crystals providing 200 kc segments from 3.4—30.2 mcs built in.

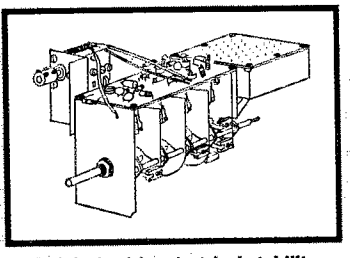
TRANSCEIVE OPERATION: Provided.

FREQUENCY READOUT: Visual dial accuracy is ±100 cycles on all bands.

FREQUENCY STABILITY: Less than 100 cycles per hour.



I-beam construction for strength



Modularized for electrical stability

TRANSISTORS: 26 transistors, 13 diodes and 2 Zener regulator diodes.

SELECTABLE FILTERS: 2.1 kc mechanical filter supplied. Plug-in space for two optional filters. Any filter may be switch-selected from front panel.

MODE: Selectable USB, LSB, CW, OR AM.

SERVICE: SSB, CW, AM, and RTTY.

SENSITIVITY: Better than 0.5 microvolt for 10db signal-to-noise ratio.

SELECTIVITY: SSB-2.1 kc mechanical filter, 2:1 shape factor.

DIMENSIONS: Size: 6.8" H x 15.8" W x 14" D.

WEIGHT: 21 lbs.

CAREER OPPORTUNITY

Exciting things are happening at Hammarlund. We need electronic engineers qualified in RF, SSB, and FM engineering. Enjoy mountain vacation land living. Send resume to Director of Personnel.

Established 1910

HAMMARLUND

MANUFACTURING COMPANY

73-88 HAMMARLUND DRIVE, MARS HILL, NORTH CAROLINA 28754

A GIANNINI SCIENTIFIC COMPANY

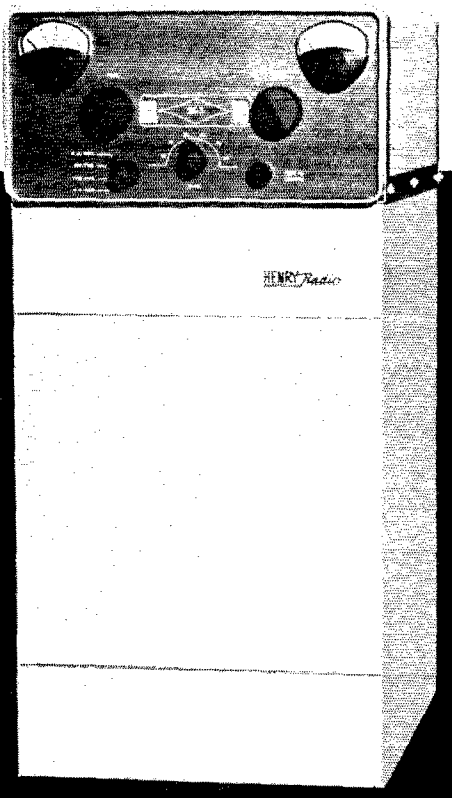
NCN/2 (Slo-speed)	3630	0430Z	Daily	WB6HVA
Yolo Co CD	146.94	0300Z	Tue.	WA6TQJ
SCEN	146.25	0500Z	Wed.	K6IKV
Nevada Co1	145.80	0300Z	Wed1	W6ZUZ

New officers of the RAMS are W6QHP, pres.; WB6FHO, vice-pres.; WB6PHQ, secy.; WB6KZN, treas. W6VUZ installed a 700-ft. long-wire for 40 and 80 meters up at Los Molinos. W6DOR reports openings on 6 meters with working a KH6 and a VE2. WB6VBB has installed a home-brew 20-meter four-element quad up 100 feet. The site of the new governor's mansion borders WA6JDT's QTH. The skiing season has kept WA6FWU busy operating the ski lift at Soda Springs and off the air. WB6RSY, EC for Shasta Co., reports the addition of WB6WDI to AREC; this makes 2 members to Jim's staff. How about you Redding area amateurs giving WB6RSY some support? WA6JDT hopes to have enough DX for DXCC after this year's ARRL DX Test. Let's hear some SV activity in the March portion and send in your logs no later than Apr. 22. If you participated, please send in your logs. Traffic: (Dec.) W6LNZ 147, WB6MAE 74, K6YZU 28, WA6TQJ 13, W6NKR 9, W6VUZ 2, WA6JDT 1. (Nov.) WB6RSY 36.

SAN FRANCISCO—SCM, Hugh Cassidy, W6AUD—A new OVS in San Francisco is WB6WMB. A new General in Marin is WB6VOA, in Corte Madera. The Marin Radio Club is updating the roster of amateurs in the county. W6HSA, W6AVX and W6GQA were active in the Dec. Bell System Telephone Pioneers test. WB6AIS is home after another siege in the hospital. WA6BYZ and W6KVQ made the BPL in Dec. W6EAJ is moving the site of his 160-meter operations to Mendocino. WB6JQP managed to run some traffic while his ship was in port. K6TWJ still is going strong on the Golden Bear Net. W6GQA made an average error of .6 p.p.m. in the Nov. FMT. The San Francisco Radio Club held its Christmas Dinner at the San Remo Restaurant in Dec. The Cathay Club held a revival dinner at the Imperial Palace during Dec. A neighbor trimming a hedge did some "pruning" of W6BIP's Zepp antenna. W6ERS is leading the way to more activity on 160 meters. A station activity report for Oct. was received from K6NCG via the W6 QSL Bureau. WA6PYN has a new Swan for 6-meter activity. Another Marin DXer in the Northern California DX Club is W6ZC. W6PTS and WB6UJO found their photos on the cover of the DXer magazine, *West Coast Big Guns.* Attending the joint No. Calif. and So. Calif. DX meeting at Fresno were W6GPB, WB6UJO, W6PTS, W6ZC and WA6AUD. The San Francisco Radio Club is holding some theory classes at its meetings. K6OJO was at the Las Vegas SAROC in Jan. W6CYO has the confirmations for DXCC. The San Francisco Section Net continues to meet Mon. and Fri. at 1830 local time on 3900 kc. The San Francisco Section *Courier* is starting its fourth year of publication. W6KVQ is EC for the West Coast Amateur Radio Service. Traffic: (Dec.) W6KVQ 644, WA6BYZ 251, W6WLV 121, K6TWJ 49, W6BWV 36, WA6AUD 23, K6TZN 12, W6CYO 4, WB6JQP 2. (Nov.) W6WLV 227. (Oct.) K6NCG 114.

SAN JOAQUIN VALLEY—SCM, Ralph Saroyan, W6JPU—Our congratulations to W6ZRJ on his election as ARRL Pacific Division Director. Now is the time to be thinking of attending the 26th Annual Fresno Amateur Radio Hamfest to be held here the first week end of May, 1968. Any correspondence regarding the Hamfest should be sent to P.O. Box 783, Fresno, Calif. K6QPE is the general chairman, and promises a bigger and better affair than last year. The Central California Single Sideband Assn. held its Annual Christmas Party at the White Horse Inn in Three Rivers with 45 members and wives present. The Fresno Amateur Radio Club held its Annual Christmas Dinner at Cedar Lanes with 40 attending. WB6OSH received the boner award. W7AAF/6 is now located in Tracy. WB6JND has an HW-22A. WA6MLQ found out that his mobile rig won't fit in his new car. W6ADB took the Extra Class exam. WB6ETQ now has an advanced Class license. K6OZL has daily skeds with VU2DIA. W6TBI is on s.s.b. W6PIX is heard on 75 s.s.b. W6UHN is the editor of the Tulare County Amateur Radio Club's new newsletter, *The Grid Leak.* Traffic: (Dec.) WB6HVA 405, W6ADB 354, WA6SCE 287, WB6INO 250, K6KOL 179, W6AAF/6 28, WB6TFU 27, K6OZL 10. (Nov.) WB6INO 256.

SANTA CLARA VALLEY—Acting SCM, Jean A. Gmelin, W6ZRJ—Asst. SCM: Ed. Turner, W6NVO. SEC: W6VZE. RM: W6QMO. W6QMO, our RM for the past several years and a very active supporter of NCN, has been reported to have suffered a heart attack, and we hope is recovering well at the time of this publishing. Jeri has worked very hard and long for amateur radio as well as other service type activities. Our best to her. SEC W6VZE was very busy preparing for the SET and



the 2K-3 ...a true masterpiece

by Henry Radio

The 2K-2 was good . . . in fact, it was the best linear amplifier for the amateur on the market. But now, thanks to a pair of new and improved Eimac 3-500Z tubes, providing 1000 watts of plate dissipation, the 2K-3 operates with even greater power output and less drive. (Its so much better we're going to call it the 2K-3 now.) Still endowed with the same rugged and reliable mechanical construction, inspired design and using only the very best components, the 2K-3 is unquestionably the finest. You have heard the strong clear signals of the 2K-2 by now. Why not go on the air with an even better signal? You can NOW with the new 2K-3. Console or desk model $745.00. Let us send you a descriptive brochure.

6% FINANCE CHARGE • 10% DOWN OR TRADE-IN DOWN • NO FINANCE CHARGE IF PAID IN 90 DAYS • GOOD RECONDITIONED APPARATUS • Nearly all makes & models.

Our reconditioned equipment carries a 15 day trial, 90 day warranty and may be traded back within 90 days for full credit toward the purchase of NEW equipment. Write for bulletin.

TED HENRY (W6UOU) **BOB HENRY** (WØARA) **WALT HENRY** (W6NRV)

Henry Radio Stores

CALL DIRECT . . . USE AREA CODE

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

East Coast Rep.: Howard Laughrey, 2 Elizabeth St., Chappaqua, N.Y. 10514, (914) CE 8-3683

"World's Largest Distributor of Amateur Radio Equipment"

organizing the section EC program. WB6IZF is busy on WCARS and other activities and as EC for King City. W6OII renews as OPS. W6ACW is very active on NCN2 and will take any traffic for Sunnyvale. K6YKG is NCS of NCN Sat. W6MMG reports that the San Carlos CD Club will be taking part in ARPSC activities. OVS W6PBC reports that a strained neck muscle has prevented activities in his station for the past few months but that he will be busy experimenting with v.h.f. soon. K6PJW was busy with plans for the SET. W6YBV is back on NTS after a short period of operation on Navy MARS. ORS WA6LFA assumed the managership of NCN2 as of the first of the year. W6ZRJ, with XYL K6BGM and also with K6KUM, attended the SAROC Convention in Las Vegas. W6DEF reports that the SCARS Annual Christmas Potluck was a great success. W6PLS has applied for a two-letter call now that he has Extra. K6HGV is active on Navy MARS on 2 meters. W6AUC is busy as OO and on several nets. Russ reports that W9MIB was the guest of the OOTC Luncheon Dec. 2 and talked about the old spark days. W6CBX is active as OO and is making fine scores in the FMT. Traffic: (Dec.) W6RSY 1238, W6YBV 432, WA6LFA 164, W6DEF 90, W6VZE 46, W6PLS 44, K6HGV 31, W6ZRJ 31, W6AUC 26, W6OII 20, W6ACW 5. (Nov.) W6VZE 30, WB6IZF 1.

ROANOKE DIVISION

NORTH CAROLINA—SCM, Barnett S. Dodd, W4BNU—Asst. SCM: James O. Pullman, WA4FJM. SEC: WA4LWE. RM: K4CWZ. PAM: W4AJT. V.H.F. PAM: W4HJZ. WB4BGL has a new Finco 6N2 beam up, and also made the BPL. WA4UQC, WA4ZPC and others set up a station at the Mall in Rocky Mount to accept traffic from the public with sons overseas, and originated around 300 messages, for which WA4UQC earned a BPL certificate. WB4EQW has a new 10-meter beam up. K4TTN is sporting a new Swan 350. Officers of the newly-formed Rowan Amateur Radio Society are K4KGR, pres.; K4SNF, vice-pres.; and K4YYJ, secy.-treas. WB4CVM received a new 2-meter rig for Christmas. WB4APN has moved to Charlotte, N.C., from Jacksonville, Fla. WA3FLM will be operating portable /4 from Duke University until June.

Net	*Freq.*	*Time*	*Days*	*Tfc.*	*Mgr.*
THEN	3865 kc.	0030Z	Daily	494	WA4GMC
NCN (E)	3573 kc.	2230Z	Daily	236	W4IRE
NCN (L)	3573 kc.	0300Z	Daily	128	WA4CFN
SSBN	3938 kc.	0030Z	Daily	85	WA4LWE

Traffic: (Dec.) WB4BGL 505, W4LWZ 366, W4EVN 269, WA4UQC 155, W4RWL 153, W4FDV 132, WA4VNV 112, W4ZZC 103, WA4ZLK 72, K4EO 58, K4PKE 50, K4CWZ 43, WB4EQW 33, K4CDZ 28, WA4FJM 28, WA4KWC 24, WA4CFN 22, K4TTN, 14, WA4VTV 14, W4BNU 11, W4AJT 9, WB4CVM 3, K4ZKQ 3. (Nov.) WB4EQW 1.

SOUTH CAROLINA—SCM, Clark M. Hubbard, K4LNJ—SEC: WA4ECJ. Asst. SEC: W4WQM. RM: K4LND. PAM: WA4EFP.

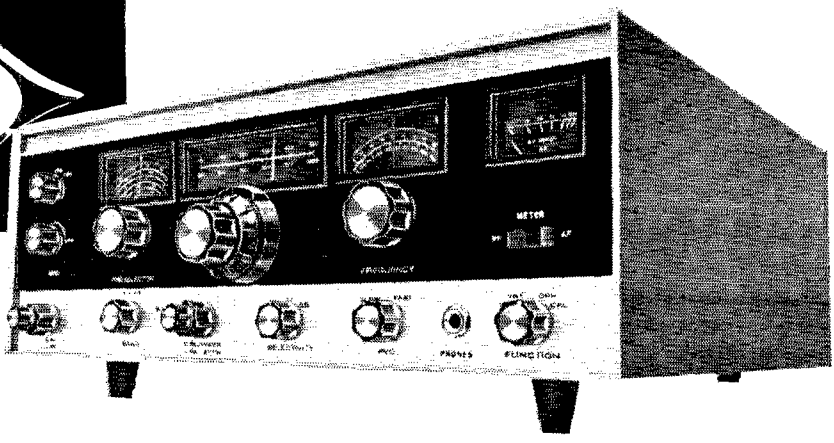
SCN	3795 kc.	Daily	0000Z/0300Z	Dec. Tfc. 131
SCSSBN	3915 kc.	Daily	0000Z	Dec. Tfc. 176

The SC Phone Net meets on 3930 kc. Mon. through Sat. at 1730Z and Sun. at 1330Z and 2030Z. The net has operated continuously since 1934. W4DX and W4AZT are charter members. The nets' first 1968 dinner was held in Orangeburg. WA4ANG was the host and the next one is planned for Apr. The Spartanburg Club had its Annual Christmas Party. NJS is home-brewing. Phil Jones is awaiting his Novice Class ticket. Watch for plans for a section meeting in March. WB4CBJ has been appointed Official VHF Station. Traffic: WB4BZA 201, WA4APD 100, WA4NWI 73, W4WQM 58, K4LNJ 47, W4NTO 40, WA4EFP 33, W4FFH 33, W4AZT 30, K4EIB 26, WB4CBJ 16, W4UMV 13, W4VFO 12, W4JA 11, W4PED 8, WB4BSW 5.

VIRGINIA—SCM, H. J. Hopkins, W4SHJ—SEC: K4LMB. PAM: W4OKN. RMs: WA4EUL, K4MLC. WA4NJG has been appointed EC for Louisa County and W4EFX EC for Orange County. W4EXI operated mobile from 13 counties during the Va. QSO Party; W4SHJ was assistant operator. W4RHA, K4CG, K4TSJ, WB4FDT and WB4GTG made the BPL during Dec., all via originations/deliveries. WA4FCS retired from the Marine Corps at the end of Jan. and plans to remain in the D.C. area. WA4TKB and WB4FDT earned VSBN certificates. WB4GTS/WA2UFI has devised an effective break-in keying system for the SB-401. WB4DOY is taking over the publication chores of the *VA HAM*; WA4EUL continues as editor. Because of the large number of appointments in the section, the SCM has not been able to publish a list of annual endorsements or to notify the individual appointees upon endorsement. All

A NEW Thoroughbred in Solid-State Receivers

NOW—a **Competitively Priced Receiver** for the **most exacting** Professional **Performance!**



Phase-locked Frequency Synthesizer for Maximum Stability!

The superb, new **R-530** *by* **GALAXY**

Designed for the exacting requirements of ***laboratory, broadcast*** and ***HF monitoring*** and ***point-to-point*** complex system ***communications***, the R-530 is an advanced ***solid-state*** communications ***receiver.*** Its unsurpassed performance is the result of over three years of exhaustive research.

It receives selectible Upper and Lower Sideband, CW AM and RTTY signals... provides ***accuracy of 1 KHz*** tuning throughout the 0.5 to 30 MHz frequency spectrum.

Unique front end design and crystal lattice filters insure ***optimum sensitivity and selectivity.*** An adjustable ***noise blanker*** minimizes interference ...background noise. Frequency stability is amazing...less than 100 Hz drift after turn-on!

Complete transistorization and ***modular construction*** provide ***maximum stability.*** Minimum heat generation and power requirements allow the R-530 to be used in field applications now impractical with vacuum tube equipment. The new Galaxy R-530 is compatible with existing systems. ***Beautifully styled,*** compact, weighing only 25 pounds.

(Priced in the $700 range) Write for free brochure and complete specifications.

GALAXY ELECTRONICS

"Pacesetter in Commercial/Amateur Equipment Design"

10 South 34th Street, Dept. QST-f27, Council Bluffs, Iowa 51501

appointments are endorsed automatically at or near their expiration date provided the appointee has submitted reports during the six months prior to expiration. Many appointments are being cancelled for lack of reports, but any such appointment may be reinstated by resumption of activity and reporting. Keep Virginia on the air by frequenting 3935, 3835 or 3680. Traffic: (Dec.) K4TSJ 408, W4NLC 370, W4ZM 289, WB4FDT 282, K4CG 246, W4DVT 227, W4RHA 224, W4SZT 195, WA2UFI/4 140, K4KNP 124, WB4DRB 123, WB4GTG 120, WA4EUL 106, WA4OUS 99, W4BZE 86, WB4DOY 83, W4TE 83, WA4-FCS 71, K4MLC 62, W4OKN 57, K4FSS 52, K4GR 45, K4LMB 43, W4IA 36, W4MUJ 36, W4SHJ 27, WA4TKB 21, W4YZC 20, WA4TCF 17, W4WRM 15, WA4FIJ 12, WA4PBG 12, K4VCY 12, W4KFC 11, K4AET 10, WA4-DAI 8, WB4DQF 8, W4KX 8, W4MK 8, K4YEE 8, W4ZAU 7, W4WG 5, WB4GYV 4, W4OP 4, WB4IBF 2, W4JUJ 2, W4WBC 1. (Nov.) WA4TKB 3. (Oct.) WA4FCS 112.

WEST VIRGINIA—SCM, Donald B. Morris, W8JM—SEC: W8IRN. RMs: W8HZA, K8TPF. PAMs: K8CHW, W8IYD. WA8NDY and his XYL WA8WCK, mobiled to Point Pleasant, furnishing communication at the site of the Bridge disaster. The WVN Phone Net was active with NCSs, WA8YSB and WA3FKB/8 and many state amateurs assisting. New officers of the West Virginia State Radio Convention are K8MYU, pres.; WA8YSB, vice-pres.; WA8OKG, secy.; W8SSA, treas. The Convention will be held at Jackson's Mill June 29 and 30. K8MQB keeps in touch with her sister in Pennsylvania by amateur radio each Tue. morning. K8NNF, K8NYH and W8YOI are active in the "Thumpin Keger" Net on 3927 kc. K8CHW becomes WACWV Member No. 47. W8-IRN reports new ECs are WA8LFW, Pocahontas; WA8-WIX, Nicholas and Webster; K8VNF, Kanawha County. Renewing as EC are W8AVW, WA8SHT, WA8RQB, WA8-FCZ, K8MDI, WA8HPE, WA8FIE, K8ZPR, K8CFT. WVN Phone Net reports 31 sessions, 938 stations and 247 messages. The C.W. Net held 28 sessions and handled 143 messages. WA8TWR is a new ORS. K8MYU is the new West Va. c.w. net manager. Monogalia Wireless Assn., Morgantown, officers are K8LGS/8, pres.; WA8YSB, vice-pres.; WA8TGH, secy.-treas.; WN8YCD, historian. Traffic: WA8POS 297, WA8RQB 147, W8HZA 95, WA8-YSB 85, K8BIT 71, W8CKX 67, K8MYU 59, WA8TWR 59, K8MQB 40, W8JM 27, W8IRN 14, W8WEJ 13, K8PRC 12, WA8NDY 10, K8CHW 9, W8GUL 7, W8IYD 6, W8CZT 5, WA8LAL 4, W8AEN 3, WA8PXF 3, WA8UFX 3, WA8UIH 3, W8UPH 3, WN8YCD 3, W8CUL 2, WA8-KQX 2, K8QYG 2, WA8TOS/8 2, W8VOI 2, K8VQG 2, K8ZDY 2, WA3FKB/8 1, K8CFT 1, WA8CRW 1, W8EEO 1, WA8FGD 1, WA8FZS 1, WA8HPE 1, WA8IPN 1, WA8LFW 1, W8QEC 1, K8QQS 1.

ROCKY MOUNTAIN DIVISION

COLORADO—SCM, Richard Hoppe, KØFDH—Asst. SCM: Albert E. Hankinson, WAØNQL. SEC: WØSIN. PAM: WØCXW. The holiday season was reflected in increased activity of all our sectional nets with CCN taking top honors with a QTC of 172 and a QNI of 175. The High Noon Net handled slightly less traffic but had 712 check-ins. The monthly report from the Columbine Net was not received in time for recognition here. Our section recently gained new amateur membership, both from the ranks of new Novices and from transfers into Colorado. I hope that all of you newcomers will enjoy your amateur activities in Colorado and your participation in our sectional nets is greatly encouraged. It is with deep regret that we note the passing of WØQD, of Ouray, Colo. Living in a small town in the mountainous part of southwestern Colorado, Harold provided valuable communications to tourists and was active in our sectional nets. WØQD will be missed greatly by all of us. Any of you wishing to assume extra work and responsibilities? We need volunteers as net managers of our Evergreen and Colorado Emergency Phone Nets. Traffic: WØIES 802, WØKAU 205, WØUAT 172, WØLRN 164, WØSIN 98, WAØPGM 45, WA7FXD/Ø 29, KØECR 21, WAØJTB 8.

NEW MEXICO—SCM, Kenneth D. Mills, W5WZK—SEC: K5KTQ. W5NSN operated his station in Oklahoma with the call W5GGL while on vacation there. WA5RBU made a pre-Christmas trip to New Jersey. W5UBW spent the holidays in Florida. New Mexico had a white Christmas for the first time in many years. WA5JAM reports that the situation in Grants was not as bad as news reports said. Roads were closed in that area for two days. WA5JNC has been appointed as OBS. WA5PNY's appointment for OPS has been renewed. W5BWV has a new 20-10 Hy-Gain vertical up. Traffic: W5NON 25, W5DMG 17, W5NUI 13, WA5BLI 12, W5-MYM 10, W5PNY 8, WA5JNC 7, W5BWV 4, WA5MIY 4.

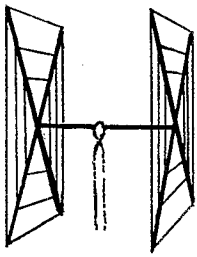
UTAH—SCM, Gerald F. Warner, W7VSS—SEC: W7-WKF. RM: W7OCX. Traffic nets:

GOTHAM'S AMAZING ANTENNA BREAKTHRU!!

How did Gotham drastically cut antenna prices? Mass purchases, mass production, product specialization, and 15 years of antenna manufacturing experience. The result: The kind of antennas you want, at the right price! In QST since '53.

QUADS

Worked 42 countries in two weeks with my Gotham Quad and only 75 watts . . . W3AZR



CUBICAL QUAD ANTENNAS — these two element beams have a full wavelength driven element and a reflector; the gain is equal to that of a three element beam and the directivity appears to us to be exceptional! ALL METAL (except the insulators) — absolutely no bamboo. Complete with boom, aluminum alloy spreaders; sturdy, universal-type beam mount; uses single 52 ohm coaxial feed; no stubs or matching devices needed; full instruction for the simple one-man assembly and installation are included; this is a foolproof beam that always works with exceptional results. The cubical quad is the antenna used by the DX champs, and it will do a wonderful job for you!

10/15/20 CUBICAL QUAD SPECIFICATIONS

Elements: A full wavelength driven element and reflector for each band.

Frequencies: 14-14.4 Mc.; 21-21.45 Mc., 28-29.7 Mc.

Dimensions: About 16′ square.

Power Rating: 5 KW.

Operation Mode: All.

SWR: 1.05:1 at resonance.

Boom: 10′ × 1¼″ OD, 18 gauge steel, double plated, gold color.

Beam Mount: Square aluminum alloy plate, with four steel U-bolt assemblies. Will support 100 lbs.; universal polarization.

Radiating elements: Steel wire, tempered and plated, .064″ diameter.

X Frameworks: Two 12′ × 1″ OD aluminum 'hi-strength' alloy tubing, with telescoping ⅞″ OD tubing and dowel insulator. Plated hose clamps on telescoping sections.

Radiator Terminals: Cinch-Jones two-terminal fittings.

Feedline: (not furnished) Single 52 ohm coaxial cable.

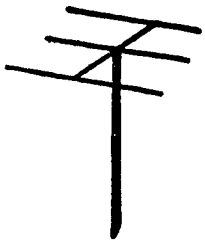
Now check these startling prices — note that they are *much lower* than even the bamboo-type:

10-15-20 CUBICAL QUAD	$35.00
10-15 CUBICAL QUAD	30.00
15-20 CUBICAL QUAD	32.00
TWENTY METER CUBICAL QUAD	25.00
FIFTEEN METER CUBICAL QUAD	24.00
TEN METER CUBICAL QUAD	23.00

(all use single coax feedline)

BEAMS

The first morning I put up my 3 element Gotham beam (20 ft) I worked YO4CT, ON5LW, SP9ADQ, and 4U1ITU. THAT ANTENNA WORKS! WN4DYN



Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history! Each beam is brand new! full size (36′ of tubing for *each* 20 meter element, for instance); absolutely complete including a boom and all hardware; uses a single 52 or 72 ohm coaxial feedline; the SWR is 1:1; easily handles 5 KW; ⅞″ and 1″ aluminum alloy tubing is employed for maximum strength and low wind loading; all beams are adjustable to any frequency in the band.

2 El 20	$16	4 El 10	$18
3 El 20	22*	7 El 10	32*
4 El 20	32*	4 El 6	15
2 El 15	12	8 El 6	28*
3 El 15	16	12 El 2	25*
4 El 15	25*		
5 El 15	28*		

*20′ 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, W1WOZ, W2ODH, WA3DJT, WB2FCB, W2YHH, VE3FOB, WA8CZE, K1SYB, K2RDJ, K1MVV, K8HGY, K3UTL, 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, XE2I, KP4AQL, 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

How to order: Send check or money order. We ship immediately upon receipt of order by railway express, shipping charges collect.

GOTHAM, 1805 Purdy Ave, Miami Beach, Fla. 33139

BUN	Daily	7272 kc.	1930Z
UARN	Sat.-Sun.	3987.5 kc.	1500Z

The new officers of the Utah ARC are W7QWH, pres.; K7JLF, vice-pres.; WN7HGT, exec. vice-pres.; K7SOT, secy. Officers of the Ogden ARC are WA7IAW, pres.; W7JIE, vice-pres.; WN7IGN, secy.; K7NJY and W7WQC, directors. New appointee: K7ZJS as OO. W7OCX earned a BPL certificate for Dec. traffic. John also sports a new SW-500. The Utah ARC is formulating a State of Utah Counties Award. The award is to be made to those who have proof of QSO with 20 of Utah's 29 counties. Further details may be obtained from any Utah ARC officers. WA7IAW has new 1215-Mc. gear on the air. Nominations soon will be open for SCM. All clubs and groups are urged to send in valid nominating petitions. Traffic: W7OCX 316, WA7BME 169, K7RAJ 138, K7-CLS 83, K7SOT 25, K7ERR 11.

WYOMING—SCM, Wayne F. Moore, W7CQL—SEC: K7NQX. RM: WA7CLF. PAMs: W7TZK, K7SLM. OBSs: K7SLM, K7NQX. Nets: Pony Express, Sun. at 0800 on 3920; Yo, daily at 1830 on 3610; Jackalope, Mon. through Sat. at 1215 on 3920; Wx Net, 0630 Mon. through Sat. on 3920. WA7DNZ is a new Amateur Extra. W7HTL has been transferred to Vancouver, Wash. K7KMQ has moved to Loveland, Colo. K7SDD and WA7EGK have their Advanced Class licenses. WA7BFV got a new transceiver for Christmas. 1968 Casper Club officers: WA7CLF, pres.; K7SLM, vice-pres.; WA7DNZ, secy.; W7NNX, treas.; W7BXS, act. mgr.; WA7BFV, trustee. Some new calls: WA7IXI, WA7GWK, WN7IRK, WN7IRL, WN7IRB. Tentative plans are being made for the Rocky Mountain Division ARRL Convention June 29-30 at Cheyenne. Traffic: K7NQX 579, WA7CLF 410, K7KSA 175, W7TZK 65, WA7EUX 62, K7ITH 55, K7SLM 38, WA7BPO 29, W7-HLA 24, K7VWA 23, K7HHW 21, WA7BFV 14, W7BXS 12, WA7EGK 11, W7NKR 10, WA7HAB 4, W7BKI 2, K7BTE 2, K7JED 2, K7OVD 2, K7RFL 2.

SOUTHEASTERN DIVISION

ALABAMA—SCM, Edward L. Stone, K4WHW—SEC: W4FPI. PAM: WA4EEC. RM: WA4EXA. W4WGI reports that the Huntsville Repeater Assn. is progressing with the equipment being readied and looks like we will soon have a repeater on 146 Mc. with the transmitter high atop Monte Sano Mountain. Glad to have WA4-AVM back as ORS. WA4VEK made the BPL for the fourth straight month. New ORSs: W4SVM, WB4ADT, WA4FAT, K4BQP and W4MKU. WB4EKJ has been appointed Asst. Mgr. of AEND. The outstanding work during the recent tornadoes in Florida and Alabama was greatly appreciated and many fine letters have been received. W4FPI and K4TNS liaisoned AENM with the West Fla. Net into Ft. Walton. WA4ZFA put in many hours handling welfare traffic from the Huntsville area.

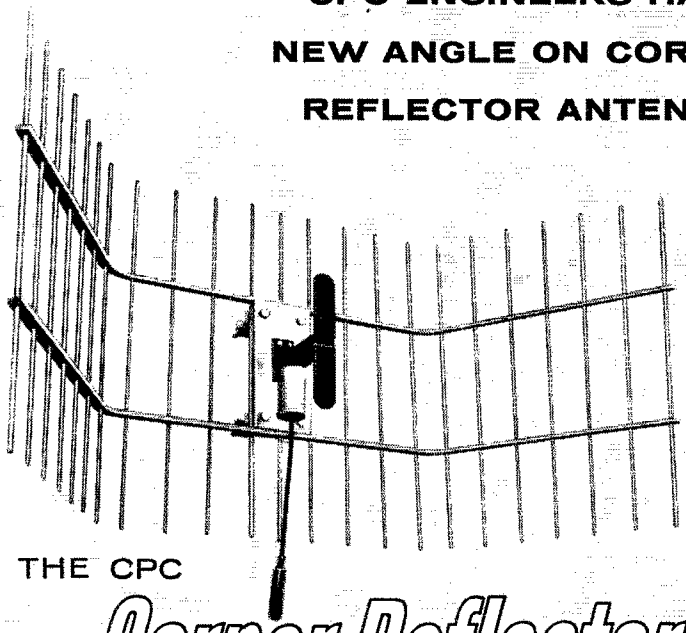
ALA. AM Net	3955	0000 GMT	Daily	40 Tfc.
AENB	3575	0100-0400	Daily	193 Tfc.
AEND	3525	2330	Daily	86 Tfc.
AENH	50.7	0200	S-T	16 Tfc.
AENM	3965	0030	Daily	559 Tfc.
AENO	50.54	0115	T-T-S	15 Tfc.
AENP	3955	1230	Daily	80 Tfc.
AENR	50.52	0115	W-F	5 Tfc.
AENS	50.35	0030	W	5 Tfc.

Traffic: (Dec.) WA4AVM 267, K4AOZ 165, WA4UXC 145, W4FPI 141, WA4EEC 139, WA4FYO 134, WB4DIN 126, WA4VEK 118, K4WHW 95, W4SVM 91, WA4GGD 79, WB4EYZ 77, K4BSK 66, WB4ENX 44, WB4EKK 39, WB4ADT 35, WA4FAT 34, WB4EKJ 33, WA4PIZ 33, W4MKU 26, W4UDJ 24, WA5KXL/4 22, K4KJD 21, K4-NUW 21, WA4WTX 14, WA4ROP 12, K4WOP 12, WA4-AZC 10, K4UUC 10, W4DGH 8, W4NLI 8, K4NJY 6, K4KMG 4, WB4ALW 3, WA4VKT 2. (Nov.): WA4UXC 102, WB4BLX 40, K4KMG 24.

CANAL ZONE—SCM, Russell E. Oberholtzer, KZ5OB —The CZAREC held a practice drill on Jan. 6 with 34 stations participating on 2, 6, 10 and 40 meters. The 1968 officers for the CZARA are KZ5SS, pres.; KZ5EH, vice-pres.; KZ5FK, secy.; KZ5WI, treas.; KZ5MA, act. mgr. New officers of the CARC are KZ5AD, pres.; KZ5-WR, vice-pres.; KZ5FN, secy.-treas.; KZ5LM, act. mgr. WA4VYF, of Bradenton, Fla., visited with son-in-law KZ5BF and family for the holiday season. KZ5FX is out of the hospital and recuperating at home after being hospitalized. Lil (ex-KZ5TT) also is recuperating at home after her automobile accident in Houston. I would like to thank the membership for their confidence in me and hope to fulfill my duties to the best of my ability as Canal Zone SCM during the next 2 years. Traffic: KZ5AD 66, KZ5OA 60, KZ5OB 18, KZ5WR 15, KZ5FX 9.

EASTERN FLORIDA—SCM, Jesse H. Morris, W4-MVB—SEC: W4IYT. Asst. SEC: W4FP. RM C.W.:

CPC ENGINEERS HAD A NEW ANGLE ON CORNER REFLECTOR ANTENNAS



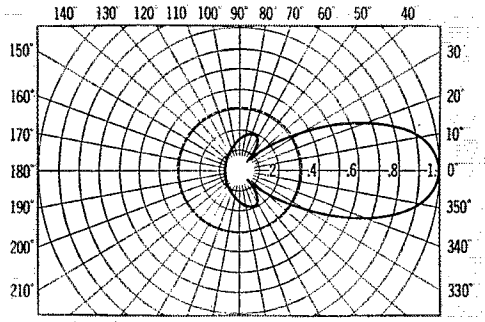
Combining maximum strength with optimum electrical performance, this 10.0 db gain antenna meets the increasing demand for rugged durability at minimum weight. Cat. No. 465-509, has a reflector 55 in. by 29 in., yet weighs only 20 lbs. Its rated wind velocity is 150 mph. The radiating element material is brass, reflector screen components are of high strength aluminum alloys, and mounting accessories are fabricated of hot galvanized steel. This CPC Corner Reflector Antenna is ideally suited for use in multiple corner arrays.

THE CPC

Corner Reflector Antenna

Cat. No. 465-509

Frequency Range 406-470 Mc



Horizontal field strength pattern; a dipole pattern is shown for reference.

Note: dbd gain indicated as per EIA RS-329

Electrical Specifications

NOMINAL INPUT IMPEDANCE	50 ohms
FORWARD GAIN	10.0 db at 450 Mc
FRONT-TO-BACK RATIO	25.0 db
MAXIMUM POWER INPUT	250 watts
TERMINATION	Type N Female with metal weather shield and Type N Male with Neoprene housing
VSWR	1.5:1
BANDWIDTH	406-470 Mc
LIGHTNING PROTECTION	Direct Ground

Mechanical Specifications

REFLECTOR	55" wide by 29" high
REFLECTOR MATERIAL	6061-T6 aluminum
RADIATING ELEMENT MATERIAL	Brass
RADIATING ELEMENT SIZE	13-1/4" long by 2" wide
RATED WIND VELOCITY	in excess of 150 MPH with no ice 85 MPH with 1/2" radial ice
LATERAL THRUST AT RATED WIND	164 lbs. no ice 180 lbs. with rated ice load
WEIGHT	20 lbs.

Communication Products Company
DIVISION OF
PHELPS DODGE ELECTRONIC PRODUCTS CORPORATION
Marlboro, New Jersey 07746 — Tel. (201) 462-1880
Los Angeles, California 90065 — Tel. (213) 245-1143

W4ILE. RM RTTY: W4RWM. PAM 75 M: W4OGX. PAM 40 M: W4SDR. V.H.F. PAM: WA4BMC. The Florida RTTY Society has just completed its annual meeting in Daytona Beach. Reelected pres. was W4ZAG. W4IMZ was elected vice-pres. and W4RWM was reelected secy.-treas. President's awards went to W4RWM and K4TMF for outstanding contributions to the society during the past year. Christmas brought a lot of new equipment. WN4FLW reports receiving a new Drake R-4A-T-4X. W4ILE has a new Hunter Bandit 2000C. WA4UFO has a new SR-2000. WB4AJV has a new SB-101. Thanks to the efforts to WA4NBE and W4CNA, many junior operators got to talk directly to Santa Claus on 3940 kc. This annual event is always a favorite with the kids. One of our outstanding Florida OOs. K4IEX, reports he is on s.s.b. now. WA4PWF, WA4TWD and WB4ANA operated WA4PWF/4 from a shopping center during the holidays and made the BPL. WA4NBE is the new manager for the FAST Net. We are looking forward to a big year in Eastern Florida in 1968. Good luck de W4MVB. Traffic: (Dec.) WA4SCK 1147, K4YSN 798, WA4NEV 508, W4FPC 465, WB4AIW 440, WA4NBE 434, WA4FGH 368, K4LEC 361, WA4IZZ 248, W4SMK 216, WB4EPD 194, W4ILE 194, WA4PWF 179, WB4DSP 170, WA4TWD 154, W4SDR 128, WN4HQX 102, W4TRS 90, WA4IJH 86, WA4HDH 85, W4FP 80, K4COO 74, W4LAD 73, WA4OHO 72, K4DAX 70, WA4JWV 67, W4YPX 65, K4SJH 59, W4SME 57, W4KHY 49, W4NGR 47, W4AKB 46, W4DVO 45, W4KRC 45, W4OGX 43, WA4CIQ 33, K4LPS 30, W4ZAK 29, WA4FJA 25, W4VWL 23, K4BLM 20, WA4BGW 19, WA4UFO 18, WN4FSF 16, K4IEX 16, W4GDK 15, W4PBK 15, W4TJM 13, W4CBE 12, W4GUJ 12, W4BKC 11, WA4MOL 11, K4DSN 10, K4EBE 7, WN4FLW 6, WA4YRU 6, W4LEP 4. (Nov.) W4EHW 63, W4MVB 62, WA4IJH 61, K4HQK 24, WA4UFO 14, W4VWL 14, K4DSN 9.

GEORGIA—SCM, Howard L. Schonher, W4RZL—Asst. SCM: James W. Parker, Sr., W4KGP. SEC: W4DDY. RM: W4CZN. PAMs: K4PKK, WA4WQU. WB4HSG reports high noise level on 6 during Dec. WB4FMJ indicates good ground wave on 6 for the month as well as evening openings to 1-2-3-5-8-Ø. The Dixie 6-Meter S.S.B. Net meets Sun. and Wed. at 2100 EST on 50.110. All southeastern 6-meter stations are urged to participate. W4PGU is on with a 2er. The Augusta Radio Club bulletin arrived with interesting observations from new pres., WA4WQU. K4HQI reports a 6-meter opening on Dec. 4 to N.Y., Penna., Ohio and Mich. starting around 1900 EST to 2030 when the band started to fade. The 13th and 16th also produced good signals into La., Tex., Okla., Kan., Mo. and Nebr.

Net	*Freq.*	*Days*	*Sess.*	*QNI*	*QTC*
GSN	3595	0000/0300 Dy.	62	624	281
GSSB	3975	2000 Dy.	31	972	209
GTN	3718	Dy.	19	106	30

W4GXU is now Extra Class. K4RZB is on 2. WB4FMJ has a new 65-ft. tower. WA4ARS was married. K4TQU added a v.f.o. to the SR-42. W4HYW is attending U.S. Adj. Gen. school. W4LRR is studying for Extra Class. K4HQI added a 15-w.p.m. sticker. Traffic: (Dec.) W4FOE 592, W4CZN 190, W4DDY 81, W4PIM 78, K4AHO 68, K4BAI 55, WB4EMF 50, W4GXU 50, WA4LLI 50, WA4RAV 49, WA4JES 43, W4ARH 28, W4RZL 23, WA4GAY 22, W4PGU 10, WB4HSG 2. (Nov.) W4FOE 358, W4FDN 44, WA4JES 29, WB4EMF 17, W4GXU 1.

WEST INDIES—SCM, Albert R. Crumley, Jr., KP4DV—KP4CB/AE6CB (Army MARS) retired from ITT and is making hamming a fulltime occupation. KP4JM is pres. of the PRARC and advises club dues are now $12.00 yearly. KP4AT and KP4CH regularly assist KP4CB in teaching a radio class with 19 would-be hams as students. KP4CK/CL, Felix and Alicia, devote most of their spare time to rare DXing. KP4BBN is heard regularly on 20-15 c.w. with 1KW. KP4BJD is returning to the U. of Mich., while KP4BJU continues studies at Georgia Tech. KP4BJU and father, KP4DV, had an "eyeball QSO" with HP1IE/W6GTO at Mayaguez Dec. 31. Ricky, 13-year old brother of KP4BJD, is now WP4DCL operating 15 meters with an EICO 60. All Puerto Rico and Virgin Islands amateurs should report their activities to me by the 3rd of each month for inclusion in this column. Activity amongst the KV4s appears to be in the process of revival, according to KV4AA. Traffic: KP4CB 172, KP4WT 166.

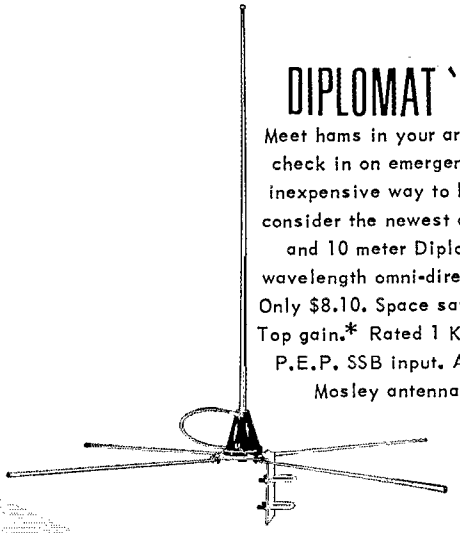
WESTERN FLORIDA—SCM, Frank M. Butler, Jr., W4RKH—SEC: W4IKB. PAM: WA4ZGI. RM: W4BVE. Section nets:

Net	*Freq.*	*Time*	*Days*
WFPN	3957 kc.	2300Z	Daily
QFN	3651 kc.	2330/0300Z	"

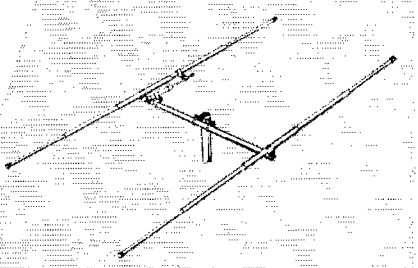
Whats **NEW** from Mosley!

DIPLOMAT '2'

Meet hams in your area on 2 meters . . . check in on emergency nets! For an inexpensive way to keep in touch, consider the newest addition to the 6 and 10 meter Diplomat family of 5/8 wavelength omni-directional antennas. Only $8.10. Space saving. Lightweight. Top gain.* Rated 1 KW AM/CW, 2 KW P.E.P. SSB input. Another Quality Mosley antenna!



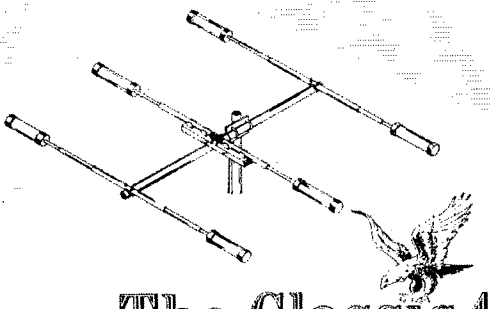
X-15



Own a Quality Mosley 15 meter beam, yet build it yourself - - just like in magazine projects. Drill your own holes and assemble according to concise instructions given. All parts included (minus coax). Gamma matched. Outstanding gain.* Full power rated. By readjusting elements according to instructions supplied, Generals may use this beam on 10 meters.

LANCER 1000

Hams are working lots of DX with this 5-band mobile antenna! Full power rated. Use on 10 meters without coil. Interchangeable coils for other bands. Adjustable upper whip section for peaking antenna to desired frequency. Coils with whip tip pre-cut and set for each band, available (extra). Hinged break over.



The Classic 10-15

The 10 and 15 meter bands are hot again! Command your share of DX on these popular bands with this Classic New Trap-Master beam. Full power rated. Broad Band Capacitive Matching. Incorporates performance proven Mosley metal encased traps. Tops in DX punch . . . gain!*

Gain omitted due to requirements of certain publications. For full details, send for FREE '67 catalog. Dept. 140

MOSLEY ELECTRONICS, INC.

4610 N. LINDBERGH BLVD., BRIDGETON, MO. 63042

Pensacola: OO K4DOT does well in the FMTs. WA4EPH is boning up for Extra Class and First Phone. WA4IZM is fighting ignition noise in the mobile rig. K4NMZ gave his Marauder a smoke test, and it flunked! Milton: K4HOX is now EC for Santa Rosa County. Fort Walton: Local hams got the jump on the National SET when a severe tornado struck Dec. 10. The 2-meter nets (a.m. and f.m.) were given a good workout; several hundred messages and inquiries from all over the country were handled. WA4THJ's home was totally destroyed. W4MMW relinquished the EC job to WB4EER because of Red Cross duties. Panama City: New Tyndall Club officers are WA4VIY, pres.; WA4QKZ and W4FOX. W4FOX has facsimile setup to copy weather satellite photos. Chipley: K4SGY is working on his Master's degree at the U. of Fla. W4IKB and WB4FLK built a portable 40-meter antenna for WN4HMD to use while at school, Tallahassee: WA4EAO is Jefferson County EC. W4MLE has a tri-band quad up. Traffic: W4BYE 376, K4BSS/4 358, WA4IMC 267, W4RKH 205, WB4GYX 159, W4IKB 122, WA4JTM 50, WB4DHZ 21, WA4EOQ 15, WB4FLK 10, WA4EPH 2, WA4GHE 2. (Nov.) WB4DHZ 17.

SOUTHWESTERN DIVISION

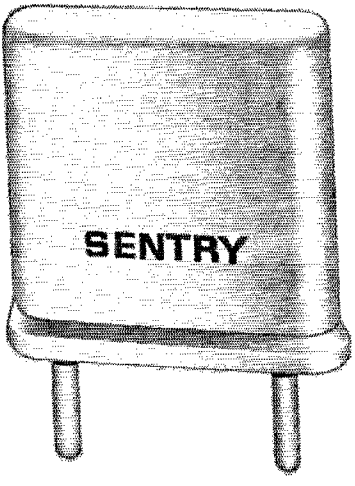
ARIZONA—SCM, Floyd C. Colyar, W7FKK—PAM: W7CAF. RM: K7NHL. OBSs: K7MTZ, K7VOR. OOs: K7OIX, W7CAL. New officers of the Scottsdale Amateur Radio Club are W7EJE, pres.; WA7EIG, vice-pres.; W7OPS, secy.; K7JWB, treas. Thanks to K7OIX and K7MTZ for their faithful continuing services as OO and OBS, respectively. A BPL certificate for Dec. was earned by K7NHL. WA7GOG is in its seventh month of continuous ATV operation. Continuous operation is maintained so amateurs can receive the ATV signal and bulletins at their convenience. New officers of the Old Pueblo Radio Club, Tucson, are WA7EQC, pres.; DL6UK/W7, vice-pres.; WA7FPU, secy.-treas. Traffic: (Dec.) K7NHL 658, K7UYW 79, K7MTZ 51, W7FKK 9. (Nov.) K7MTZ 50.

LOS ANGELES—SCM, Donald R. Etheredge, K6UMV—SEC: K6QPH. Asst. SEC: K6AVQ. A new ORS appointee is W6IVC. The holiday season brought a high amount of BPLers including WB6BBO, W6MLF, W6QAE, WB6GGL, WB6OLD, W6BHG, W6DSC and W6MLZ. Congratulations! W6FD and WB6SCK are working on their homes. WB6UHF is now an SCN liaison. W6OEO visited W4-Land while WB6RJX visited W0-Land during the holidays. The Santa Clarita ARC is now ARRL affiliated and has the following '68 officers: W6JFJ, prexy; WB6ROY, vice-pres.; WB6NBR, secy.; WA6KOE, treas. The club meets at 8 P.M. the 3rd Wed. of each month at Valley Federal Savings in Newhall. WA6WXD is now in Florida. W6DOY had a bout in the hospital but is recovering nicely. Meantime the OM, W6PA, passed the Advanced Class exam! The W6LS Hamfest is planned for May 18 and 19 in Burbank. Contact WA6RQQ or W6LS for information. WB6OLD and W6LDA are Amateur Extra Class holders now. K6UMV added a new bug from DL-Land to the family. W6TXJ advises that RACES in Culver City has a Swan 400 with v.f.o. and a Communicator IV located in the new police station. A new program has been initiated by the SCN traffic handlers called the SCATS program. SCATS (Southern California Amateur Traffickers' Society) is designed to promote additional interest and participation in SCN, 3600 kc. at 0300Z daily. K6ROC, Los Angeles City RACES, is considering a 220-Mc. repeater at Mt. Lee. K6YUL now holds a General Class license. K6BPC, operated by K6AVQ and WB6IMV, telephone relayed from the USS *Sanctuary* during the holidays. W6NSH recently became treas. of K6BPC, while W6FNE's XYL was elected secy.; K6AVQ, vice-pres.; and WA6JOK, prexy. W6HO and W6QKI both have excellent photos from their trip on the *Queen Mary* taken late last year. K6CSO took home an Ameco receiver from the SAROC thing in January. New L.A. members of SCN include WB6TQS and WB6VOP. An opening is presently available for the post of V.H.F. PAM for the section, any v.h.f.ers interested, please contact the SCM. It is rumored that W6NJU may be thinking of a new QTH in the Chatsworth area, multi-op position perhaps? Might be line of sight with W6RW. The TRW Club has installed WB6WDS as prexy; WB6VTQ, as vice-pres.; W6SMH, secy.; WA6JHD, treas.; and W6MYC, club trustee. SCN-2, the slow-speed code traffic net, invites newcomers to traffic circles. The net meets at 0530Z (2130 local) daily on 3600 kc. Traffic: (Dec.) WB6BBO 1269, W6MLF 748, W6QAE 643, WP6GGL 631, WB6OLD 623, W6GYH 477, W6BHG 406, WA6KZI 355, K6CDW 334, W6DSC 243, W6FD 243, W6MLZ 226, W6OEO 179, WB6UHF 144, K9ELT/6 134, WB6TQS 80, W6HUJ 70, K6ASK 55, WB6ZES 54, WB6IQT 45, WP6TMC 41, W6DGH 38, WB6AEL 37, WB6KIL 37, WB6OUD 34, WB6WDS 30, WB6KGK 24, K6UMV 21, W6AM 16, K6LJ 16, W6TXJ 12, W6PCP 10, W6TN 10, W6ORS 6, W6RCV 1. (Nov.) W6DSC 218. (Oct.) W6DSC 235. (Sept.) W6DSC 279.

SPEED

24 HOUR DELIVERY

We guarantee that we will ship all orders for 10 crystals or less within 24 hours of receiving the order.



Buy The Best

SEND FOR OUR 1968 CATALOG OF
PRECISION QUARTZ CRYSTALS AND ELECTRONICS
FOR THE COMMUNICATIONS INDUSTRY

SENTRY MANUFACTURING COMPANY

1634 Linwood Boulevard - Oklahoma City, Oklahoma 73106

PHONE: 405-232-1431—TELEX: 071-361—TWX: 910-831-3175

ORANGE—SCM, Roy R. Maxson, W6DEY—The Edison Amateur Radio Net furnished communications for the Rialto Jaycees Christmas Parade on Dec. 16. Members taking part were WA6JXG, WA6DTG, W6JQB, WB6QZT, WB6HIE, W6ZJZ, WA6AXH, W4CVA, W6YAN, WB6LOY, W6TCK, W6VBV, WB6PQV and K6LGR. The SAROC was a great success, saw many Orange section amateurs there and attended WCARS meeting. WN6ZQQ now is on 40-meter c.w. W6FB repeats W1AW Official Bulletins on local RACES/AREC Nets, also is up to 227/220 DXCC. W6FB visited W6MLZ and they met W9MIB at the La. Airport. W6BAM advises that Gerry Evans is WN6YZK and Joe is WN6YZJ. They are going for General soon. K6GMA is waiting a two-letter call and is active on 75 meters. W6PQA is back on the air after nearly a year's absence. Traffic: (Dec.) K6IBI 1091, K6QEH 850, K6MCA 562, WB6JFO 475, WA6ROF 457, WB6RJX 380, WA6RQK 102, K6IME 75, W6WRJ 61, WB6WPK 12, WA6TAG 9, K6GMA 5, W6BUK 2. (Nov.) W6WRJ 19. (Oct.) WB6TYZ 243.

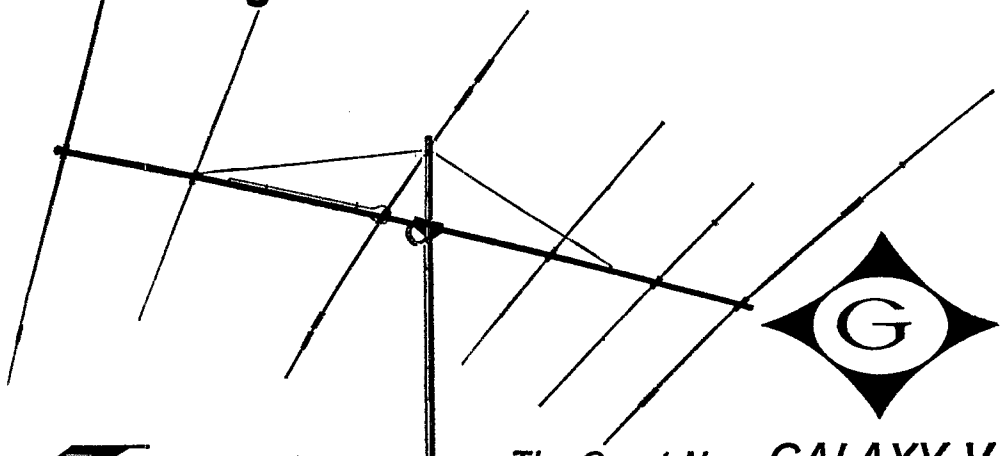
SAN DIEGO—SCM, James E. Emerson, Jr., WB6GMM—New officers of the ARC of El Cajon are WB6SEZ, pres.; W6IJO, vice-pres.; WB6UKM, secy.; WB6UNB, treas. The North Shores ARC's officers are WA6KHN, pres.; WB6SOK, vice-pres.; WB6UPW, secy.; W6SK, treas. Back from Vietnam and in at MCRD is K4WRM. Seen across the tables at the SORAC Convention in Las Vegas were WA6TAD and W6QXN, (getting ideas for the Southwestern Convention to be held in San Diego in '69?). K6BTO reports several duplex crossband QSOs during the holidays. WN6VKU recently passed the General Class exam and is waiting to put his HG-10B v.f.o. to work. WB6UPW has a new quad up 30 feet. WB6NMT has 4 elements up the same height pointed toward L.A. on 6 meters. We regret to report the following Silent Keys: WA6QBL, beloved XYL of WA6IUZ, W6BZC and W6LYF. The Christmas Party of the V.H.F. Club saw WB6UAN take home a noise blanker. WA6COE is the new editor of the ARC of El Cajon's monthly *News Letter* and he is doing a great job. WA6TAD reports 23 Full and 7 Limited AREC members in the San Diego County 2-Meter Net. W6BKZ can be heard daily checking into the 75-Meter Weather Net at 1300Z. The quarterly meeting of the board of directors of the Mission Trail Traffic Net was held at the home of WB6GMM in Jan. Traffic: (Dec.) K6BPI 9232, W6EOT 1057, W6BGF 837, W6LRU 834, WB6SQZ 231, W6ECP 113, WB6GMM 67, WA6KHN 25, WB6NMT 9, WA6QAY 4. (Nov.) WA6IUZ 57, W6ECP 50.

SANTA BARBARA—SCM, Cecil D. Hinson, WA6OKN—SEC: K6GV pinchhitting. The SCM left for Cocos Island aboard the schooner *Swift* of Ipswitch 0900 PST Jan. 1, 1968, from Santa Barbara and is on the air using the call WOCUG/MM. W5DTM/6, Santa Barbara EC, has appointed WB6DPV and WB6DXY as Asst. EC. WB6BWZ, EC in Santa Maria, has time for all activities including Air Force MARS and frequency measurements. W6ORW has been appointed OPS and continues active on the Mission Trail; he also has a new tower and beam. W6OED now has his Extra Class license. W6LVQ and K6GV were guests of K6AAK for lunch at the Saticoy Country Club. The Simi Valley Radio Club now has its ARRL Charter. WB6BII, W6BJM, WA6LML, W6KZO, W6LVQ and K6CV journeyed to Santa Barbara to wish WA6OKN bon voyage. Traffic: W6ORW 17, W6OED 16, WA6MGG 1.

WEST GULF DIVISION

NORTHERN TEXAS—SCM, L. L. Harbin, W5BNG—Asst. SCM: E. C. Pool, W5NFO. PAM: W5BOO. SEC: W5PYI. RM: W5LR. Now that the holidays are over I hope that everyone can devote more time to amateur radio activities. I heard many New Year's resolutions made by various amateurs on the air, but one in particular stuck in my craw, so to speak: "I resolve to do unto others *before* they do unto me." To me this, as applied to amateur radio, is not a very good attitude for any ham to take. In other words get on some frequency before you listen to see if there is a net or traffic being handled there with which you might interfere. I would like for that to have been, "I will listen on a frequency before I transmit." In this area there is an eye bank network operating on 3970 kc. each morning from 7 A.M. to about 7:30 A.M. and the net control has complained of interference from some local stations. I had the pleasure of attending the Christmas Party of the Arlington ARC and enjoyed a very fine dinner and program. The club presented Mayor Vandergriff with a plaque expressing its appreciation for his cooperation with the amateurs of that area. Award of the year went to "Two Feathers," WA5HTQ, for his outstanding contribution to the cause of amateur radio. New officers of the ARC for 1968 are K4LNM, pres.; WA5SRJ, vice-pres.; W5BCW, secy.; K5ZFZ, treas.; K5ZGA, EC. The

now... this great combination from ARROW!



hy-gain's THUNDERBIRD 10-15-20

HY-GAIN TH6DX SUPER THUNDERBIRD

The very ultimate in tribander performance—exclusive Hi-Q traps are individually pretuned at the factory for the very best performance on each band. Exclusive, time-proven Beta Matching System provides optimum gain, maximum F/B ratio, all-weather peak performance and the additional advantages of the antenna being at D.C. ground.

SUPER THUNDERBIRDS are mechanically superior; featuring extra husky boom-to-mast bracket for masts from 1" to 2½". This new bracket tilts down for easy maintenance. All tubing ends are slotted for rugged adjustability.

IF THIS GREAT COMBINATION ISN'T EXACTLY WHAT YOU WANT—YOU CAN ALWAYS GET EXACTLY WHAT YOU WANT AT ARROW. WE CARRY ALL OF HY-GAIN'S ANTENNAS, GALAXY TRANSCEIVERS AND OTHER AMATEUR NEEDS.

The Great New **GALAXY V** Mark 2

5 BAND TRANSCEIVER / MOBILE or FIXED STATION

- Smallest size (6" x 10¼" x 11¼").
- Hottest transceiver—special new six-crystal lattice filter.
- Complete 80-10 meter coverage.
- Both upper and lower selectible sideband.
- Highest stability. Drift less than 100CY in any 15 minute period after warmup.
- The personal drift chart of every Galaxy goes with the unit to its new owner!

OPEN NOW! ARROW'S NEW NEW YORK CITY STORE AT 97 CHAMBERS STREET

ARROW ELECTRONICS, INC.

- 900 Rte. 110, Farmingdale, N.Y. 516—MYrtle 4-6822
- 97 Chambers St., N.Y., N.Y. 212—Digby 9-4411
- 525 Jericho Tpke., Mineola, N.Y. 516—Pioneer 2-2290
- 18 Isaac St., Norwalk, Conn. 203—838-4877
- 225 Rte. 46, Totowa, N.J. 201—256-8555

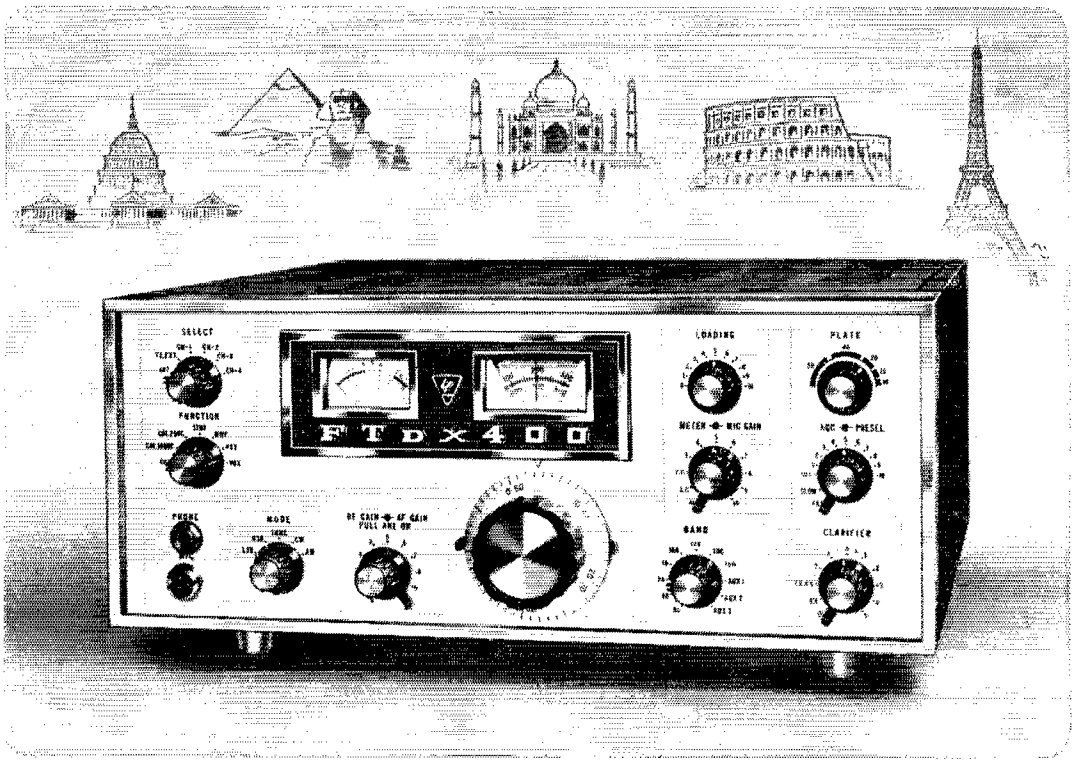
CENTEX ARC, at Waco, elected WA5PUP, pres.; WA5QPE, vice-pres.; WA5PPX, secy.; W5GLY, treas.; WA5BPM, Radio Officer. W5PBN has renewed his ORS and OPS certificates. Why don't you look at your appointment certificate and renew it on its endorsement date? K5BNH still is going strong handling traffic and made the BPL again. Traffic: K5BNH 521, W5JSM 32, W5LR 16, W5QGZ 10, W5BNG 6.

OKLAHOMA—SCM, Cecil C. Cash, W5PML—SEC: WA5AOB. PAMs: W5MFX 75, K5TEY 40. RM: W5QMJ. Newly-appointed: K5CAY, former SCM, as OPS and OVS. Net skeds: OLZ, 0100Z Sun. through Sat., 3682.5 kc.; SSZ, 0345Z Sun. through Sat. 3682.5 kc.; OPEN, 1400Z Sun., 3850 kc.; Sooner Tfc. Net, 2330Z Mon. through Sat., 3850 kc.; newly-registered Okla. Post Office Net, 2300Z Mon. through Fri., 3920 kc. W5MFX, PAM 75, put out a real fine bulletin to his NCSs and ANCSs on STN. I have been very fortunate in enlisting some most excellent helpers. I still need a couple of PAMs and my SEC needs some ECs. New officers of the Lawton-Ft. Sill ARC, Inc., are W5PML, pres.; K5BKF, vice-pres.; WA5QJB, secy.; WA5NPN, treas. New officers of the Aeronautical Center ARC are W5UZX, pres.; W5NTL, vice-pres.; W5EHC, secy.-treas. WA5GFI is stationed at Ft. Polk, La., with the Army. WA5NYX is on 2-meter f.m. W5QMJ is on RTTY. W5SWJ is the proud owner of a new Swan 500 and Tri-Band beam and is getting all set to talk to his son at the South Pole. WA5OHX has moved to W4-Land. WA5KNR is QSY to Florida with the Air Force. WA5KZA is BPL for the third month. Our traffic mainspring, K5TEY, came through again with a good count. Traffic: K5TEY 2272, W8VDA/5 203, W5QMJ 200, WA5KZA 156, WA5IMO 101, W5PML 64, K5SWL 48, WA5KFT 42, W5MFX 40, W5FKL 32, W5OLB 26, WA5KNR 22, K5CAY 15, K5OCX 13, K5WPP 13, WN5SZK 1.

SOUTHERN TEXAS—SCM, G. D. Jerry Sears, W5AIR—SEC: K5QQG. PAM: W5KLV. RM: W5EZY. Our thanks to the many amateurs in Southern Texas who have cooperated in reporting various activities and traffic and participated in the various emergency and traffic nets. Your efforts are greatly appreciated. We are looking forward to a better year in 1968. Congratulations to WA5INZ/5, who made the BPL with a traffic count of 513 in Dec. '67. The Houston ARC will host the *Old Timers Night* Feb. 16 with W5WR as program chairman. This annual meeting brings out many old-timers who don't get around much any more. Hope to see you there. We noted from EC W5KR's bulletin *Off Resonance* that W7HBX and lovely Lady Dolly celebrated their 50th wedding anniversary in Brownsville. Members of the West Gulf Emergency Net elected EC of Brazoria County, K5HMF, as net control station for 1968. Attendance has been very good on the West Gulf Emergency Net as well as on the South Texas Emergency Nets S.S.B. The Tex C.W. Traffic Net, under the direction of RM W5EZY, is making excellent progress. W5ABQ reports he still is trying to get a block buster on the air; also that WA5INZ/5 showed up with a hefty signal. He must be right as WA5INZ/5 made the BPL. WA5MBC reports the new ground-plane antenna is doing fine with 13 new countries during Christmas week. From reports it seems the FCC will be busy giving Extra Class exams. OO W5NGW is going strong with a new printed circuit keyer, a Christmas present from the XYL. Traffic: WA5INZ/5 513, WA5GZX 374, WA5QKE 211, K5HZR 140, WA5MBC 134, W7WAH/5 117, W5EZY 106, WA5MXY 85, W5ABQ 64, W5KLV 57, W5BGE 35, K5HMF 29, WA5IQL 17, W5TFW 17, W5AQN 5, W5OAU 5, K5WYN 1.

CANADIAN DIVISION

ALBERTA—SCM, Harry Harrold, VE6TG—SEC: VE6FK. PAM (APSN): VE6ADS. ECs: VE6SA, VE6SS, VE6XC, VE6PL, VE6AFQ. ORSs: VE6BR, VE6ATH, VE6ATG. OPS: VE6HM, VE6SS, VE6AFQ. OOs: VE6HM, VE6TY. OBSs: VE6HM, VE6AIF. It is time to start making your plans for the International Glacier-Waterton Hamfest to be held in Waterton Lakes July 20 and 21 with an informal meeting on the evening of the 19th. Listen in on the Vulcan County Radio Club Net Sun. at 2130 MST on 3740 kc. VE6AJZ is making cupboards for his new house and is too busy to get on the air. VE6AM finally broke down and went s.s.b. VE7RW, ex-VE6CA, is having receiver trouble and has to have a relay station. VE6AO is doing a lot of entertaining these days. VE6ABS started out for Disneyland for Christmas and never got there. After a long absence VE6SF was heard back on 75 meters. VE6ADS reports that APSN is picking up these days with more check-ins and he hopes that the boys will keep it up. Traffic: VE6HM 65, VE6FK 13, VE6AKV 9, VE6SS 9, VE6FS 6, VE6AFW 4, VE6KS 4, VE6AOO 3, VE6ARU 2, VE6BL 2, VE6VF 2, VE6AHL 1, VE6FV 1, VE6II 1, VE6ZY 1.



TOMORROW'S TRANSCEIVER TODAY BY YAESU

FTDX-400

Latest arrival on the American scene, Spectronics presents the FT dx 400. Yaesu engineers have looked into the future to provide the present day amateur with a complete station in one package.

The usual "accessories" are standard equipment in the FT dx 400. Features built-in power supply, dual calibrators — 100KC and 25KC, break in CW with sidetone, fully adjustable VOX system, four switch selected crystal controlled transmit channels in addition to VFO positions, and varactor controlled clarifier offers receiver offset tuning capability.

Remember, all these extras are included in this new imported transceiver. Check the specs and ask your local dealer for a demonstration dx trip with the FT dx 400.

$599.95 including power supply and all accessories except speaker.

SP-400 matching speaker **$14.95**

DEALER INQUIRIES INVITED

SPECIFICATIONS

FREQUENCY RANGE: 3.5-4Mc, 7-7.5Mc, 14-14.5Mc, 21-21.5Mc, 28-30Mc (3 more 500KC receiver bands can be added).
FREQUENCY STABILITY: Less than 100 c/s drift in any 30 minute period after warm up.
ANTENNA IMPEDANCE: 50 to 120 ohm unbalanced.
MAXIMUM INPUT: 500W P.E.P. SSB, 440W CW, 125W A.M.
CARRIER SUPPRESSION: —40db
SIDE BAND SUPPRESSION: —50db (at 1,000 c/s)
DISTORTION PRODUCT: Down at least 25db
AUDIO BANDWIDTH: 300-2,700 c/s
RECEIVING SENSITIVITY: 0.5uV,. S/N 20db (14Mc SSB)
SELECTIVITY: 2.3Kc (—6db), 3.7Kc (—55db)
IF AND IMAGE RATIO: More than 50db
AUDIO OUTPUT: 1 watt @ 5% distortion
OUTPUT IMPEDANCE: 8 ohm, 600 ohm
TUBES AND SEMICONDUCTORS: 18 tubes, 9 transistors and 33 diodes
POWER SOURCE: AC 117 volts, 50/60 c/s
DIMENSIONS: 15¾" wide x 6¼" high x 13¾" deep
WEIGHT: 50 Pounds

SPECTRONICS

BOX 356 • LOS ALAMITOS, CALIFORNIA 90720

BRITISH COLUMBIA—SCM, H. E. Savage, VE7FB—This is the time of the year to say thanks to each of you for all the help you have given. The Centennial Year has ended with all the projects and contests. But really, after this great year, my wish is we continue with the help and projects. It's been a most gratifying year for the B.C. section. VE7ASU has obtained his commercial flying license. VE4LI has returned home and now is VE7BJT. VE7AMW is busy putting together Santa's Heath s.s.b. rig. VE7BQ is out of the hospital and doing OK. VE7BML will be a VE5. VE7BOA is the OM, VE7BQJ George and now VE7BXV Joe. VE7BXX is a new call. The VARC has sixteen code and theory members. According to reports from other clubs it looks like a big year for new amateurs. Traffic: VE7BQA 108. VE7AC 38, VE7BLS 22, VE7FQ 15, VE7BLO 13, VE7-BUG 13, VE7BWA 2.

MANITOBA—SCM, John Thomas Stacey, VE4JT—Wedding bells rang for VE4QK, VE4LG and VE4YJ recently. New officers of the Dauphin ARC are VE4NE, pres.; VE4DP, vice-pres.; VE4PA, treas.; VE4SB, secy. New calls earned from the Brandon ARC course are VE4FD, VE4OD and VE4UP. VE4RW has an HW-12 and has started a swap and shop net on 3750 at 8 P.M. CST. VE4YC and VE4FO are recipients of c.w. section net certificates. Let us briefly recap the section activities: The AREC participated in the Brandon Balloon Race, Paraplegic Pan-AM Games, St. John's College Snow Shoe Race, Red River Exhibition, Miles for Millions Walk and the Halloween Goblin Patrol as well as providing 2-meter emergency communications units in one Winnipeg hospital. The traffic nets have also provided good service; with both of them operating daily throughout 1967 and showing excellent traffic results combined they handled in excess of 1200 individual pieces of traffic. The nets and the AREC need every willing amateur. How about joining up today? VE4JJ is active from Thomson. Net reports: Phone sessions 30, QNI 644, QTC 25; c.w. sessions 31. QNI 152, QTC 104. Traffic: VE4ET 108, VE4JT 101, VE4NE 70, VE4JA 17, VE4-NW 14, VE4RW 14, VE4YC 14, VE4GN 10, VE4QJ 8, VE4XN 8, VE4CR 5, VE4LQ 4, VE4MK 4, VE4PA 3, VE4FX 2, VE4EX 1.

MARITIME—SCM, J. Harley Grimmer, VE1MX—Asst. SCM: R. P. Thorne, VO1EI, SEC: VE1HJ. I expect that this will be the last column I will be writing as SCM of this section and I would like to express my appreciation to all those who have contributed to this column and who have helped to promote ARRL in this section. The Acting SCM will be William J. Gillis, VE1-NR, who will act in this capacity until an election can be arranged. I am sure that Bill will perform his duties most capably and I trust that all members will give him their support. VE1AJE is a new amateur in Antigonish. You are reminded that APN meets daily at 0000Z on 3635 kc. APN reports QNI 200, QTC 41, sessions 31. Traffic: VE1OM 41, VE1AMR 32, VE1MX 18, VE1AAX 16.

ONTARIO—SCM, Roy A. White, VE3BUX—My sincere thanks to the Ontario hams who voted for me in the recent election and I'll do my best to warrant your confidence. Please keep me advised concerning items of interest. I would appreciate receiving copies of club bulletins each month. The Ontario Phone Net, on 3770 kc., is coming back to life with a bang. VE3ETM, our capable PAM, is looking for more controllers. Why not offer your services for half an hour or so once a week? The DOT has been sending out violation notices to a few Ontario hams who have been neglecting to put the prefix "VE" before call letters. As the DOT points out, the prefix is necessary to determine the country of origin and failure to include it is a violation of the regulations. The Windsor Amateur Radio Club lost a valued and well-liked member when VE3ANJ passed away suddenly in Dec. Let's give a big hand to VE3DJK for so capably carrying out the duties of Acting SCM during the past few months. Our hard-working SEC appeals to a few tardy EC laddies to send in their reports regularly. Please give VE3EUM your full cooperation. VE3-CAB says 2-meter activity around Belleville is going great guns and he hopes to have a repeater station in operation shortly. The Wentworth County ARPSC has been busy lately what with assisting with Christmas parades, car rallies, etc. Those taking part in the parade portion included GBX, FSI, FVJ, FYV, EUM, ELY and FYY, while DPC and CXJ helped out from their base stations. The assistance to the car rallies was considerable and thanks go to CJ, CO, EQI, AAE and EUM. This may be a little late but your new SCM wishes one and all health, happiness and prosperity in 1968. Traffic: VE3GI 171, VE3DPO 140, VE3DBG 132, VE3EZI 116, VE3BZB 107, VE3GCE 104, VE3BUR 80, VE3ATI 70, VE3AWE 50, VE3NO 39, VE3DU 33, VE3EHL 33, VE3-BQL 19, VE3DGB 17, VE3DH 13, VE3EBC 12.

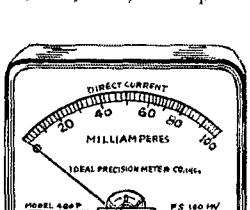
BARRY ELECTRONICS

200 Mfd. @ 300 VDC Gen. Inst. Capacitors. Fresh stock. **60¢** w/mtg brkt.

80 Mfd. @ 350 VDC Gen. Instr. Capacitors. Fresh stock. . . **50¢** w/mtg brkt.

ROTRON AIR FLOW INTERLOCK SWITCH. Actuates purely on Air Velocity. Controls 5 Amps @ 250 VAC. When air flow stops, it automatically cuts off high voltage on expensive tubes, etc. Brand new, jobber boxed (Reg. Mfgr. cost **$9.70**). Sale price only **$3.95** (with instruction sheet).

METERS! New Lot **JUST ARRIVED. ALL UNUSED IN ORIGINAL MANUFACTURERS CARTONS.** This special purchase allows us to offer these high quality meters at about half the original price.



For example:

Milliammeters 3½" Square **$4.99**; 4½" Square **$6.99**; Microammeters 3½" Square **$5.99**; 4½" Square **$7.99**; DC Voltmeters & Ammeters 3½" Square **$4.99**; 4½" Square **$6.99**

. . . Since we have almost 2,000 meters, most ranges in stock, subject to prior sale. . . . (Limited supply on Microammeters). Specify 1st and 2nd and 3rd choices when placing your order. Also, specify clear plastic or black bakelite finish choice, but allow us to ship what is in stock at time of your order.

RECEIVERS: Good used, condition. TMC Model GPR-90 General Coverage with bandspread dial. **$250.00:** Hammarlund SP-600 JX @ **$250.00**; Hallicrafter SX-73 (SX73 is Hallicrafter version of SP-600) @ **$200.00** . . . requires some alignment; Ameco R-5 .54 to 54.0 Mcs. **$79.95** brand new; RCA Compact All-Band Receiver **$75.00** (good cond. but dial needs adjustment) Sommerkamp FR-100B **$250.00** unused.

RME 6900 HAM BAND WWV, CW, SSB, AM Receiver, excel. cond. **$250.00.**

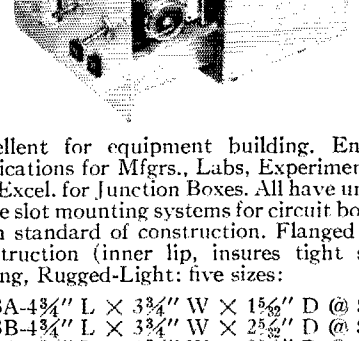
DUMONT TYPE 279 DUAL-BEAM 5" Scope. Good lab checked-out condition. **$95.00.**

DUMONT TYPE 322 DUAL-BEAM 3" Scope. Lab tested O.K. **$150.00.**

TV6/U BENDIX LAB TUBE TESTER for Electrometer Type tubes. For repair of radiation instruments, using electrometer tubes. Also excel. for testing high megohm resistors. Unused, "Mint" condition, with book. Portable. **$95.00**, less batteries.

TUBES: New factory stock, just arrived with factory warranty: 572B 1 pc **$15.95**, 2 or more @ **$14.50** ea. also fresh stock of 872A, new factory jobber boxed @ **$5.95**, new factory fresh 866A @ **$1.70**, new factory fresh 811A @ **$4.60** and 812A @ **$4.60.**

BARRY'S ALUMINUM ALLOY DIECAST BOXES

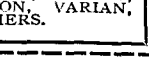


Excellent for equipment building. Endless applications for Mfgrs., Labs, Experimenters, etc. Excel. for Junction Boxes. All have unique guide slot mounting systems for circuit boards. High standard of construction. Flanged edge construction (inner lip, insures tight seal). Strong, Rugged-Light: five sizes:

#043A-4¾" L × 3¾" W × 1⅝" D @ **$1.50**
#043B-4¾" L × 3¾" W × 2⅝" D @ **$1.75**
#064A-6¾" L × 4¾" W × 2⅝" D @ **$2.25**
#085A-8¾" L × 5¾" W × 2⅝" D @ **$3.00**
#106A-6¾" L × 6¼" W × 2⅝" D @ **$3.50**
For 50 or more of each size write.

KW TRANSMATCH (using all Millen new factory parts) . . . (See Oct. 66 *QST* article on Lew McCoy's Transmatch page 38) Less Chassis and Meter. KW Kit @ **$45.66** Prepaid. 150 Watt Kit @ **$34.00** Prepaid.

1,000 Volt (P.I.V.) @ 1 Amp. Diodes. 30¢ each (100 for **$25.00**)



Also save on **unused,** lab-certified (R.F. tested) surplus and factory terminations. Jobber-boxed receiving tubes in stock at 60% (and better) off list.

STILL SPECIALIZING IN TUBES AND SEMICONDUCTORS — FRANCHISED DISTRIBUTOR FOR BOMAC, CETRON, EIMAC, ITT, JENNINGS, MACHLETT, PENTA, RAYTHEON, VARIAN, WESTINGHOUSE AND MANY OTHERS.

BARRY ELECTRONICS DEPT. Q-3
512 BROADWAY, NEW YORK, N. Y. 10012
WALKER 5-7000 (Area Code 212)

☐ Enclosed is money order or check and my order. Prices FOB, NYC. Shipments over 20 lbs. will be shipped collect for shipping charges. Less than 20 lbs. include sufficient postage. Any overage will be refunded. Fragile tubes shipped via Railway Express. **Minimum order $5.00.**

☐ Send 10c for 72 page Greensheet Catalog #18. (Prices subject to change) Write for your copy.

☐ Send information.....

.....

Name.....Title

Company.....

Address.....

City.....State.....Zip.....

QUEBEC—SCM, J. W. Ibey, VE2OJ—SEC: VE2ALE. RM: VE2DR. PAMs: VE2AGQ, VE2BWL. We are pleased to hear about the formation of these new clubs. In Thetford-Mines, VE2CTM—VE2ASW, pres.; VE2-BEA, vice-pres.; VE2BZL, treas.; VE2DGY, secy. The Club des Amateurs de Gaspe—VE2WM, pres.; VE2GU, vice-pres.; VE2DDO, secy.; VE2DAL, treas.; VE2-BZY, responsible for V.H.F.; VE2DAL responsible for H.F. and R. Desjardins, public relations. We list here nets who report: RTQ 3600 kc., RPQ 3780 kc., Quebec AREC (Sun.) 3780 kc., OQN 3535 kc., ECN 3540 kc., VE2RM (f.m.) 146,400 Rx; 147,180 Tx.; VE2RM (a.m.) 144,400 Rx, 147,745 Tx.; VE2TA 146,250 Rx, 147,500 Tx. Le Radio Club de Québec, avec la collaboration de Bernard VE2AP, EC pour la région de Québec, procède actuellement à une réorganisation complète des communications d'urgence dans la ville de Québec et la banlieue. Tous les amateurs actifs sur le deux mètres via VE2VD, sont invités à offrir leur collaboration en joignant les rangs de l'AREC. Félicitations à VE2BYK et VE2BVG qui ont répondu à un appel d'urgence de laBelgique et qui ont ainsi permis de sauver la vie d'un patient belge en lui procurant un médicament très rare venant de Toronto. VE2XN a maintenant changé de QTH; Joseph est toujours très actif sur le 75 et 40 mètres et c'est de Gaspé qu'on peut l'entendre régulièrement. VE2AJD a dû se résigner à une longue convalescence à la suite d'un malheureux accident d'automobile. Traffic: VE2DR 197, VE2OJ 112, VE2BRD 111, VE2ALE 68, VE2DCW 56, VE2AJD 43, VE2EC 37, VE3WM 30, VE2CP 28, VE2BMS 20, VE2BVY 10.

SASKATCHEWAN—Acting SCM, Gordon Pearce, VE5HP—New officers of SARL are VE5HP pres.; VE5-OF, vice-pres.; VE5FH, secy. The new EC for the South East Section is VE5DO, probably assisted by his XYL, VE5HO. Our new PAM is VE5PZ, of Swift Current. The Boy Scout Jamboree held at Buffalo Pound Lake, north of Moose Jaw, was serviced by hams from Moose Jaw, Saskatoon and Regina. The Saskatoon Club has been working hard on a "History of Ham Radio." Two-meter activity in Regina is picking up, also Moose Jaw and Saskatoon are well into this phase. A tip of the hat to the hams who took part in the communications relay and alert when a small plane was lost in southwestern Saskatchewan. Liaison was maintained with the search centre at Lethbridge. The directors of the SARL should be in touch with all their "constituents." On-the-air and mail liaison would certainly help to build up our SARL. We are also hoping for a large increase in SARL membership. Get in touch with VE5FH. And remember too, the 1968 Saskatchewan Hamfest is to be held this year in Saskatoon—June 28 to 30, 1968. Two of our Regina boys, VE5FO and VE5WG, have forsaken the Queen City for Saskatoon. Early in Jan. VE6ABS, from Lethbridge, had his car break down in the U.S.A. Several Alberta hams immediately headed south with a truck and towed him back. Within minutes after the return trip started his XYL in Lethbridge and parents in Regina were breathing easier. Many of the boys made contact with the *Queen Mary* on her voyage to San Diego. VE5LM seemed to have regular hourly skeds with her. Traffic: VE5LM 71, VE5HP 69, VE5RJ 45, VE5LQ 18, VE5BO 7, VE5NX 5, VE5EQ 4, VE5LK 3, VE5BD 2.

ROHN® THE PROBLEM SOLVERS

Somebody's always looking for something different in home TV, amateur or CB towers. Some people are hard to satisfy.

But that's what ROHN thrives on, tough problems. Most problems in the tower field can be answered with a ROHN tower right off the shelf. That's because ROHN manufactures the only line of galvanized towers nationally — including complete mounting hardware. If your problem is finding the best possible tower to offer your customers, we can answer that in one word: ROHN. This is just one of the reasons why ROHN is the largest tower manufacturer in the U.S.

Home Office — Factory
P.O. Box 2000, Peoria, Illinois, U.S.A. 61601
Phone 309-637-8416 TWX 309-697-1488

Systems Office —
Box 877, Richardson, Texas 75080
Phone 214-AD1-3481

ROHN®

Western Office—
310 Quincy Street, Reno, Nevada 89502
Phone 702-322-9300

Eastern Office —
P.O. Box 2101
Hanover, Mass. 02339
Phone 617-826-2511

Southern Office —
P.O. Box 6537, Birmingham, Ala., 35217
Phone 205-841-1789

Sale

FREE "HAM SHACK PAK"

$25 WORTH OF
- TRANSISTORS
- RECTIFIERS
- RESISTORS
- CONDENSERS
- DIODES ETC.

Add 25¢ for handling

PLUS ANY $1.00 * ITEM FREE

* or items totalling $1.00.)

BOTH FREE WITH ANY $10 ORDER

TRIACS* AND SCRS ** RCA G.E.

PRV	3** AMPS	6* AMPS
50	.35	—
100	.50	.85
200	.75	1.35
400	1.25	1.95
600	1.75	2.60

LOOK SPECIAL

500 MIL All Tests TOP HATS

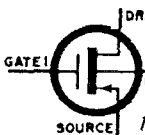
PRV	Sale
50	10 for 25¢
100	10 for 35¢
150	10 for 40¢
200	10 for 45¢
250	10 for 50¢
300	10 for 55¢

EPOXY TRANSISTORS & IC's

Fairchild, Motorola, Texas, Bendix

- 4—2N3563 NPN, 600MC, 200MW $1
- 4—2N3643 NPN, 250MC, 350MW $1
- 3—B-5000 5W, 3Amp, PNP $1
- 4—2N4313 PNP 600MC, 200MW $1
- 3—2N3565, 500HFE, NPN, 200MC $1
- 3—2N4265, 400HFE, NPN, 350MC $1
- 1—DUAL 4 IN. GATE, EXPANDER $1
- 1—QUAD 2 IN. NAND/NOR GATE $1
- 1—703 LINEAR RF AMP. Fairchild $2.49

FIELD EFFECT TRANSISTORS



RAYTHEON "MOST." IGFET Input *10 million meg-*

2N3608 p-channel

☐ 2.99 ea.

1 AMP TOP HAT AND EPOXIES

PIV	Sale	PIV	Sale	PIV	Sale
50	5¢	800	21¢	1800	90¢
100	7¢	1000	32¢	2000	1.25
200	9¢	1200	45¢	3000	1.50
400	11¢	1400	65¢	4000	1.95
600	17¢	1600	75¢		

Actual Size →

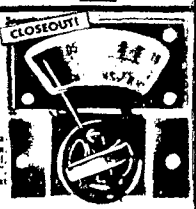
1 AMP MICROMINIATURE SILICON RECTIFIERS

PIV	Sale	PIV	Sale
50	7¢	600	20¢
100	9¢	800	25¢
200	12¢	1000	39¢
400	17¢		

100 MICROAMP PANEL METER

- *Made in U.S.A.!*
- *D'Arsonval Meter Movement!*

2.99 ea.



New! Originally designed to be used with radiation detector! Basic meter movement 100μa. 2 mounting holes for easy installation in panel. Size: 2x2½x¾". Mounting centers: 1.11/16". Ideal for builders, hobbyists, labs, etc. Hurry, at this fantastic price they won't last long!

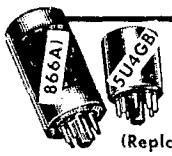
2 AMP SILICON RECTIFIERS

PIV	Sale	PIV	Sale
200	12c	1000	45¢
400	16c	1200	59¢
600	19¢	1400	69¢
800	29¢	1600	89¢

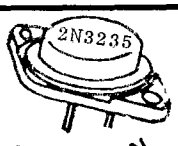
SILICON POWER STUD RECTIFIERS

PIV	3A	6A	12A	55A
50	.06	.16	.20	.50
100	.07	.22	.25	.75
200	.09	.30	.39	1.25
400	.16	.40	.50	1.50
600	.20	.55	.75	1.80
800	.30	.75	.90	2.30
1000	.40	.90	1.15	2.70

HAM SILICON TUBE SPECIALS



	(Replaces)	Sale
☐ 1N1238	5U4GB)	2.39
☐ 1N1239	5R4)	4.39
☐ 1N1237	0Z4)	2.39
☐ 1N1262	6AU4GTA)	2.39
☐ 1N2637	866A)	9.99
☐	3DG4)	2.39



2N3235 NPN SILICON

(Watts) 115

BV_{CBO} 100

(AMP) 15

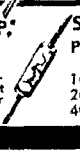
$2.25

SOLITRON DEVICES, 5 AMP Epoxy Rectifiers

PIV	Sale	PIV	Sale
50	19¢	600	59¢
100	25¢	800	69¢
200	39¢	1000	79¢
400	45¢		

GLASS AMP ONE AMP

PRV may be exceeded without the rectifier breaking down.

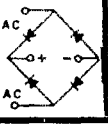


SILICON RECTIFIERS

PIV	Sale	PIV	Sale
50	5¢	600	19¢
100	7¢	800	21¢
200	9¢	1000	32¢
400	13¢	1200	45¢

General Instrument

Full Wave Bridge $4.88 ☐



5 AMP 1500 PIV

☐ 1.5 AMP 2000 PIV SILICON RECTIFIERS $1

☐ 2 AMP 800 PIV SILICON RECTIFIERS 4 for $1

AS ADVERTISED OR YOUR MONEY BACK

☐ GIANT SPRING CATALOG ON: Parts, Rectifiers, Transistors, SCRs, I.C.'s, Equipment, Etc. 10¢

TERMS: include postage. Rated, net 30 days. COD 25%

POLY PAKS P.O. BOX 942 M Lynnfield, Mass. 01940

EXPERIENCE TALKS TO YOUTH . . .

See Page 157

Silent Keys

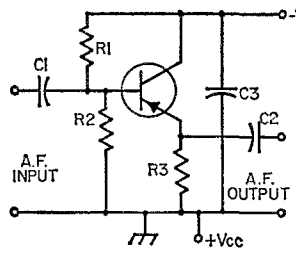
IT is with deep regret that we record the passing of these amateurs:

ex-W1AJP, Stanley Mulkin, Philadelphia, Pa.
W1LBY, Benjamin M. Kinsley, Marshfield Hills, Mass.
W1PJE, J. E. "Cap" Smith, West Newton, Mass.
K1VPF, Edward Allen Avery, Storrs, Conn.
W2AJI, Frank W. Hogan, Howard Beach, N. Y.
W2BSS, John P. Schroth, Elizabeth, N. J.
K2CVS, Sigurd Flom, Bronx, N. Y.
W2EEX, Joseph A. Armstrong, Delanco, N. J.
WB2HTJ, Everett J. Brill, Malverne, N. Y.
K2IGK, William Almas, Brooklyn, N. Y.
W2JV, Shirley I. (Si) Burke, Dumont, N. J.
W2LG, William Bauer, Brooklyn, N. Y.
W2NQS, Angel Fernandez, Brooklyn, N. Y.
K2OTQ, Samuel T. Marks, Albany, N. Y.
WA2VNU, Joseph LoVaglio, Rome, N. Y.
W2VVK, Thomas H. Ambruster, Haddonfield, N. J.
WA3CFB, Louis M. Biester, W. Philadelphia, Pa.
W3GLI, George E. Reid, Berwyn, Pa.
K3IEC, Richard L. Spiese, York, Pa.
W3JFR, Wenzel (Bill) Welischek, Hartly, Dela.
K3LHU, George S. "Pete" Truly, Frostburg, Md.,
W3MO, Don G. Harmer, Washington, D. C.
W3UVJ, J. Rollen Quillan, Coatesville, Pa.
WA4AIS, W. K. Cowan, Chattanooga, Tenn.
WA4AKS, Wayne J. Morris, Oldsmar, Fla.
W4BXG, Wm. J. Huffstetler, Alcoa, Tenn.
WB4CNO, Richard E. Bolen, Atlanta, Ga.
K4DDL, David W. Simmons, Shelbyville, Tenn.
W4GOX, William J. O'Phelan, St. Petersburg, Fla.
W4KV, James W. Spratlin, Springfield, Va.
W4PZY, William B. Attmore, Ellerson, Va.
W4UOT, Warner A. Simpson, Tullahoma, Tenn.
K4UUD, Henry C. Carlisle, Smyrna, Ga.
W4UVY, Charles D. Thompson, Jr., Johnson City, Tenn.
WA5BDI, Albert Goss, Loranger, La.
W5CJJ, J. D. Pritchett, Dallas, Texas
W5CT, James N. Barclay, Austin, Texas
W5PBU, M. H. "Moon" Mullins, McAllen, Texas
WA5QME, Robert P. Jarrett, Canyon, Texas
WA5QYE, Michael Stottlemyre, Hennessey, Okla.
W5SZZ, John Drummond, Jackson, Miss.
K6AB, Alva J. Spriggs, Los Angeles, Calif.
W6ASM, Daniel O. Cleaver, Dunsmuir, Calif.
WA6CEL, William G. O'Connell, San Jose, Calif.
K6HTJ, Frank Goulart, Hayward, Calif.
WA6KIL, Earle B. Duskin, Baldwin Park, Calif.
K6MZT, William J. Peters, San Marino, Calif.
K6VTQ, Edwin J. Mitchell, Garden Grove, Calif.
W7NZP, Stanley L. Rea, Spokane, Wash.
W8IDC, Philip "Red" Byerly, Sr., Detroit, Mich.
W8OZW, Ronald A. Slutz, Dayton, Ohio
K8PKU, Leland K. Lebar, Flint, Mich.
W8POH, Ray Hartman, Tiffin, Ohio
WA9GEQ, Kenneth E. Smith, Chicago, Ill.
WA9HQB, George M. Lyons, Indianapolis, Ind.
W9IMG, Milton L. Davis, Harvey, Ill.
WA9LFZ, James Wylie, Minonk, Ill.
K9MUD, Edward R. Codman, New Carlisle, Ind.
WA9RKW, Thomas G. Robinson, Chicago, Ill.
W9TNP, Harold W. Beach, Fort Wayne, Ind.
WAØHTW, Edward L. Mueller, Edmore, N. D.
KØIGZ, Ralph Hammer, Rushford, Minn.
KØPGQ, Ray S. Eldridge, Denver, Colo.
WØVBH, Arthur B. Monroe, Sikeston, Mo.
WØYQR, Earl Shirley, Rapid City, S. D.
KH6AM, Corwin D. Sayres, Honolulu, Hawaii
KH6ATS, William W. Ruddock, Kailua, Hawaii
KH6AXY, James G. Kagihara, Honolulu, Hawaii
KH6DLA, Edward T. P. Lau, Honolulu, Hawaii
VE1RT, A. E. S. Whittaker, Aspen, N.S., Canada
VE2VD Gerard Vaillancourt, Quebec, Canada
VE3ACV, Jack Hough, Toronto, Ont., Canada
ZS1CG, Sid E. Poole, Onrust River, C. P., Rep. of S. Afr.
9Y4TI, Stanley E. Knowles, Port of Spain, Trinidad

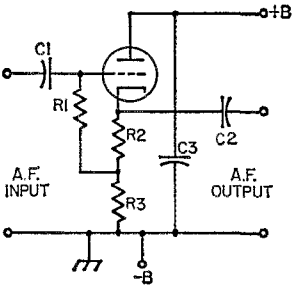
Higher-Class Licence

(Continued from page 68)

Answers to license quiz: Q1 — B; Q2 — D; Q3 — C; Q4 — E; Q5 — D; Q6 — below.



C_1, C_2—A.f. coupling capacitors
C_3—A.f bypass capacitor
R_1—Grid return resistor
R_2, R_3—Load resistor and bias divider



C_1, C_2—A.f. coupling capacitors
C_3—A.f. bypass capacitor
R_1, R_2—Bias voltage divider
R_3—Load resistor

VOX System for S.S.B.

(Continued from page 38)

which is still adequate to cut off plate current.

C.W. Operation

Those who have followed earlier articles on c.w. break-in for the Collins S Line[2,3,4] may be interested in the following. Since working with the voice system, it has been found that the screen switch works well as a c.w. control. An advantage is that it is no longer necessary to adjust the final-amplifier bias.[2]

The screen switch is the same as shown here in Fig. 1. The driving signal is taken from the collector of the 2N591.[2,3] The 2N591 base resistor is changed to 300K.

All backwave is eliminated by applying an FET switch, indentical to one of those shown in Fig. 1, to one grid (Pin 2) of V_4 (the second mixer) in the 32S-3, in the same manner. The driving signal for this switch is also taken from the collector of the 2N591.

With this arrangement, keying is clean, and break-in operation very smooth.

In conclusion, it might be mentioned, for the benefit of Collins-equipment owners, that Collins can supply a four-foot coax section to be substituted for the 21-ft. cable normally used between the 32S-3 and the 30L-1. This change avoids the "suck out" problem when using a t.r. switch. QST

[2] Hildreth, "Instantaneous Break-In With the Collins S Line," *QST*, December, 1963.
[3] Hildreth, "Transistor Keyer/Muter for Collins S Line," *QST*, December, 1964.
[4] Hildreth, "More On S-Line Break-In Keying," *QST*, May, 1966.

M.U.F. Tendencies in Sunspot Cycle

(Continued from page 23)

Elongated F_2 single hop (i.e., KH6 to eastern and midwestern USA, Europe to midwest and W5) usually occurs just as the skip is going out for the more regular F_2 distance contacts, such as KH6 to W6, or Europe to W1, 2, 3.

During the season change period (mid-March, mid-September) there are often F_2 type contacts between North and South America. The spring contacts often extend into late April or early May. Openings in March and early April are usually centered around 10 A.M. local time for the North American end. Later, our summer season E skip may yield a single hop of E skip into the Caribbean area, where it links up with the regular F_2 that builds up in the equatorial regions and south of the equator during our summer months. This may occur at any time of day, and contacts from 1600 PST to 1900 PST are not uncommon. Stations in the southern USA usually benefit the most from this.[3]

Summary

The low band occupancy during scattered 50-Mc. openings is a shame. There is no good reason why more of us can't be aware that the band is open, or that it is likely to be open, when these unusual conditions occur. This is especially characteristic of regions of the Caribbean, Central America and northern South America. In this regard, we can all stand to do a little missionary work.

I am reminded of an instance on January 3 when W6BJI here in Fresno heard VP1PV in Belize, British Honduras on 10 meters asking a VE3, . . . "hey, what's going on with 6 meters?" WB6BJI broke in and told the VP1 in short order. That was a Wednesday, and the VP1 promised to be on 6 the next Saturday, the 6th. (He had a converter, but had to build a transmitter and beam!) On the 6th, he was on the air, and promptly worked into W/K.

50 Mc. is often open; at least much more often than we observe with reportable two-way contacts or verifiable heard reports. But you do have to be on hand at the right times, and so does somebody else, at the right distance, in the right direction! QST

[3] Similar combinations of east-west F_2 and the north-south TE mode have provided extreme DX, even to more than half way around the world. — *Editor*

The Army Loop Antenna

(Continued from page 18)

the military version, Mr. Patterson stated that the military have access to a higher-quality mica capacitor than the average ham, and we have to agree! The loop has been used for over two years in Vietnam with excellent results reported, and because of the inherently high angle of radiation from such an antenna, it is particularly useful in maintaining contact from gullies or ravines where normal whip operation would be impractical.

(Continued on page 152)

Conclusions

For a ham with limited real estate, the antenna has possibilities. However, cost is an important factor when all the considerations are taken into account. The version shown in the photographs cost about $70.00. The 1½-inch-diameter tubing was about $35.00 and the air variables in the matching network about another $30.00. A considerable amount of capacitance is required; C_1 is about 650 pf. for each section and C_2 amounts to about 500 pf. If surplus variables with necessary capacitance could be found, the total cost could be reduced. However, a wire dipole will do as good a job or better, is much cheaper, and can be used on all bands. The loop, because of its small physical size and low resistance, is inherently a narrow-band antenna. It maintained a reasonable match about 10 kc. either side of the match point, but any frequency change greater than this would require rematching. This isn't true of a center-fed dipole with tuned feeders. QST

ARPSC

(*Continued from page 61*)

at the judges' booth. Mobile stations trailed the foot runners and reported the progress of the race. — *K3NYG.*

— • • • —

On Dec. 17, Ulysses, Kansas, was selected as the site for a simulated commercial power failure. This particular area would also be without its telephone system, which depends upon commercial power. WAØNFP moved his station to a hospital and operated on 75 meters using a temporary vertical antenna and a portable generator. Over 25 stations checked into the Zone 11 Kansas AREC Net and all were able to hear WAØNFP. During the test, a 2-meter link was available from Dodge City to Minneola, Copeland and Montezuma. The test was a success. — *KØJDD, EC Zone 11, Kansas.*

— • • • —

Forty-five SEC reports were received for the month of Nov., representing 16,833 AREC members. This is two more reports but 301 fewer members than for a year ago. The following sections reported: Ala, Alta, Ark, BC, Colo, Conn, Del, EFla, EMass, Ga, Ill, Ind, Kans, Ky, La, Me, Mar, MDC, Mich, Mo, Mont, Nebr, Nev, NH, NLI, NC, NNJ, Okla, Ont, Org, Que, SF, SCV, Sask, SDak, SNJ, STex, Tenn, Utah, Va, Wash, WVa, WFla, WNY, WPa. QST

How's DX?

(*Continued from page 91*)

usually get on around 28,560 kc. from 2200 GMT till the band closes, then start up on 14,250 kc. at 0200 or so, week ends only." Traffic work takes precedence over DX hunting at KG6IC, and Don notes that his QSOs with Sixes outnumber any other U.S. call area at least two to one . . . . . KH6BZF reports action by 5W1AS on 28,582 kc. at 0230 GMT or so, also that WA6VOP/KH6 changed his spots to KH6GKI . . . . . ZL2AFZ tells WA1DJG of imminent Chathams hamming, and WA6VVJ solicits your cooperation to assist with plans for a Brunei go . . . . . K6CAA totes a KWM-2, HW-32A and 18-AVQ with him to KP6AP and other Pacific points . . . . . More Oceanian tidbits from literature of aforementioned clubs and groups: VKØIA supplants VKØCR on Macquarie, 14,030-kc. c.w. after 1500 GMT, the latter returning to VK3UG. . . . VK9DR's departure leaves Christmas in VK9XI's 20-side-band charge. . . . Ex-ZK1AR rocks 'em as 5W1AT. . . . PKs 1SH 8YAK 8YBC 8YFE and 8YZZ abound on 20 phone, 1000–1300 GMT.

(*Continued on page 164*)

SOUTH AMERICA — PY2BJH and PZ1AH took turns panicking the 160-meter DX pack in December's tests, firsts for dozens of W/K/VEs. PZ1AH clinched a 1.8-Mc. WAC for DL9KRA, according to W1BB . . . . "VP8IU's transceiver and quad bend my S-meter on 20 and 15 from Argentia island," reports VE7AON. "Robin is G3SFN back home." . . . . YV5AGD hunts rare U.S. counties with the assistance of W5PWG. Neighbors YV5s CIZ and CKR, an OM-XYL team, lugged their NC-200, SB-300, tower and rotary to Valera where WA1FHU finds them happily signing "/1" on c.w. . . . . Volcanic activity deactivates VP8IY and other South Shetlanders for a spell . . . . . *DX News-Sheet* hears that CEs 7DX and ØPG represent Chiloe and Navarino isles on 14-Mc. s.s.b., also that PYØs DX and SP managed two kiloQSOs aboard St. Peter & Paul. Lovely anchorage — seven hours for a landing.

HEREABOUTS — KP4RK files "DXCC²" No. 52, the first from Puerto Rico (see p. 95, November '67 *QST*, and p. 97, October). The world of DX misses Jose's outspoken *Puerto Rican DXer*, a project KP4RK had to abandon because of increased vocational pressures . . . . . ARRL Director W4KFC and W4GF dropped in on ex-CM2SW-CO2SW, pioneer Cuban DX chaser, who now thrives as KP4CRT . . . . . K4TWJ regularly visits the six highest points in Alabama as a microwave engineer. "What QTHs!" . . . . . Northern Illinois DX Association is a new and menacing outfit founded by charter members W9s ARV BZW DWQ GFF GXH JUV LKJ NZM QQN WYB, K9s CSW KYF LUI and VLE. Secretary W9BZW warns, "Expect fierce competition from this group in all pile-ups and DX contests. Excellent coordination of the artillery is obtained via our 2-meter NIDXA channel." . . . . . "Redecorating the shack put me out of business for a while," says long-time "How's" helper W9LNQ. Hope it's not one of those parlor-looking jobs with no DX QSLs on the walls, Bob! W3HNK, another key Jeeves aide, is dripping solder into a new SB-301/SB-401 layout . . . . . Old-time ARRL official W6CIS convalesces from heart troubles with an SR-160 and whip radiator, a fun combination he finds adequate for c.w. WAC these fine sunspotty days . . . . . Between big-gun sessions WA8MCQ has a DX ball with QRP rigs ranging from 0.7 to 20 watts . . . . . WA1FHU feels that the two Ones who monopolized VQ9JW on 7005 kc. December 30th might well brush up on the Golden Rule . . . . . VE3CDP/W9 found southern Illinois good for 120 countries in about ten weeks, "More than I've heard in fifteen years of careful band-watching from various parts of North America." The sport gets rough when the going is tough, so Donald recommends "a glance at the Amateur Code once in a while to keep the whole thing in perspective." . . . . . ZF1ES tells WA5PIF he should be on Grand Cayman for another year . . . . . Griping DX editors gripe DX editor W2GKZ of Long Island DX Association's *DX Bulletin*. Dave says it's a key spot to get the jump on new ones . . . . . VE3DXV/W6 is the first Northern California DX Club member resulting from international ham reciprocity treaties . . . . . Questionnaires circulated by W4PJG among Florida DX Clubbers turned up interesting facts. The organization's operation is 57-per-cent c.w. and 76-per-cent twenty meters. Fifty-three per cent use quads, and average antenna height is 55 feet. As listed in the club's *DX Report*, W4BRB editor, Sikkim, Albania, Tibet, Iraq, Bhutan, Spanish Guinea, Mongolian Peoples Republic, mainland China, Navassa and Clipperton, in that order, are countries most needed by FDXC members. QST

World Above 50 Mc.

(Continued from page 84)

been reported; that between W8PT/4, South Carolina, and VE3BPR. Previous experiences with this shower have been productive, but this year it was a bust, with scheduling stations only exchanging a few forlorn pings and an occasional short burst, especially over the North-South paths. Periods of stagnant weather patterns over much of the country produced periods of localized tropo openings, but no exceptional DX. In the midwest and east conditions were "above normal" for days at a time, but the openings extended only two to three hundred miles, though signal levels were outstanding at times. As noted in the 50-Mc. report, periods of solar activity produced a few auroral openings during early January, but they were not especially significant on 144. (As sure as I write this there will be a major aurora!) Briefly around the circuit, in Nova Scotia both VE1AFB and VE1PL are available for schedules, as is W4WQZ in Tennessee.

The latter has been bitten by the m.s. bug and offers a kw. and stacked Yagis to those who haven't already worked K4EJQ. Thanks to K1HTV, W1VTU, K3CFA, W3BDP, W3GKP, K4EJQ, K4QIF, K4SUM, W4ORH, W8PT/4, WA8VHG, and K8ZEH for reporting. W5GVE may now be contacted at Route 8; 10814 Rick Drive; Waco, Texas 76710.

We have the following tentative schedule for upcoming v.h.f. conventions. The second annual Roanoke V.h.f. Convention is scheduled for July 20–21. WA4LTS will have more on this one later, and the 144-Mc. DXers in the midwest are planning their second annual meeting, to be held in the St. Louis area, during the latter part of August. If you're interested in two, don't miss this one.

432 Mc. continues to enjoy a rapid increase in activity, and rightfully so because our lowest u.h.f. band has much to offer. In Florida, K4NTD at Oakland, says W4TOD, W4ZFO and WB4AKJ are all active on ATV in Orlando, and that W4PAO and WA4NKN are telecasting occasionally. Another active station is K4GYO at Merritt Island, transmitting a broadcast-quality picture, according to K4NTD. The Indiana Amateur Television and U.h.f. Club in the Indianapolis area is quite active with several stations telecasting regularly including K9QYI and WA9TMH. How about more information from you fellows? WB4BPS and WB4CKM at Florence, Alabama, are nearing completion of their respective ATV transmitters.

Mid-winter tropo conditions in the East were surprisingly good. W4FJ at Richmond, Virginia, made numerous contacts with W3RUE and WA2EMB in the 250- to 300-mile range. W4FJ soon will double his present 22-element Yagi stack and wants schedules. At Bristol, Tennessee, K4EJQ wants to keep schedules from his 4600-foot Holston Mountain location, looking especially for South Carolina, Georgia, Kentucky, West Virginia and Pennsylvania. He has three transmitters on 432 including a 4CX250B final. In Kingsport, Tennessee, W4WQZ is active with a varactor tripler and has worked W4NUS and WA4BVW, both North Carolina, recently. W3GKP, Spencerville, Md., claims 5 states with his varactor. Smitty runs a 432.1 beacon when conditions appear favorable. K9GJX says he will put South Dakota on 432 soon. He will start with a varactor and a 32-element collinear array. In Quebec, VE2HW continues his activity with regular tests over a 90-mile path to VE3BDX, who runs 20 watts output. VE2AKF has gone from 30 to 100 watts output and also schedules VE2HW. Those three stations operate near 432.03 nightly after 0100 GMT.

1296 Mc. activity is also reported by VE2HW. He has just finished a 32-element extended collinear made of brass rod elements with aluminum reflectors. The frame is ½-inch weatherproofed white pine, and the elements are mounted through ⅜-inch hardwood dowels glued into the frame crossmembers. His signal source is a 2N706A oscillator with a 108-Mc. crystal, tuned to 432, and a diode multiplier into a 1296 trough line. Even with a multiplication factor of 12, the generator provides a stable 1296 signal for converter and antenna checks. He has loaned a 2C39 tripler to VE2BMQ for tests over a 25-mile path. In the Washington, D. C. area W3AHQ, W4API and W4EXS are preparing for tests, as is K4QIF near Norfolk, Virginia. K4NTD and WA4GHK, both Florida, report building projects also underway.

No 220 Mc. reports were received in the 30 days prior to this writing. QST

It's a Ham's Best Bargain!

Any way you look at it, it costs plenty to be a ham these days. Except for one thing.

ARRL membership—as nearly 100,000 of us can testify—is the biggest bargain we amateurs can get anywhere. As a member, you get your own copy of QST every month—the most complete, authoritative coverage of every phase of amateur radio. You get contests, awards and the opportunity to be a part of the biggest amateur field organization there is. Most important, you have a direct voice where it has counted for more than fifty years in amateur radio affairs. **All for only $6.50.** Why be out when you can be **In?**

THE AMERICAN RADIO RELAY LEAGUE, INC.
NEWINGTON, CONNECTICUT 06111

Please enroll me as a member of ARRL. Enclosed is $6.50 (for Canada and the U.S.; $7 elsewhere) to cover my membership dues for one year and twelve issues of QST.

NAME_____ CALL_____

STREET_____

CITY_____ STATE_____ ZIP_____

(Please see other side of this page for list of available League publications.)

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 box number without identifying signature cannot be accepted.
(3) The Ham-Ad rate is 35¢ 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 10¢ per word will apply to advertising which, in our judgment, is obviously noncommercial 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 10¢ 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 35¢ 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 columns 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.

DAYTON Hamvention April 27, 1968. Wampler Arena Center, Dayton, Ohio, sponsored by Dayton Amateur Radio Association. QSO in person at the nation's foremost radio event of the year. Technical sessions, exhibits, hidden transmitter hunt. Bring the XYL for an outstanding Ladies Program. Join the satisfied participants who return year after year. Watch the Ham-Ads for information, or write Dayton Hamvention, Box 44, Dayton, Ohio 45401.

AUCTION: The largest and most outstanding ham auction in the New York area will be held by the New York Radio Club on Friday, March 8th at 8 P.M. at Hotel George Washington Lexington Ave. and 23rd Street. All are welcome. Our regular monthly meeting the second Monday of each month will not be held in March due to this auction. W2ATT, New York Radio Club.

A.W.A. Historical Radio Meet for old time amateur and commercial operators, historians and collectors. Smithsonian, Washington, D.C. Oct. 5th. Write to W2QY, Lincoln Cundall, A.W.A. Treas., for details.

ROCHESTER, N.Y. Headquarters again for the big Western New York State Hamfest and VHF Conference Saturday, May 11.

MOTOROLA used FM communication equipment bought and sold. W5BCO, Ralph Hicks, 813B No. Federal Hiway, Fort Lauderdale, Florida.

PRE-WORLD WAR I operators will find many of their old buddies are members of the Old Old Timers Club. Pictures and thumbnail sketches will also appear in the coming Bluebook. We welcome all applicants whose first wireless contact was more than 40 years ago but give special consideration to those pre-World War I Pioneers including Charter Membership. Write to W5VA, Secretary of the Old Old Timers Club, P. O. Box 840, Corpus Christi, Texas 78403.

WANT Callbooks, catalogs, magazines, pre-1920 for historical library. W4AA, Wayne Nelson, Concord, N.C. 28025.

TUBES, Diodes and Transistors wanted. Astral Electronics Corp., 150 Miller St., Elizabeth, N.J. 07207.

SELL, swap and buy ancient radio set and parts magazines. Laverty, 118 N. Wycomb, Landsdowne, Penna.

TUBES Wanted. All types higher prices paid. Write or phone Ceco Communications, 120 West 18th St. N.Y. 11, N.Y. Tel: 242-7359.

DUMMY Loads, 1 KW, all-band, $7.95; wired, $12.95. Ham Kits, P.O. Box 175, Cranford, N.J. 07016.

WANTED: 2 to 12 304TL tubes. Callanan, W9AU, 118 S. Clinton, Chicago 6, Ill.

MANUALS for surplus electronics. List 10¢. S. Consalvo, 4905 Roanne Drive, Washington, D.C. 20021.

WANTED: Collins Parts. BC-610, GRC-2, Autodyne, Bethpage, L.I., N.Y. 11714.

HAM'S Spanish-English manual $3.00 Ppd. Gabriel, K4BZY, 1329 N.E. 4th Ave., Fort Lauderdale, Florida 33304.

BEST Offer paid for any piece of aircraft or ground radios, tubes or test equipment. In a hurry? Cash-in-advance arranged. Turn those unused units into money. Air Ground Electronics, 64 Grand Place, Kearny, N.J.

1916 QSTS needed for personal collection. Price secondary. Ted Dames, W2KUW, 308 Hickory Street, Arlington, New Jersey 07032.

QSLS?? America's finest! Personalized made-to-order! Samples 25¢. DeLuxe 35¢. Religious 25¢. (Refunded). Rus Sakkers, W8DED, Box 218, Holland, Michigan 49423.

QSLS. New catalog, 10¢. Filmcrafters, Box 304, Martins Ferry, Ohio 43935.

QSLS "Brownie" W3CJI. 3111 Lehigh, Allentown, Penna. Samples 10¢. Catalog 25¢.

QSLS stamp and call brings samples. Eddie Scott, W3CSX, Fairplay, Md.

C. FRITZ—QSLs that you're proud to send, bring greater returns! Samples 25¢ deductible. Box 1684, Scottsdale, Arizona 85252 (formerly Joliet, Illinois).

QSLS-SMS. Samples 10¢. Malgo Press, Box 373, M.O., Toledo, Ohio 43601.

DELUXE QSLs Petty, W2HAZ, P.O. Box 5237, Trenton, N.J. 08638. Samples, 10¢.

10¢ Brings free samples. Harry R. Sims, 3227 Missouri Ave., St. Louis, Mo. 63118.

QSL, SWL, cards that are different. Quality Card stock. Samples 10¢. Home Print, 2416 Elmo Ave., Hamilton, Ohio 45015.

CREATIVE QSL Cards. 25¢ for catalog, samples, 50¢ coupon. Personal attention, Imaginative new designs. Wilkins Printing, Box 787-1, Atascadero, California 93422.

RUBBER Stamps $1.15 includes tax and postage. Clints' Radio, W2UDO, 32 Cumberland Ave., Verona, N.J. 07044.

QSLS, finest YLRL's, OMs samples 10¢. W2DJH Press, Warrensburg, N.Y. 12885.

QSLS, SWLS, XYL-OMS (sample assortment approximately 9¢) covering designing, planning, printing, arranging, mailing, eye-catching comic, sedate, fabulous. DX-attractive, prototypal, snazzy, unparagoned cards (Wow!) Rogers KØAAB, 961 Arcade St., St. Paul, Minn. 55106.

3-D QSL cards, recognized leader among raised designs. Compliments aplenty! Prized collector's item. Samples 25¢ (refundable). 3-D QSL Co., Monson, Mass. 01057.

QSLS, SWLS, WPE. Samples 15¢ in adv. Nicholas & Son Printery, P.O. Box 11184, Phoenix, Ariz. 85017.

QSLS 300 for $4.35, samples 10¢. W9SKR. George Vesely, Rte. #1, 100 Wilson Road, Ingleside, Ill. 60041.

QSLS 3-color glossy 100, $4.50. Rutgers Vari-Typing Service. Free samples. Thomas St., Riegel Ridge, Milford, N.J.

QSLS-100 3-color glossy $3.00: silver globe on front, report form on back. Free samples. Rusprint, Box 7575, Kansas City, Mo. 64116.

ORIGINAL EZ-IN double holders display 20 cards each in plastic, 3 for $1.00 or 10 for $3.00 prepaid and guaranteed. Free sample to Dealers or Clubs. Tepabco, John K4NMT, Box 198T, Gallatin, Tenn. 37066.

QSLS's: Quality with service. Samples free. R. A. Larson Press, Box 45, Fairport, N.Y. 14450.

QSLS's. Free samples, attractive designs. Fast return. W7IIZ Press, Box 2387, Eugene, Ore. 97402.

QSLS. Kromkote glossy 2 & 3 colors, attractive, distinctive, different. Choice of colors 100-$3.00 up. Samples 15¢. Agent for Call-D-Cals. K2VOB Press, 240 West Kinney St., Newark, New Jersey 07103.

QSLS. Fast service. Free samples, Bolles, W5OWC. Box 9363, Austin, Texas.

QSLS Glossy coated, 100, $2.00. 3 and 4 colors. Samples, dime. Bob Garra, Leighton, Penna. 18235.

PICTURE QSL Cards for your shack, etc. Made from your photograph. 1000 $14.50. Also unusual non-picture designs. Samples 20¢. Raum's, 4154 Fifth St., Philadelphia, Penna. 9140.

QSLS by K1FF, $2.00 for 100. Others at reasonable prices. Samples 25¢ deductible. Box 33, Melrose Highlands, Mass. 02177.

QSLS. Gorgeous rainbows, cartoons, etc. Top quality! Low prices! Samples 10¢ refundable. Joe Harms, WA4FJE/W3COP, 905 Fernald, Edgewater, Fla. 32032.

COLORFUL QSLS. Free samples. WA8NYB Print, Reynard, Cincinnati, Ohio 45231.

EXCLUSIVE QSLS. Picture, custom, standard. Over 250 styles available. Samples dime. K1NCZ Press, 535 Walpole St., Dept. C, Norwood, Massachusetts 02062.

RAISED Lettering QSLs. Ace Printing, 6801 Clark Ave., Cleveland, Ohio 44102.

QSLS. 100, $1.25 and up, postpaid. Samples, dime. Holland, R3, Box 649, Duluth, Minnesota 55803.

QSLS by Jansen, K2HVN, samples 25¢. 860 Atlantic St., Lindenhurst, New York 11757.

RUBBER Stamps, 3-line address $1.50. J. P. Maguire Company, 448 Proctor Avenue, Revere, Massachusetts 02151.

QSLS, samples, 20¢. Fred Leyden, W1NCZ, 454 Proctor Ave., Revere, Massachusetts 02151.

QSLS. Free samples. CBM Printers, 5161 N. Hopkins, Milwaukee, Wis. 53209.

QSLS. 3-color glossy, 200 $6.99 postpaid. Samples 10¢. Gates Print, 317-11th Avenue, Juniata, Altoona, Penna. 16601.

RUBBER Stamps. Return mail delivery, postpaid. Basic price, $1.00 first line, 50¢ each additional line. Request type style chart. Fulton Rubber Stamps, Route 216-A, Fulton, Maryland 20759.

CANADIANS: Want prop-pitch rotor with original motor. Send price and condition to M. Ross, 395 Pleasant St., Truro, N.S., Canada.

FOR Sale: SB-101 and SB-200. Wanted, kits to wire. Heath preferred. 12% of cost, some in stock. Professionally wired. Lan Richter, K3SUN, 131 Florence Drive, Harrisburg, Penna. 17112.

WE buy all types of tubes for cash, especially Eimac, subject to our test. Maritime International Co., Box 516, Hempstead, N.Y.

CASH Paid for your unused Tubes and good Ham and Commercial equipment. Send list to Barry, W2LNI, Barry Electronics, 512 Broadway, N.Y., N.Y. 10012. Tel: (212) WAlker 5-7003.

GOODIES. Cash for Teletypewriters, parts. List. Typetronics, Box 8873, Ft. Lauderdale, Fla. 33312.

WANTED: Tubes and all aircraft and ground radios. Units like 17L, 51X, 618T or S. R388, R390, GRC. Any 51 series Collins unit. Test equipment, everything, URM, ARM, GRM, etc. Best offer paid. 22 years of fair dealing. Ted Dames Co., 308 Hickory St., Arlington, New Jersey 07032.

HAM Discount House. Latest amateur equipment. Factory sealed cartons. Send self-addressed stamped envelope for lowest quotation on your needs. HDH Sales Co., 170 Lockwood Ave., Stamford, Conn. 06902.

INTERESTING Sample copy free. Write: "The Ham Trader," Sycamore, Illinois 60178.

WANTED: For personal collection: Learning the Radiotelegraph Code, Edition 4; How to Become a Radio Amateur, Edition 9; The Radio Amateur's License Manual. Edition 2, 11, 12. W1CUT. 18 Mohawk Dr., Unionville, Conn. 06085.

RTTY gear for sale. List issued monthly, 88 or 44 Mhy toroids, five for $1.50 postpaid. Elliott Buchanan & Assoc., Inc. Buck, W6VPC. 1067 Mandana Blvd., Oakland, Calif. 94610.

WANTED: Tubes, all types, write or phone Bill Salerno, W2ONV, 243 Harrison Avenue, Garfield, N.J., Tel: GArfield Area code (201)-773-3320.

WE'RE Trying to complete our collection of Callbooks at Headquarters. Anyone have extra copies of Government Callbooks 1922-1925 and Radio Amateur Callbooks 1928-1934? ARRL, 225 Main St., Newington, Conn. 06111.

WANTED: Model #28 Teletype equipment. R-388, R-390A. Cash or trade for new amateur equipment. Alltronics-Howard Co., Box 19, Boston, Mass. 02101.

SELL: CQ, QST, Handbooks, old radio magazines, any quantity. Buy old radio gear and publications. Erv Rasmussen, 164 Lowell, Redwood City, Calif. 94062.

NOVICE Crystals: 40-15M. $1.33, 80M, $1.83. Free list. Nat Stinnette, Umatilla, Fla. 32784.

TOROIDS, 88 mh uncased, 5/$2.50. Postpaid. Humphrey, WA6FKN. Box 34, Dixon, Calif.

WANTED: Military and commercial laboratory test equipment. Electronicraft. Box 13, Binghamton, N.Y. 13902.

SAVE On all makes of new and used ham equipment. Write or call Bob Grimes, 89 Aspen Road, Swampscott, Massachusetts, 617-598-2530 for the gear u want at the prices u want to pay.

MICHIGAN Hams! Amateur supplies, standard brands. Store hours 0830 to 1730 Monday through Saturday. Roy J. Purchase, W8RP. Purchase Radio Supply, 327 E. Hoover St., Ann Arbor, Michigan 48104. Tel. NOrmandy 8-8262.

RTTY Channel filters, octal mounted, 2125/2975, $5.95 pair. Special filters for TT/L-2. SASE for information, 88 Mh. toroids, uncased, 5 for $2.50. Herman Zachry, WA6JGI, 3232 Selby Ave., Los Angeles, Calif. 90034.

DAH-DITTER. New integrated circuit automatic keyer. Fully self-completing. Built-in AC supply and keying monitor. Isolated relay output. Completely assembled, ready for operation. Price $34.95. See your distributor or order direct. Free brochure. M & M Electronics, 6835 Sunnybrook, N.E., Atlanta, Georgia 30328.

TOOOOBES. Tranzeesters. New, guaranteed. 6CW4, $1.40; 811A, $4.25; 6146B. $4.00; 6146A, $2.55. Also transistors. Write needs. Free catalog. Note new address. Vanbar Distributors, POB 91-Z, Paramus, N.J. 07652.

WANTED: Electronics Instructor. General ticket indispensable. Theory and workshops. Science. Camp Lake Placid, N.Y. Write Lother Eppstein, 440 West End Avenue (4B), New York, N.Y. 10024.

WANT: Gianinni Microtorque potentiometers. Must be linear taper. Thompson, 5 Palmer, Gorham, N.H. 03102.

DRAKE T4-X. AC-4 combination, new. $350.00. No trades, sry. Larry Wilson, WØKVE, 215-3 De Long Drive, Marion, Iowa 52302.

GENERAL Electric regulated power supply: 1800 volts at .5 amp. G-E model 516E739G1. Varian VA-1302 power supply, 4000 volts, 200 Ma. Best offer. K3ZPN, Box 6001, Philadelphia, Penna. 19114.

HT-44 and power supply, $250.00; SX-117, $225.00; HT-45 and power supply, $275.00; SX-115, $325.00; SR-42, and VFO, $150.00; Gonset Sidewinder, $150.00. All like new condx. W4MVC, 10 Carjen Ave., Asheville, N.C. 28804.

NATIONAL NC-303, 6 meter converter, XCU-27 calibrator, mint condition, $275.00. Utica 650 six-meter transceiver, VFO, mike, $130.00. Richard Ravich, 10 Coolidge Road, Marblehead, Mass. 01945.

CLEARWATER, Florida 33516. Save on new Galaxy MK-2 with AC-400. Richard Leis, W4UHO, 1300 Milton St.

TR-4, $480.00; AC-4, $83.00; DC-3, $123.00; R4-B, $360.00; T4-XB, $360.00; MX-4, $17.50; RV4, $83.00; L-4B, $580.00; W-4, $43.00; factory-sealed boxes, fully guaranteed. Mel Palmer, K4LGR, Box 10021, Greensboro, N.C. 27404. Tel: 919-299-8767.

WANTED: Military, Commercial, Surplus, Airborne, Ground, Transmitters, Receivers, Testsets, Accessories. Specially Collins. We pay cash and freight. Ritco Electronics, Box 156-Q345, Annandale, Virginia 2203. Phone 703-569-5480 collect.

KWS-1, S.N. 1491 and SC-101, each mint, $990 for both. Prefer not to ship. W6WZD, 98 Fairview Ave., Atherton, Calif. 94025.

SELL: DX-60, $55.00; Heath 10-12 'scope, $50.00. Eico 221 VTVM w/probes $10.00. Vibroplex Original bug, $10.00. Three 829Bs, $7.00 each. Martin Huyett, S&T, Rt. 3, #30, Yankton, South Dakota 57078.

HQ-100 Hammarlund receiver. In excint condx. $75.00. R. Will, 1900 Chicago, Minneapolis, Minn. 55407.

TELEPRINTER and radio equipment must be removed by purchase. Also old radio books and magazines. Prices reasonable. Write for list or telephone. Alexander McKenzie, 245 Poplar, Hackensack, N.J. 07601.

MUST Sell: Swan-350, perfect, late model, with 117XC power supply, microphone, manual. $305.00. HD-10 keyer. $18.00. SX-111 receiver, like new, $95.00. 18AVQ antenna. $15.00. Gary Schwartz, Box 523, Azusa, California 91702.

PROP Pitch motors; replace your old rotors with the popular WW II surplus (PPM); supply limited. Small—10,000:1, large, 7,000:1, $30.00 each. F.o.b. California. John Link, 1081 Aron St., Cocoa, Fla. 32922.

SUMMER Camp ham radio instructor wanted, at top N.H. boys' camp. Counsellor and instructor age 19+. Must have General license or higher. We have complete equipment for training and operation. Write to Camp Cody, 99 Park Avenue, New York City 10016. Tel: (203)-226-4389.

JOYSTICK Variable frequency antenna systems solve space problems. Available immediately. SWL Guide, 218-S Gifford, Syracuse, N.Y. 13202.

TUBES new, surplus. (1) 4-250A, $20.00; (3) 4-125A, $15.00 ea. Used, good (2) 4CX-250B, $10.00 ea. (2) 100TH, $5.00 ea. W3HMR, Paul Moffitt, 222 Sharbrook Blvd., Upper Darby, Penna. 19082. CL-94692.

SELL: FW 6N2 Johnson with HP-23 Heath A.C. supply. $110.00. Brand new 16 element 432 Mc. collinears made by I-Beam, with phasing harness. WB4HIP, 1238 Woodcroft Road, Richmond, Va. 23235.

WRL's Used Gear has trial-guarantee-terms. Thor 6-AC/PS, $169.95; G76, $99.95; HW12, $94.95; 650A-VFO, $99.95; Apache, $119.95; Ranger II, $169.95; HX20, $149.95; HA10, $189.95; SX-99, $89.95; SX-122, $199.95. 75S1 $299.95; HQ-170AC, $239.95; 2B, $179.95; NV-270, $139.95. Hundreds more. Free "Blue Book" list. WRL, Box 919, Council Bluffs, Iowa 51501.

SELL: Microwave test equipment, TS-147A (easily modified to "D"), excellent condition, with manual, $85.00. IM-81/UP Standing Wave Indicator, $22.50. WB2PLY, Box 207, Princeton Jct., New Jersey 08550.

FREQUENCY Meter BC-221Q, a.c. supply, $50.00; Knight Grid Dip G-30, factory-wired, $15.00; Clegg 99'er, $69.00; BC-342 A.C. supply, $35.00. All in excint condx. F.o.b. Huntsville, Ala. Kirchhuber, W4NLI, 2804 Broadview Dr., Huntsville, Ala. 35810.

HEATHKIT Cheyenne, AC/Mobile power supplies, mike, excellent condition, make offer. Bob Aberle, Tel: 516-AN5-7036. W2QPP, 33 Falton Dr., Hauppauge, L.I., N.Y. 11787.

ESTATE Of W4LLU. Collins xmttr 32V-2, $110.00; Collins receiver, 75A2, $175.00. W. P. Neal, K4MKC, 5223 Pineland Ct., Richmond, Va. 23234.

URGENTLY Needed: Wanted: Used KW Johnson Matchbox, or James Millen Transmatch. Will take any brand, however. Pse quote price and condx. Tnx. Mike Desforges, WA2HGI, 49 Lake Ave., Melrose, Mass. 02176. (617)-665-7500.

60 Watt 6-meter B&W xmtr, VFO, power supply, 4-el. beam; Intl. Crystal converter to 40 meters, pass band filter, control panel. All for $60.00. Apache xmtr, excellent, B&W low pass filter; standing-wave meter. All for $100. K2GKU, 248-54-54 Ave., Douglaston, L.I., N.Y. 11362.

SELL QSTs. CQs. Send SASE for list. Larry Nickel, K3VKC, 4220 Chestnut St., Philadelphia, Penna. 19104.

FOR Sale: Viking Invader 2000 in mint condition, with manual. Ship US factory cartons. Will include 250-39 TR switch for $500.00. Dr. George Meyer. WA9EUA, 929 Jackson, Oshkosh, Wisconsin 54901.

SB-400, RTTY modified tune position, $300.00; HR10, excellent, manual, calibrator, $50.00; HG-10, excellent, manual, $25.00. WA4IMF, 310 Andover Drive, Lexington, Ky. 40502.

OVERSEAS Bound: SX-111, $125.00; HQ-145AC/Spkr, $200.00; Globe Scout 680A/755A VFO, $50.00; Dow-Key $5.00. Ameco CB2/p.s., $25.00; PCL, $15. All in FB condx. Steven Weinstein. 865 Walton Ave., Bronx, N.Y. 10451.

SELL Hallicrafters T-O keyer with Autronic key. $65.00. Waters compreamp $20.00. Wollensak/3M T-1400 "Monophonic" tape-recorder with two new reels tape. $65.00. Marvin Fein, 151 Rock Creek Lane, Scarsdale, N.Y. 10583.

SELL: HQ110A-VHF, in mint condx. Was won at Hamfest and never used: $265.00. Steve Cruse, 2918 N. George St., York, Penna. 17402.

WANTED: Marine Radiotelephone, Heath MWW13A or similar for 12-volt DC supply. State features, condition and price. Charles E. Rider, WB2ZNT, 62 River Road, Rhinebeck, N.Y. 12572.

COAXIAL Relays, 12 VDC coil, 50 ohm cables, no connectors 0-500 MHZ, 150 watts, new commercial guaranteed: $1.50 postpaid. USA. K8ZES, Sid Emmons, 660 Willowcrest, Galion, Ohio 44833.

WILL swap a "Precision" Model E-400 sweep-marker generator originally costing $189.00, for ham receiver or xmttr. William Taylor, WA1HXW, 27 Shore Drive, Waterford, Conn. 06385.

SELL: Johnson Navigator, 40 watt c.w. Good condition for Novice: $60.00. Bob Novas, WB2YSR. 38 Loretta Court, Englewood Cliffs, N.J. 07632. Tel: (201)-568-9056.

HEATH HO-10 monitor scope, $50: Simpson Model 260 Multimeter, $40: Eico 377 square and sine signal gen., $20; B&W T-R switch, $10.00; National HRO, dial, gear-box and 3-gang condenser, $20; One pair PL 5D22s (slightly used), $25.00; one pair 4CX250Bs (slightly used), $10.00: One pair 4X150As (new), $15.00; Heath Q multiplier, $6.00; Heath Tunnel Dipper, $22.50. All manuals. P. G. Balko, W1KHW, Hillcrest Road, New Canaan, Conn. 06840.

TRADE Deal, fellas? Have Norge refrigerator 11 cubic feet. Must dispose of; going into smaller home. Frank Rodio, WA2GKA, 243 Senator, Brooklyn, N.Y. 11220. Tel: 748-7473.

HEATH HR-10, factory-checked, perfect condx, $55.00. WB2VYI, Mitch Tuckman, 1722 East 16th St., Brooklyn, N.Y. 11229.

FOR Sale: Swan 350, 117XC, MARS oscillator, USB/LSB selector, $400; 4CX1000A, sealed carton, $100; 351D-2, $50; MP-1, $100; HW32, calibrator, mike, $90.00; 30S-1, $825.00; 75S-1, 32S-1, 312B-4, 516F-2, $750.00, KWS-1, 75A4, spkr, $850.00. Cliff-Dweller, 75-40, new, $75.00. James Craig, 29 Sherburne Ave., Portsmouth, N.H. 03801.

FOR Sale: Complete station. HT-32A, SX-101A, SB-200 linear, w/all manuals, D-104 mike and all-band vertical. Excellent condition—will deliver within 100 miles, otherwise shipped freight collect. First check for $500 takes all. Contact J. Lythans, K6VRY, 199 E. La Verne Ave., Pomona, Calif. 91767.

FOR Sale: Eico 753 (with solid state VFO), $195.00; Eico 751 AC supply, $69.00; Eico 717 Electronic Keyer, $45.00. Individually, buy all three for $275.00. Originally cost $469. Will ship prepaid. All new, factory wired. Not built from kits. Factory guaranteed. W2OMM, 85-14 66th Rd. Forest Hills, L.I., N.Y. 11374. Tel: 212-897-5259.

TO settle an estate: Sell Collins 75A4, ser. No. 3175, 3.1 2.1 filters, $450.00; SX-101 MK3A, $150.00; Collins KWM2, Waters Q-multiplier: Collins AC supply, 312B4 console, Collins DC supply, mount and cables, $1000; Collins 310B with turret and supply, $75.00; SX-71 5-band, $100; SP44 Panadaptor, $50; Matchbox, $75.00. All in A-1 shape. Will pack and ship collect on receipt of check. W2BND, Ben Braunstein, 251 Dogwood, Valley Stream, L.I., N.Y. 11580. Tel: 516-VA5-4380.

WANTED: Manual for Harvey-Wells TBS-50D. Will photocopy. K8AAB, Bob Evans, 4994 St. Rte 5, Ravenna, Ohio 44266.

FOR Sale: Heathkit Apache xmttr, $85.00; Hammarlund HQ-110 rcvr, $90; Johnson Matchbox (250 watt), $35.00; Instructograph Code, $20.00. All in excellent condition. Also write for info or coax, relays, odds and ends, ham mags and books, etc. Mike Bailey, 515 Harvard St., Grand Forks, N.D. 58201.

1000 PIV @ 1.5 amp. epoxy diodes, includes by-pass capacitors and resistors. 10 for $3.75 ppd U.S.A. Fully guaranteed. East Coast Electronics, 123rd St. Boniface Road, Cheektowago, N.Y. 14225.

RANGER I, factory-wired, PTT, in gud condx: $100. WB2RJG, tel: 516-CA1-5711.

SALE: Vibroplex Bug, $15; trade new Heath Twoer for Sixer, or will sell for $45.00 including Cush Craft halo and mast. Tom, WB4FOT, 1923 Oxford Cir., Lexington, Kentucky 40504.

TWO Meter transceiver, Hallicrafters SR-42A and HA-26 VFO, in excellent condition, with manuals, $135.00. Ralph Amdursky, W2DFS, 45 Barry Rd., Rochester, N.Y. 14617. Phone 716-266-3312.

WANTED: TM30C Telrex antenna complete with Hardware in operating condx. C. H. Buchanan, W4SEY, 16 Elizabeth Ave., RR 5, Jonesboro, Tennessee 37659. Tel: 477-7189.

URGENTLY need a working WD-11 tube. Have promised as a gift to old friend. Contact W6IBG, 780 Grand Avenue, Pasadena, Calif. 91103. Phone MUrray 2-2915.

ESTATE Liquidation. SSAE brings list quality equipment. Paradd Engineering, 284 Route 10, Dover, N.J. 07801.

VALIANT II Factory-wired. In mint condition: $150.00. Wiley, 1706 Weldon, Ann Arbor, Michigan 48103.

NATIONAL NCX-3, NCX-A, A.c. supply, like new: $250.00. Shipping paid. Eugene Gossett, K4EUH, 762 Maple St., Spartanburg, S.C. 29302.

VIKING 500, in excint condx, spare 4-250, manuals. Will ship c.o.d. guaranteed no bugs: $195.00. NC-303, like new condx. Just aligned. Ship c.o.d. New tubes, manual, $195.00. Ham-M rotor, used one year, complete. Ship c.o.d. $50.00. New Eimac 4-400. $20.00. Never used. L. D. McCreary, 319 College, Franklin, Ky. 42134.

WRITE, Phone, or visit us for the best deal on new or reconditioned Collins, Drake, Swan, National, Galaxy, Gonset, Hallicrafters, Hammarlund, Hy-Gain, Mosley, Waters, SBE, Henry Linear, BTI Linear, towers, rotators, other equipment. We meet any advertised cash price on most equipment. We try to give you the best service, best price, best terms, best trade-in. Write for price lists. Your inquiries are invited. Henry Radio, Butler, Missouri 64730.

SELL: HQ-110A, in excint condx, 24-hr. clock, $200; HQ-100 with clock and speaker, $125.00. In vy gud condx. Must sell both. Paul Renault, WA1DJK/CN8FJ, Box 53, c/o FPO, N.Y. 09544.

HALLICRAFTERS HT-37, HT-41, both in mint condx: $395.00. Hammarlund HQ-180AC, like new, $300.00. Wanted: 4-1000A linear, with power supply. Rudolph Hopkins, Bethel Springs, Tenn. 38315.

WANTED: Johnson 275 watt Matchbox. Write to Charles J. Kronke, W2AXZ, 565 Prospect Ave., Little Silver, N.J. 07739.

WANTED: R-388 or R-390 receiver. Have Gonset Communicator IV 2 mtr., one owner, in very good condition. To trade, plus cash. Ed Yska, K9LUQ, Rte. 5, Box 415, Antioch, Illinois 60002.

WANTED: In excellent condition, Gonset G-76 transceiver with 12 VDC supply, also 455 Kc. Panoramic Adaptor and Collins receiver 75A1, 75A2 or 75A3. Nick Fotiadi, WA9-UDF, 654 North Pine Ave., Chicago, Illinois 60644.

TRADE complete KW for cash, SB-101 or like. Converted RCA SSB-1 transceiver with manuals, linear is 4-400As with spares. All in double bay commercial console. K1NXC/9, R. O. Swan, 461B Nicholson Road, Fort Sheridan, Illinois 60037. Tel: 432-1819.

CARDWELL PL-8013, Variable capacitors, 50 to 1500PF, 0.030" spacing. Ideal for that linear. Brand new, $27.50 postpaid. Supply is limited. Slep Electronics Co., Drawer 178O, Ellenton, Florida 33532.

FOR Sale: Drake TR-3, AC3 p.s., speaker, linear systems. HO-DC supply; Shure P-T mike, all for $375.00. Dow-Key 117V relay, $3.00. Two corner ceiling enclosures for 12" speakers, both $18.00. D-104 mike. Needs work on it, $10.00. H. Cushing, WB6CQG, 5224 Bobbie Ave., San Jose, Calif. 95130.

SHACK Cleanup! HT-37, $185.00; Heath MR-1 with a.c. supply, $60.00; SX-99 with R-46, $60.00; Scot 680A, $30.00; Johnson SWR Mtr/Bridge, $15.00; Lafayette HA-90 VFO, $15.00; Lafayette "Precon" presel.-conv. (less xtals), $20.00. Sry, no shppg! Details write to K4JBJ, 403 E. College, Griffin, Georgia 30223.

A Must for every ham shack: a 9½" x 10½" conversion chart for making your clock a 24-hour clock, reading time at a glance. .75 P.O. J. F. Siemietkoski, 3039 E. Thompson St., Philadelphia, Penna. 19134.

SELL: Collins 75S-3B, 32S-3, 516F2, 30L1, all in mint condition. Will not split up, sry. First $1425 takes all. W2PBJ, 6289 Glass Factory Road, Marcy, N.Y. Tel: 315-735-9149.

BUY my NCX-3 and NCX-A (in original condition and cartons) and receive a UG8D-104 microphone, headphones, SWR meter, bug, and all manuals free. I will pay the shipping. Absolutely in mint condition. $225.00. WB2Y, O. A. (D. Christopher Only), 2242 East 13 Street, Brooklyn, N.Y. 11229.

WANTED: Parabolic dish for radio astronomy and 1215 moonbounce. Bill, WA9PWR, 509 Fifteenth Ave., Green Bay, Wis. 54303.

QUITTING Radio! SX-117, HA-10 Tuner, headphones, perfect, $250.00. Knight T-150A with key, $75.00; Ameco CB-6, $10.00; PS-1 supply, new, $10.00. Hy-Gain 6-meter halo, $8.00. Brader, Rte 2, Box 196, Silsbee, Texas 77656.

WANTED: Spare pair of 4-400 tubes for my Thunderbolt. K8UZX, Washington, W. Va. 26181.

FOR Sale: Like new, make offer: RCA-WR36A dot-bar generator, WR61B color-bar; Heathkit CTI condenser checker, TV field strength meter, TV sweep generator, Kay Megaliguer (TV Marker). Hunter, 252 Jefferson Heights, Catskill, N.Y. 12414.

FOR Sale: Make offer in your 1st letter: Johnson T-R switch 250-39; DB20 Preselector; BC-348R, 24 hour clock, Precision sig. gen. E-200, Sylvania CRT 5BP1, Century tube-tester SS-1, Hallicrafters SX-42, Knight xmtr 50W, Heath Kits, Audio gen. HG-8, RF gen. SG-8, capac. tester CT-1, linearity pattern gen. LP-1, Eico 'scope 460, 'scope 425, Modulator 730, battery eliminator 1050, sig. gen. 377, tube-tester 625. W2UGM, 66 Columbus Ave., Closter, New Jersey, 07624. Call 201-768-1884.

COLLINS 30L-1, one year old, immaculate with four new spare Waters hi-power tubes: $375.00. Want: Heath monitor 'scope, Shure 444 and Collins MM1 and MM2 mikes; 51S-1 or gud gen. cov. rcvr and electronic bug. Ashton, W1WNY, One Dew Lane, Darien, Conn. 06820. Tel: 203-655-9997.

SX-117, $250.00; HX-10, $250.00; HE-30, $40.00; T-60, $35.00; Gotham Triband 2-element quad 100 ft. RG/8U, $25.00; Vanguard 401 6M converter, $15.00; BC-458, new, $10.00; Hy-Gain V-18 vertical 20 ft. R/G8-U, $10; Hi-Par 5-el. 6M beam, 75 ft. R/G8-U, $15.00. WA5MZD, 915 E. Ave. L, Silsbee, Texas 77656.

HALLICRAFTERS SX-117, WWV and complete 10 mtr. xtals, like new, $175.00. First come, first served. Alan Kogerup, 324 Crestwood Drive, Roselle, Illinois 60172. Tel: 312-894-1328.

(2) EICO sweep/Marker generators, $368.00; Knight Flyback checker, Paco in-circuit can checker, Soundex Auto Radio (1964 Rambler). Swap for SWL equipment or sell. Dereck H. Rout, 1347 East St. North, Glendale Hts., Illinois 60137.

BECKMAN Counters, Transistor 6147 50 Mc. (will cover 6M.) $1000; No. 7370 tube, 10.5 Mc, $600. No shipping, sry. Swap for Swan 500, Galaxy V, Linear, WA6TFP.

SALE: Eico 720, Heathkit HR-10 with xtal calibrator, Heathkit HG-10 VFO. Complete with manuals: $125.00. WA1EUG, 295 Union St., Manchester, N.H. 03103.

DRAKE 2B with speaker, in excellent condition, $175.00; Seneca VHF-1 (has been used only on 6 meters), $70.00; Tapeton XC50 (6 meter converter, 14-18 MHZ I. F) with power supply. Needs xtal, $20.00. All with manuals. Buy all $245.00. Ken Mathis, 9863 Monte Vista, Montclair, California 91763.

MUST Sell: Drake TR-4 transceiver, AC-4 AC supply, new in carton, Best offer within ten days after ad appears; over $500 takes it. Stan Buckwalter, K2APL, 139-18 Pershing Crescent, Briarwood, N.Y. 11435.

HALLICRAFTERS HT-32A, SX-101A, HA-1 T-O keyer, with Vibroplex, like new, $650.00. W9CRP, Herbert C. Stamats, 21112 Brookview Drive, Warsaw, Indiana 46580.

COMPLETE station priced to sell: 75S-3C, 312B-4, 32S-3, 516F2, late Henry 2K kilowatt Matchbox with indicator, complete 70 foot tower, with Ham-M rotator, Mosley TA-36; all gear in like-new condition. For details write or phone Mel Marsley, 1242 Stevens Avenue, Kalamazoo, Mich. 49001. Phone: 3428838. Area code 616.

SELL: HW12A, HQ-110C, AF-67, HB power, RME DB-23 Preselector, Reasonable. WA4FCA, 1703 Jones Drive, Albany, Georgia 31705.

WANTED: Commercial and Military Test Equipment, Waveguide and Coaxial Components by Hewlett-Packard, Tektronix, General Radio, Measurements, and others. Tucker Electronics Company, Box 1050, Garland, Texas 75040.

KNIGHT R-100 receiver, accessory speaker, in excellent condition: $75.00. John Taylor, WA4IDLQ, 3613 Floral Dr., Nashville, Tenn. 37211.

SX-62, $119.00; 2-meter Lunchbox, $29.00; DC pwr. for Lunchbox, $7.00; 6 & 2 Converter, $29.00; Heath AA-50 stereo amp, $39.00; Precision sig. gen. 90 kc. 120 Mc., $19.00; Collins speaker for 75A series, $12.00; Johnson T-R switch, $12.00; Heath condenser checker, $9.00; sig. tracer, $9.00. Chuck Camp, KØIFT, RFD Box 40, Peyton, Colorado 80831.

HAMMARLUND HXL-1 linear 1500 watts P.E.P. with 2 new tubes, $195.00; Collins 75S-1 receiver, immaculate, $280.00; homebrew 4-1000A linear, $195.00. Drake 2B mint condx, $165.00. Foy Coble, WA4LXX, 251 Collier Ave., Nashville, Tenn. 37211.

EXCEPTIONAL Swan 350, immaculate, including AC supply, and Astatic 335 H microphone, $385.00. J. E. Taylor, K5PAC, 105 N. Marjorie, Osceola, Arkansas 72370.

HALLICRAFTERS SX-140, Eico 720, Heath HG-10 VFO. $150.00. WB2QVY.

GOVERNMENT Amateur Callbook for 1924 wanted. K2NP, 926 Woodgate Ave., Elberon, N.J. 07740.

KWM-2, 516-F2 AC power supply, Jones Micro-Match and VSWR meter; D-104 mike and 505C mike and speaker. All brand new condition. Jerry Morris, WIJYE, 303 Southwick Road, Westfield, Mass. 01085.

GROUNDED Grid filament choke, 30 amps., $4.00; plate choke, 800 Ma., $2.00 pp. William Deane, 8831 Sovereign Road, San Diego, Calif. 92123.

COMPLETE Mobile station: Swan 350, linear systems 500-12 p/s, Lancer 1000 ant. with coils 80-10 meters. Excellent condx. Approximately 3 hours operating time. $520.00. Fred Fontana, K2RYH, Van Etten, N.Y. 14889.

HQ-170: Perfect physical and electrical condition. Guaranteed 90 days. $165.00. Professional looking, solid homebrew KW amplifier, two 813s, four Simpson meters, extra heavy p/s, $200 in parts alone. $150.00. Write K2IRO/1, Singleton, 318 Pearl Street, Burlington, Vt. 05401.

FOR Sale: Swan 350 transceiver, $300; 14-117XC power supply for 115V and 12VDC w/cables, $75.00, in original cartons. Used less than 20 hours. Lt Col T. Jones, 86 Wing Road, c/o APO New York 09845.

SELL: Hammarlund station: perfect condition. HX-50 transmitter, HXL-1 linear, HQ-180A receiver, with matching speaker (11 x 12 x 9); complete with cables and manuals. Will ship in original cartons. Also Electro-Voice Model 664 mike; Waters load, wattmeter Model 334: Heath monitorscope, Model HO-10. Best offer. KØFYM, Schloesser, 1914 Warner Court, Topeka, Kansas 66604.

SELL: NC-188 receiver, vy gud condx. $59.00. WAØKNP, 902 15th St. S., Benson, Minn. 56215.

LAFAYETTE HE-74 VFO, latest model, like new condx., $30.00. A. Wilson, Box 392, East Brewster, Mass. 02640.

SX-100, gud shape; $110.00 or will swap on Heath singlebander. WA5ERC, 154 Ronald Blvd., Lafayette, Louisiana 70501.

COLLEGE: Collins 75A-1, $160.00; Hallicrafters HT-37, $225.00. Almost new. Johnson T-R switch, $15.00. WB6NCJ, 5882 Midwick, Fresno, Calif. 93727.

GOING SSB: DX-60, matching HG-10 VFO, S-118 rcvr., enclosed speaker, antenna relay, all cables, crystal, lot: $150.00. WA9SXE, 208 S. 8th St., Goshen, Indiana 46526.

SELL: Collins CF-2 carrying case, $35.00; MP-1 supply, $80.00, 351D-2 mount, $50.00. All in gud condx. Fred Rouse, W2PRX, 316 College Ave., Ithaca, N.Y. 14850.

HEATH Apache, $120.00; SB-10, $70.00; SB-610 monitorscope, brand new, $65.00. All in excellent condition. WA3HPF, Jeff Wagner, 3302 West Lake Road, Erie, Penna. 16505.

SELLING Surplus: (2)DX-40s, (2) 755A VFOs: SX-71, SX-99, DX-100, SB-10 (2) xtal cal. Make offers. WAØNJS, Wayne Groff, Lake Park, Iowa 51347.

SELL Or trade Valiant for receiver of equal value. WAØFGV/Ø, Box 434, Rushville, Nebrasko 69360.

SR-160 with DC supply, cables and brackets. Used very little, $250.00; TA33SR, $65.00. Two Cush Craft big wheel 2 meter ant. Both: $10.00. W1CIB, Star Rte., Bristol, N.H. 03222.

CLEANING House: Reasonable offers accepted. New transmitting tubes, Raytheon 4D32, RK-65, RK-803, RK-28A, RK-813, RK-48A, RCA-810; 3B-28, 3B-24, Miscellaneous meters including precision type Weston 0-150 AC Voltmeter, Model 496; Laboratory Model 1 0-150, 0-1500 DC milliamter. High voltage filter condensers, low resistance plate transformer and chokes. Send card offer for above and other needed items. W2CUZ, D.B. Whittemore, 36 Masterton Rd. Bronxville, N.Y. 10708.

COLLINS 75A-4 with .5/2.1/3 filters and Panadapter, $450.00; 75A-3 with .8/3 filters $250; Valiant f/w $145. HA-1 and siamese paddle, $50.00, Dumont 'scope, $35.00. KW linear with spare 813s, manual, etc. $125.00. All guaranteed. F.o.b. Cincinnati. College forces sale. Malcolm Montgomery, 3414 Telford Street, Apt. 1, Cincinnati, Ohio 45220. Tel: 513-281-1046.

NCX-3, excellent condition, HP-13, mobile P.S. Home-made fixed P.S. New-Tronics 20 and 40 M. bumper mount. All cables, $230.00. Irwin Wallman, W3HDD, 40 Stoner Ave., Great Neck, N.Y. 11021. Tel: 516-466-3152.

MY Drake 2B for sale: $160. Lampkin 105-B freq. meter, $210.00. A. L. Albright, 1524 Dean St., Sulphur, La. 70663.

HAMMARLUND SPC-10 wanted. W2ADD.

CLEANING Out: Drake DC-3, $85.00; Two'er, $28; Vibroplex Original, $9.00. All are in gud condx. K8HJM, Spicer, 334 N. Miami St., Trenton, Ohio 45067.

HEATHKIT Novice transceiver HW-16, perfect, $90. 75A4 Ser. 3481, excint, $360.00. R-388 (5113) less cabinet, $225.00. Eldico SSB100F, $225. Keller 514 Stevens Rd., Morrisville, Penna. 19067. Phone 295-2564.

HAVE Following, mint condx: Hallicrafters SX-73 with 2.1 Kc Collins filter, originally cost $975.00; CV-89A; 19ASR teletype complete (1964 model); P&H 2-150; new Heath 10-10; many other items. Want: Early S/Line, KWM-2, SB-101 or what have you? Edward Lowell, W4CRS, Box 215, Plains, Georgia 31780. Phone (912)-824-6795.

HALLICRAFTERS SR-150, 2AC supplies, DC supply, 2 mobile mounts. Will accept first reasonable offer. WAØEEG, 1036 So. Gilpin, Denver, Colorado 80209.

DRAKE TR-3, AC and DC supply, speaker, like-new condx. $575 takes all! Prefer to sell within 50 miles radius Chicago, or you pick up. W9YWX, Karl E. Luckhart, 123 Roy St., New Lenox, Ill. 60451. Tel: AC 815-485-6368.

FOR Sale: HW-12A, complete, with calibration oscillator and AC power supply: $125.00. Chester F. Bass, K100L, ARS, 59 Garfield Ave., Hamden, Conn. 06517.

SELL: Collins 75A4 serial No. 3079, vernier dial 3.1 kc filter, with Hallicrafters R4S spkr $300.00; Drake TR-3 serial No. 597 with AC-3 power supply, and spkr, $325.00. All equipment is in excint condx. Loyal King, W4GOX, Rte. 2, Box 151, Adamsville, Alabama 35005. Tel: 788-0144- B'ham.

BARGAINS for quick sale! GSB-100 exciter, $125.00; Drake 2-B and 2AQ, $150.00; both together, $250.00. Also Heath HW-12 for $75.00. Can't ship the exciter, sry, but will deliver within 100 miles. Other units postpaid U.S. Nickerson, W1RWD, Box 1832 New Haven, Conn. 06508.

SELL: Like-new Globe double sidebander DSB-100; also SSB 1 Kw rig, pair of 813s with W2EWL exciter, best offer. Tel: HA-7-4544. W2NBJ 113 Buttercup Lane, Huntington, L.I., N.Y. 11743.

OSTS: 1937-1966, 3 for $1.00 Ppd. COs, 1948-1966, 4 for $1.00 Ppd. Stamp for list. John Tate, W3FYW, 9 Diane Drive, Malvern, Penna. 19355.

WALT'S Best Brass, Nylon, Stainless Steel threaded, washer hardware. Extra-long fasteners our specialty! Stamp for lists. Bargains! W8BLR, Walt, 29716 Briarbank, Southfield, Michigan.

FOR Sale: 40 foot crank-up tower, $50.00; Hy-Gain TH-3 Triband Beam, $50.00. Gutman, 531 Edmands Rd., Framingham, Mass. 01701.

DISCOUNT Prices: Time payments, big savings on new equipment in factory sealed cartons with full warranty: Swan SW-500C, $445.00; SW-350C, $365.00; SW-250, $286.00; National NC-200, $315; NCL-2000, $595.00; Galaxy V, Mark II, $365.00; Drake R-4B, $375.00; T-4XB, $375; L-4B, $595; Ham-M rotator and indicator, $99.95. All equipment new, full warranty, factory-sealed cartons. Time payments on any purchase. No finance charge if paid within 60 days. Write for discount prices on Hy-Gain, Mosley, Tri-Ex, Hammarlund, New-Tronics, SBE. Immediate delivery. Reconditioned specials: 2-B, $189.00; NCX-3, $199.00; 32V-2, $99.00; 75A-1, $129.00. Send for list. Bryan Edwards Electronics, 1316 19th St., Lubbock, Texas 79401. Phone: 806-762-8759.

COMPLETE Station: 32S-3 w/p.s. 75S3B, 312B4. Henry 2-K, Johnson Matchbox, Astatic T-D mike with p-t-p stand, Codax keyer, 4-el. Fiberglas quad, TR-44 rotor, $1700 f.o.b. W9-NMK, 1416 W. St., Mishawaka, Ind. 46544.

SELL: Johnson 250-watt Matchbox, asking $40.00; VHF-126 converter, 6,2, 1 ½ meters, 7 Mc. output. Asking $100. C. K. Loomis, 4328 State Road, Saginaw, Michigan 48603.

HORNET TB500B Tribander beam, brand new, $60.00. Express collect. WB6MCK, Rte. 2, Box 1941, Escondido, Calif. 92025.

SELL: HW-32A and HP-23, In mint condition. Engineer-constructed. $125.00 f.o.b. K7YBF/W8MQU, 1325 Avenida Regulo, Tucson, Arizona 85710.

WANTED: HT-44, 32S-1, and a 75S-3. Must be mint condx, reasonably priced, with manuals. WA6JWK/4, 2304 N. Florida St., Arlington, Virginia 22207.

SX-115 $325.00; HT-32, $275.00; 75A4, ser. No. 3066, 3 kc. and 500 cycle filters and vernier dial, $450.00; SX-146, $150.00; one owner, in excint condx. W9PKW, 818 Solar Lane, Glenview, Illinois 60025.

FOR Sale: NCX5-1, calibrator, NCS-A, matching platform w/swr meter, clock, $475.00; Turner 250 mike, $15.00; 14AVQ, 14RMQ, 100 ft. RG5/8-U, $30.00; Loren Lafferty, WA6OIP, 5624 Broadway, Sacramento, Calif. 95820.

SELLING Complete station: college-bound! DX-60A xmtr, HG-10 VFO, HA-350 rcvr, 200w, 811-A linear, keyer, crystals, accessories. Excint condx! Asking $190.00. Write for details. Charles Sheeter, WA2AKC, 366 Marie Ct., East Meadow, L.I., N.Y. 11554.

FOR Sale: Hallicrafters SX-101A, Mark II rcvr. Guaranteed in unused condx. Highest bid received by April 15, 1968 will be accepted in case dup. bid, first one gets it. Heathkit Seneca, in gud condx, also up for bid. Contact Charles Ormsby, 6 Driftwood Lane, Weston, Massachusetts 02193.

HEATHKITS HR-10, $50.00; DX-60, with Novice xtals, $65.00. Will sell as unit: $110.00. Apache, $110.00. Stanley Mitchell, 14 Grace Ave., Plattsburgh, N.Y. 12901.

CRYSTALS Airmailed: SSB, Nets, MARS, Marine, etc., Novice .05% crystals $1.50. Custom finished etch stabilized FT-243 .01% any kilocycle or fraction 3500 to 8600 Kc. $1.90 (Five or more this range $1.75 each), (nets, ten or more same frequency $1.45). 1700 to 3499 and 8601 to 20,000 $2.75 with overtones supplied above 10,000. 10,001 to 13,500 fundamentals $2.95. Add 50¢ each for .005%. Add 75¢ each for HC-6/u metal miniatures above 2000. Many ARRL publication builders crystals, groups or singles. Be specific. Write for order bulletin. Crystals since 1933. Airmail 10¢/crystals, surface 6¢. C-W Crystals, Marshfield, Missouri 65706.

TAPETONE 2 mtr. converter, $25.00. Henry P. Ingwersen, PAØAFN/WI, Box 87, Topsfield, Mass. 01983.

NCX-5 Mk II and NCX-A. Approximately 50 hours. $545.00. Also, Heath Mohawk, in excint condx, wiring, etc. $135.00. John Richardson, K8SQM, 321 Aurora, Hudson, Ohio. 44236. Tel: 216-653-5350.

ANTENNA: Hy-Gain 18HT high tower vertical, $75.00. Complete, less legs (in concrete) plus you pay post from Philly, Penna. WA3AIL.

CONTEST Winning NCX-5 Mk II, NCX-A, XCU-27 calibrator, absolute mint condx, one year old. Paid $825.00. Will sell for $525.00. GSB-101 linear, mint condx. $150.00. Take both for complete KW station: $650.00. TH-6-DX beam, TR-44, etc. Write for details. All inquiries answered. Please help pay for college. Tom Bergan, K9DVZ, 1506 Woodmont Drive, South Bend, Indiana 46614. Tel: 219-291-4528.

UPGRADE YOUR LICENSE! All new Posi-Check for new Extra Class and Advanced Class Licenses. Multiple choice questions, diagrams, explained answers, IBM sheets. Same form as FCC exams. Study and test yourself. Around 300 questions and diagrams in each. Each set complete in itself. Many basic questions appear on both where they apply. Also General Class Posi-Check, revised to conform to new terminology. General Class $3.25, Advanced Class $3.50, Extra Class $3.75, third class postage prepaid. For first class postage add 26¢ each set. 54¢ for air mail. Send check or money order to Posi-Check, P. O. Box 3564, Urbandale Station, Des Moines, Iowa, 40322.

CLEGG 22'er, $180.00. WA5HTS.

STOLEN! Collins KWM-2 transceiver, Ser. No. 12068, with PM-2 power supply; Collins 75S-3 receiver, Ser. No. 12885. Reward! Skip Jackson, WB6WCZ, 6833 Armour Dr., Oakland, Calif. 94611.

SELL: 200V in excellent condition, by original owner. Manual and orginal shipping carton. A remarkable transmitter. All iquiries will be answered. Hays Sneed, W5RY, 4049 Berkley Drive, Jackson, Mississippi 39211.

HAMMARLUND HQ-180: National HRO-60 with 13 coils and calibrator. Both perfect. Sell one $200 or best offer. Virgil Pfeifer, 1605 Gilbert, Peoria, Illinois 61604.

ALL In excellent condition: Valiant, factory-wired, $250.00; NC-300, calbrator and speaker, $225.00; MM-2 Wave Analyzer, $55.00. Johnson 275-watt coupler; $45.00. Heath AM-2 Reflectometer, $10.00. W5LZL, 500 Cliffside Drive, Dallas, Texas 75080. Tel: 214-231-3895.

IMPRESSIVE Executive style ham stationery. Inexpensive. Write K3GWD Press, Harry Veon, RR 2, Wampum, Penna. 16157.

EICO 753 SSB transceiver, HB power supply, $180.00; Eico 460 'scope, $80.00; HB transmitter, AM modulator, VFO, 80 W, $35.00; 2 signal gens 2 tube-testers, multimeters, RLC Bridge, other misc. test equipment. Contents of large spare-parts collection offered very cheaply, including tubes, sockets, resistors, capacitors, controls, meters, much more. Will sell as lot or separately. Write or call for details. Al Goldstein, WA2ITQ, 245-30 Grand Central Parkway, Bellerose, New York 11426. Tel: 212-428-8103.

VIKING Ranger, push-to-talk. Used less than 20 hours. $190.00. NC-98 rcvr, built-in side-tone generator, $60.00; Gonset Super 12 conv., $15.00; Morrow 5BRF 10-80 meter converter, $10.00; Gonset Super Six, $10.00; surplus crystals, $1.00; Dow DK-60 coaxial relay, $6.00; Lafayette bug, $7.00. SWR meter, $10.00; Drake TV-1000 low-pass $5.00. Push-to-talk mike base, $10.00; Lafayette HE-50 10-meter transceiver with VFO, $60.00. R. D. Connor, W1ZQP, 47 Bedford Dr., No. Grafton, Mass. 01536. Tel: 839-6054.

FOR Sale: SB-100 modified with two crystal filters, HP-13 and HP-23 power supplies, SB-600 speaker, $500.00. Marauder HX-10, $200. All are in mint condx. WA2DLX, R. S. Caverhill, Stanley Road, Cazenovia, N.Y. 13035.

GONSET G-66 mobile receiver, 6, 12, 115 volts, 6 bands, AM, CW, SSB. Excellent. $90.00. G. L. Anderson, 301-A Talke Hall, Collegedale, Tenn. 37315.

SSB Transceiver, Transistor, tube driver-final. See Dec. 1967 QST. Set of printed circuit boards, $20.00. Boards for other projects. Send for list. Ivan Whitehouse, 16911 S.E. Foster Rd., Portland, Oregon 97236.

WANTED: 1932 Ford Majestic Radio. Manufactured by Gibson and Gruno in Chicago, Illinois. Consists of two metal boxes 6 x 9 x 8 inches (one has a motor generator in it and the other a series of tubes), wooden speaker box and a control head with remote control cables. J. R. Jackson, 21485 Silchester Circle, Northville, Michigan 48167.

HOWARD Radio: 75A-4, serial No. 5591, $395.00; SW-140, $119.00; R4A, $269.00; NC-300, $159.00; GSB-100, $179.00; B&W 5100B w/51SBOB, $195.00; M40, $69.00; M160, $69.00; Bonner 4 w/8 Servos, $240.00; Poly-calls, $29.00. Free list. Box 1269, Abilene, Texas 79604. Tel: a.c. 915-OR2-9501.

SELL: HRO, rack, spkr, coils 1 to 7, power supply, and rcvr. Section. Good operating condx. Best offer. K1OQX, 420 Willard Ave., Newington, Conn. 06111.

FOR Sale: Transistor TV camera (AT.V. XT-1A) with separate p/s and extra 1" Vidicon. $95.00 f.o.b. C. A. Weed, WA1BDJ.

COLLINS 75S3-B, 312B-4, 32S-3, 516F-2, cables, manuals, factory cartons, all like-new, sell for $1,100 or your best offer. Eugene J. Berenz, K9ZPJ, 4542 N. 105 St., Wauwatosa, Wis. 53225. Tel: 414-466-2184.

75A1, mint, $150. Pick-up deal only, sry, Lafayette Precon, $25.00. WB2AXH, 94 Brittle Lane, Hicksville, L.I., New York 11801.

KWS-1 in top shape, no alterations. This is top-flight SSB-KW but haven't used it twice in 5 years and I am going to sell it to best cash offer in 30 days or less. Will ship. Also G-E 30 to 54 Mc. FM xmtr, 500 watts to PR 4-125; complete in 6 ft. cabinet, with meters. $350.00. 3 Kw diesel power plant, 1200 rpm for continuous duty. 230/115 VAC. W9DSV, Box 87, Webster, Wis. 54893.

SELL: Perfect Novice station: Collins 75A-1 rcvr, Homebrew 30 watt Handbook xmtr. Coax switch, $175.00. Will consider breaking up. Adam Kerner, Ex/WN2ZTL, 25 Crescent Rd., Great Neck, L.I., N.Y. 11021. Tel: (516)-466-8927.

NATIONAL NC-270 receiver. Excellent condition. 80-6 mters, c.w., A.M. and SSB with Hallicrafters R-47 communications speaker: $160.00. G. L. Lipper, WB2AFX, 3688 Jules Lane, Wantagh, New York 11793. Tel: (516)-PE1-0722.

ESTATE Sale: K7AX. DeLuxe Hallicrafters demon. station; SR-2000 w/P-2000 power supply; HT-46 and SX-146 combo; SR-42A w/HA-26 VFO; HA-1 keyer; R-51 spkr/clock; 14AVQ and 18AVQ verticals; TH6DX beam; Ham-M rotator, many other accessories. All items new or used less than 6 months. Manuals and original shipping boxes. Sell as package or individual items. Write for complete list and prices. Bruce Duncan Estate, 517 Dexter Avenue N., Seattle, Washington 98109.

TOROIDS: 88 mhy, unused, center-tapped, 5/$1.50 postpaid. Heath DX-60A, new, $55.00; matching HG-10 VFO, new, $20. 3 head Tee-Dee with sync, $50. Johnson 250-39 TR, $18.00; Johnson Valiant, $125.00; CDR AR-22, $20.00; Eico 495 calibrator, $7.00; Eico 753 transceiver with p.s., $160.00; National NCX-3 transceiver, $165.00. RTTY page-printer paper, $5.50/case. Wanted: Clegg 22'er, Gonset Communicator for 2M, Twoer, Matchbox, NC-300, Ham-M. Stamp for list. Van, W2DLT, 302Z Passaic, Stirling, N.J. 07980.

WANTED: Collins 51J-4. Will swap Nikon F Photomic with F:1.4, 58 mm lens, F:2.8, 35mm W/A lens, 105mm F:2.5 lens; also Nikon SP with 35mm w/a lens, 135mm F:3.5 telephoto lens. Camera equipment in mint condition with little use. W. J. Garrett, 1114 Ossington Avenue, Flint, Michigan 48507. Phone 313-233-6449.

SAVE On new/used National-SBE-Ameco; callbooks. Jackaloupe Engineering, Box 1054, Laramie, Wyoming 82070.

FOR Sale: Jones SWR meter, B&W low-pass filter, Mark heliwhip and base; Heath HO-10 'scope, 08 'scope sweep generator audio generator electronic switch. Intercom variac 500 watts, also other things. Send for list and prices. Edward Schofield, 301 North 3rd St., Lantana, Florida 33460.

NEED 500 microsecond sonic on magnetic delay line or what have you? Louis Patla, 1357 Ocean, Santa Monica, California 90401.

NOVICE'S Sale: Gud condx: DX-40, $35.00; VF1 VFO, $10.00; Mint condx, HA-350, $115.00. Write WA3HLI, 805 Indiana Ave., Monaca, Penna. 15061.

FOR Sale: HRO-60, 80-6 meter coils, speaker, $249.00; CE-20A, deluxe 80-10 VFO, $110.00; P&H 600A 6-meter transverter, $15.00; Elmac AF-67, $39.00 or you make offer. F.o.b. WA4TNU, George Reeves, Rte. 4, La Grange, Georgia 30240.

75A-4, serial No. 5640; 3 mechanical filters, $475.00; Eico 460 'scope, $75.00; Sony 464-D tape recorder, $75.00; Viking Invader 2000, $450.00. All one owner, with manuals. O. C. Lindsey, W5OBX, 1919 Ramada, Houston, Texas 77058.

DRAKE TR-4 with a.c. power supply, never used! In original carton. Ameco output meter, Electro-Voice microphone, complete station $500.00. First check gets it. K9AGN, S. Derighter, 403 Sunset Dr., Wilmette, Illinois 60091. Tel: AL6-1504.

WANTED: Johnson or Heathkit SS-B adapter. K2KKU. Tel: (914)-668-3677.

SELL: HT-37, Mohawk RX-1, $300 pair, or will sell separately. Both factory reconditioned summer 1967. Both perfect. WA9-AUM, Box 63, Wiley Hall, Hanover, Indiana 47243.

SX-101A Hallicrafters receiver in perfect condx: $185.00. Charles Clark, 2910 Orchard Lane, Wilmette, Illinois 60091.

KWM-1, matching a.c. supply. Immaculate: $250.00. Charles Jaeger, 436 Bellevue, Oakland, Calif. 94610.

WANTED: Used National Technical Schools FCC license course $3. J. J. Moran, 4205 Arthur St., Hollywood, Florida 33021.

FOR Sale: SX-110, clean, like new: $93.00. Shipping and insurance paid. John, K8TVO, 331 Hillside Dr., Canfield, Ohio 44406.

FOR Sale: SR-150 transceiver and SWR bridge, PS-150 (with p.t. mike) A.C. power supply; PS-12 D.C. power supply; mobile mount Newtronic whip antennas with loading coils for 80, 40, 20, 15 and 10 meters. Package deal only. First best offer. Sry, no breaking up. K1VWI, 140 Glen, New Britain, Conn. 06051.

SX-101 Mark IIIA, and speaker, $140.00 and Lettine, 40 watt xmtr, $10. Both OK. W2LZW.

SX-100 for sale, in excellent condx, for SSB, AM and c.w. reception. First $175.00 takes it. W2TIW, phone: 201-796-2932. 0-52 28th St., Fair Lawn, N.J. 07410.

VIKING Ranger F/W, $110.00. BC-221, $45.00. 250 QSTs 1933-1960: $30.00. A. Urquhart, 198-26 Epsom Course, Hollis, L.I., N.Y. 11423.

HEATHKIT MR-1 receiver, in gud condx, $50.00; Homebrew 2-8111A 500-watt linear, w/supply, $80.00; Hy-Gain 40-10 trap doublet, $12.50; Hy-Gain 15-meter beam, $20.00. WA2POY, Kirschner, 274 Michael, Oakhurst, New Jersey 07710.

STATION Sellout: DX-100, HQ-170, NC-88, Viking Matchbox, Heath SWR, Headset, keys, manuals, all mint condx. Guaranteed. $400 takes package. Will sell separately. All inquiries answered. K3ANU, 1305 West Russell St., Philadelphia, Penna. 19140.

WANT KWS-1 and/or 75A-4. Must be in excellent shape. KWS-1 must also be over serial number 1200. Also want SC-201. Name price. Henry, WB2CNA, Tel: 201-327-9090.

SELL: Harvey-Wells TBS-50, CW-AM xmtr, w/pwr supply and 40 mtr. VFO, great condx, $50.00; Heath GR-64 SW and Novice rcvr w/Heath GD-125 "Q" multiplier. Mint condx, $40. Heath VX-1 voice-control $10. $80 takes all. Gone SSB. Mark Franz, WA5SHT, 5107 Harvest Hill Road, Dallas, Texas 75234.

2-METERS. P'ate modulated 500 watts, $125.00. Twoer, $30.00. Gonset III, $140.00. K1MBA, John Templeton, 49 Saw Mill Dr., Wallingford, Conn. 06492.

SALE: Unused (3 pcs): Gonset G-76 with AC, DC supply; Hallicrafters SR-34 transceiver. All clean and in vy gud condx. Also Stenman monitorscope, antennascope, Hentot QF-multp. Write for prices, etc. Mrs. Dan Riordan, 1708 Park Blvd., West Sacramento, Calif. 95691.

SALE: Viking II, with matching VFO and KW low-pass filter: $85.00. Command xmtr, $5.00. F.o.b. K3BYJ, 111 Elm Ave., Morrisville, Penna. 19067.

KEYER Sale: Omega DA digital automatic I.C. keyer (with DA-3 option), $65.00, ppd. In mint condition. WB6YVW, 1755 N. Wilcox, Hollywood, Calif. 90028.

KWM-2, PM2, CC2, excelnt condx. Sale or trade for 32s and 75s/PS. Need separate operation for MARS. K7HRW, 1775 Mill Street, Reno, Nevada 89502.

SELL: Drake 2B, in mint condx, DX-40 with VFO, both in gud condx, sell separately or all for $225.00. Michael Phillippe, RR #1, Versailles, Indiana 47042.

"HOSS Trader" Ed says if you don't buy your ham gear from him, you may pay too much. Limited supply of new equipment in factory sealed cartons, while they last. New Swan 500 Transceiver, Regular Price, $495.00. Cash Price $395.00: One—new Drake TR-4, Serial #26033, Regular Price $599.95, Cash Price $479.00: Package Deal: New Eico 753 Kit 3 Band Transceiver and new Eico 751 Kit AC supply with speaker, $249.00. Cash Price $169.95: New Mosley Classic 33 and Demo Ham-M Rotor, $189.50: New Displayed BTI 2000 Watt Linear, $659.00. Demonstrator Equipment with factory warranty: Demo Ham-M Rotor, $94.50: Displayed Swan Mark II Linear, $495.00: New Demo SB-34, $329.00: Demo Drake T-4XB, $359.00: Demo Drake R4-B, $369.00: Special Rohn 50 ft. Foldover Tower, prepaid: $185.00. Ed Moory Wholesale Radio Co., Box 506, DeWitt, Arkansas 72042. Phone 946-2820.

QSTS 1920 to date: 1920—6 copies; 1954—10 copies; other years 11 or 12 copies. To 1932 mostly torn or missing covers and pages, in poor condition; 1933-1936 half ditto. 1937-1948 about thirteen torn copies per year; 1949 to date good condition. 560 copies, as is, $175.00. CQ: 232 copies 1945-1967 incomplete, good condition, $90.00. Plus transportation. W2ML, 42 Prescott, Garden City, N.Y. 11535.

HAM, over 18, to instruct at a children's camp in the Pocono Mountains in Penna. Own equipment required. Please explain type equipment and further qualifications to Pocono Highland Camps, 6528 Castor Avenue, Philadelphia, Penna. 19149.

SB-300 Heath SSB receiver, with AM filter, $225.00 or your best offer. Includes shipping. M. Pollack, East Larchmont Drive, Colts Neck, N.J. 07722.

Index of Advertisers

AN/FRT-83 { DCA CIR 175-2A } AN/FRT-84
1 KW 10 KW

ISB TRANSMITTERS
FOR FIXED PLANT AND TRANSPORTABLE USE

R F Communications, Inc., a member of the joint venture of Continental Electronics Manufacturing Company and R F Communications, Inc., is under a 3-year multiyear contract from the U. S. Navy, N 00600-67-C-0589, for the production of 1 KW and 10 KW SSB Transmitters. DCA Circular 175-2A, Mil-STD-188B, Mil-STD-108 and Mil-T-4807A (USAF) apply. Four independent sidebands, 2-30 Mc in 100-cycle increments, 1 part in 10^8 stability, remote and local control capability of all functions, multiple transmitter control from one remote unit, —80 DB harmonic suppression, —60 DB carrier suppression, —70 DB unwanted sideband suppression.

RF Communications is the producer of the AN/URT-23 1 KW SSB transmitter; the AN/URA-38 1 KW antenna coupler; the AN/SRA-35, 36, 37 10 KW multicouplers; and the AN/URC-72 1 KW transceiver.

rf **RF COMMUNICATIONS, INC.**
1680 UNIVERSITY AVENUE • ROCHESTER, NEW YORK, U.S.A. 14610

Challenging positions are available to individuals with EE, ME and IE degrees with related backgrounds and interests. There are also career opportunities for Technicians (Lab, Test, Quality Control and Field Service). Write Director of Personnel, Dept. 01. An Equal Opportunity Employer.

WANT *MORE* FOR YOUR MONEY?

It's easy! Just get more of your RF watts into your signal, by reducing the mismatches which turn your precious power into heat instead of S units. Here's how:

1. Use a Millen Grid Dipper with/or an Antenna Bridge, and peak up your antenna system for lowest VSWR at your operating frequency.
2. Insert a Millen Transmatch between your transmitter and antenna feed line.

For top trades or cash allowances, easy terms, and more real value, *all ways*, it will pay you to deal with the acknowledged leader.

73 *Bil Harrison* W2AVA

See you IN NEW YORK at the SINGLE SIDEBAND SHOW

TUESDAY OF IEEE SHOW WEEK

MARCH 19 NOON TO 9

HOTEL STATLER 33rd ST. and 7th AVE.

ALL FREE! EXHIBITS, PRIZES, PRIZES, TECH TALKS

Come see all the newest Ham gear, talk with the factory people, meet old friends, win prizes, etc.

MILLEN QUALITY EQUIPMENT "*Designed for Performance*"®

GRID DIPPER

A most versatile and useful piece of test equipment. Should be in every shack!

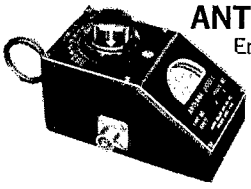
Direct reading calibrated stable RF oscillator, with highly sensitive grid current meter to indicate resonance or RF radiation. Covers 1.7 to 300 MHz (down to 165 KHz with extra inductor/probes). Works on AC or battery. Now complete with polypropylene carrying case.

90651 (Standard model) **$78.50**

90651-A New, improved modern version. Has solid state amplifier for greatly increased sensitivity, taut band ruggedized meter, etc. Well worth the difference! **$90.00**

Millen Grid Dipper OWNERS! Want the new carrying case? Send $5.47 plus $2.00 for postage and handling.

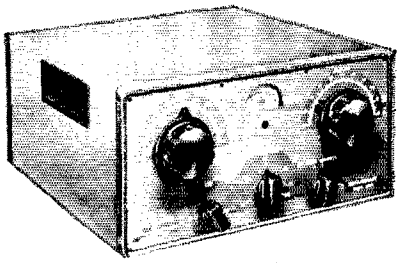
ANTENNA BRIDGE



Enables you to accurately measure impedances of 5 to 500 ohms, at up to 140 MHz. The *sure* way to increased efficiency adjustments! Very sensitive.

Model 90672 $51.50

TRANSMATCH



Most transmitters are designed for output into a flat 50 ohm resistive load. Yet, few antenna systems (especially multi-band) can be tuned to present this flat impedance. Typical mismatches at this point can waste as much as 50% of your available RF power!

The Millen Transmatch is an adjustable RF transformer to plug between your transmitter output and your antenna cable. Simple to tune, its sensitive reflectometer indicates when you have the best possible correction of the mismatch.

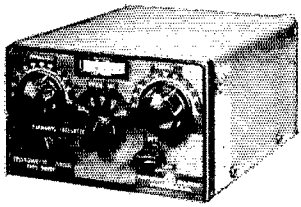
This puts more sock in your signal! Covers 10 thru 80 meter ham bands.

Rated at 2 KW peak power. 7" H x 14" W x 14" D. **Model 92200 $147**

TRANSMATCH JUNIOR

Compact, lower power version. Excellent for mobile and portable use. Rated at 300 watts peak. Only 4¾" H x 7" W x 9" D.

Model 92201 $77



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

Please include ample postage (plus $1 handling cost with orders under $10.)

OR, PHONE YOUR ORDERS TO (212) BA 7-7922 OR (516) 293-7990

Harrison

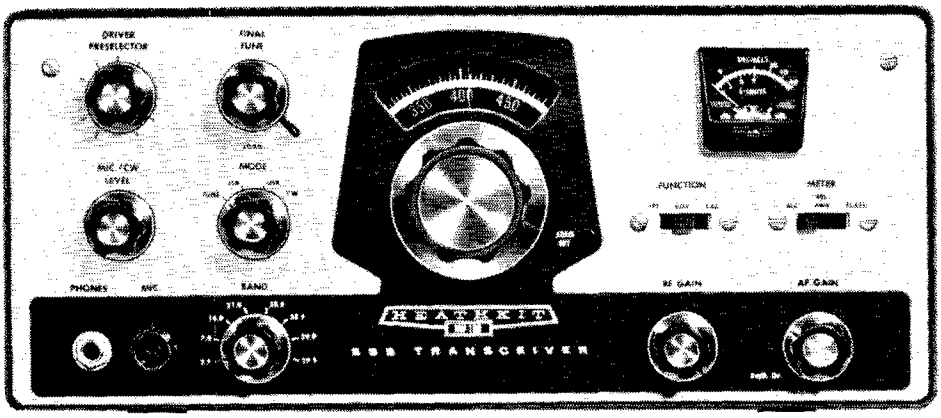
"HAM HEADQUARTERS, USA"®

NEW YORK CITY
8 Barclay St.
(212) BArclay 7-7922

JAMAICA, L. I.
139-20 Hillside Ave.
REpublic 9-4101

FARMINGDALE, L. I.
Route 110 at Smith St.
(516) 293-7995

$240!



NEW HEATHKIT® HW-100 5-BAND SSB-CW TRANSCEIVER

You asked for it . . . a multi-band version of the Heathkit "single-banders" . . . low-cost SSB operation on 10 or 15 meters . . . an SSB transceiver equal or superior to many assembled rigs, but at *much lower cost.* That's the HW-100.

How did Heath do it? We expanded on the "single-bander" design . . . borrowed from the heritage of the famous SB-101 . . . took a look at the competition . . . and produced the most SSB equipment you can get for the money.

Check the features and the specifications:

• Solid-state (FET) VFO • 80-10 meter coverage • Switch selected upper or lower sideband or CW • 180 watts input PEP SSB — 170 watts input CW • Crystal filter • Full coverage on all bands with 500 kHz per band segment • Smooth vernier control of frequency with patented Harmonic Drive™ dial mechanism • Built-in 100 kHz calibrator • Separate offset CW carrier crystal • TALC • Quiet, enclosed relays • Fixed or mobile operation with HP-23 or HP-13 power supplies • Easy assembly with circuit boards and wiring harness

Kit HW-100, 18 lbs., no money dn., $22 mo. **$240.00**
Kit HP-13, DC power supply, 7 lbs., $7 mo. **$64.95**
Kit HP-23, AC power supply, 19 lbs., $5 mo. **$49.95**
Kit SB-600, 8 ohm speaker, 6 lbs. **$18.95**

HW-100 SPECIFICATIONS — RECEIVER. Sensitivity: Less than .5 microvolt for 10 dB signal-plus-noise to noise ratio for SSB operation. **Selectivity:** 2.1 kHz minimum at 6 dB down, 7 kHz maximum at 60 dB down (3.395 MHz filter). **Input:** Low impedance for unbalanced coaxial input. **Output impedance:** 8 Ω speaker, and high impedance headphone. **Power output:** 2 watts with less than 10% distortion. **Spurious response:** Image and IF rejection better than 50 dB. Internal spurious signals below equivalent antenna input of 1 microvolt.

TRANSMITTER. DC Power input: SSB: (A3a emission) 180 watt P.E.P. (normal voice; continuous duty cycle). CW: (A1 emission) 170 watts (50% duty cycle). **RF Power output:** 100 watts on 80 through 15 meters; 80 watts on 10 meters (50 Ω nonreactive load). **Output impedance:** 50 Ω to 75 Ω with less than 2:1 SWR. **Oscillator feedthrough or mixer products:** 55 dB below rated output. **Harmonic radiation:** 45 dB below rated output. **Transmit-receive operation:** SSB: PTT or VOX. CW: Provided by operating VOX from a keyed tone, using grid-block keying. **CW Sidetone:** Internally switched to speaker or headphone, in CW mode. Approximately 1000 Hz tone. **Microphone input:** High impedance with a rating of —45 to —55 dB. **Carrier suppression:** 45 dB down from single-tone output. **Unwanted sideband suppression:** 45 dB down from single-tone output at 1000 Hz reference. **Third order distortion:** 30 dB down from two-tone output. **RF Compression (TALC):** 10 dB or greater at .1 ma final grid current. **GENERAL. Frequency coverage:** 3.5 to 4.0; 7.0 to 7.3; 14.0 to 14.5; 21.0 to 21.5; 28.0 to 28.5; 28.5 to 29.0; 29.0 to 29.5; 29.5 to 30.0 (megahertz). **Frequency stability:** Less than 100 hertz per hour after 30 minutes warmup from normal ambient conditions. Less than 100 Hz for ±10% line voltage variations. **Modes of operation:** Selectable upper or lower sideband (suppressed carrier) and CW. **Dial calibration:** 5 kHz. **Dial mechanism backlash:** Less than 50 Hz. **Calibration:** 100 kHz crystal. **Audio frequency response:** 350 to 2450 Hz. **Front panel controls:** Main tuning dial. Driver tuning and Preselector. Final tuning. Final loading. Mic and CW Level control. Mode switch. Band switch. Function switch. Meter switch. RF Gain control. Audio Gain control. **Side controls:** Meter Zero control; Bias; VOX Sensitivity; VOX Delay; ANTI-TRIP; Neutralizing. **Tube complement:** OA2 Regulator (150 V); 6AU6 RF amplifier; 6AU6 1st receiver mixer; 6AU6 Isolation amplifier; 6AU6 1st IF amplifier; 6AU6 2nd IF amplifier; 6BN8 Product detector and AVC; 6AU6 VFO Amp.; 6CB6 2nd transmitter mixer; 6CL6 Driver; 6EA8 Speech Amplifier and cathode follower; 6EA8 1st transmitter mixer; 6EA8 2nd receiver mixer and relay amplifier; 6EA8 CW sidetone oscillator and amplifier; 6GW8 Audio amplifier and audio output; 12AT7 Heterodyne oscillator and cathode follower; 12AT7 VOX amplifier and calibrator oscillator; 12AU7 Sideband oscillator; 6146 Final amplifiers (2). **Diode complement:** 6 Germanium Diodes: Balanced modulator, RF sampling, and crystal calibrator harmonic generator; 9 Silicon Diodes: ALC rectifiers, anti-trip rectifiers, and DC blocking; 1 Zener Diode: cathode bias. **Transistors:** 2N4304 FET- VFO; 2N3393 — Voltage regulator. **Rear apron connections:** CW Key jack; 8 Ω output; ALC input; Power and accessory plug; RF output; Antenna; Spare. **Power requirements:** 700 to 850 volts at 250 ma with 1% maximum ripple; 300 volts at 150 ma with .05% maximum ripple; —115 volts at 10 ma with .5% maximum ripple; 12 volts AC/DC at 4.76 amps. **Cabinet dimensions:** 14-13/16" W. x 6-5/16" H. x 13-3/8" D.

FREE 1968 CATALOG

Describes these and over 300 kits for stereo/hi-fi, color TV, amateur radio, shortwave, test, CB, marine, educational, home and hobby. Save up to 50% by doing the easy assembly yourself. Mail coupon or write Heath Company, Benton Harbor, Michigan 49022.

HEATHKIT®

HEATH COMPANY, Dept. 9-3
Benton Harbor, Michigan 49022

☐ Enclosed is $_____, plus shipping.

Please send model (s)_____

☐ Please send FREE Catalog.

Name_____
(Please Print)

Address_____

City_____ State_____ Zip_____

Prices & specifications subject to change without notice. AM-192

Now at your RCA Distributor's:

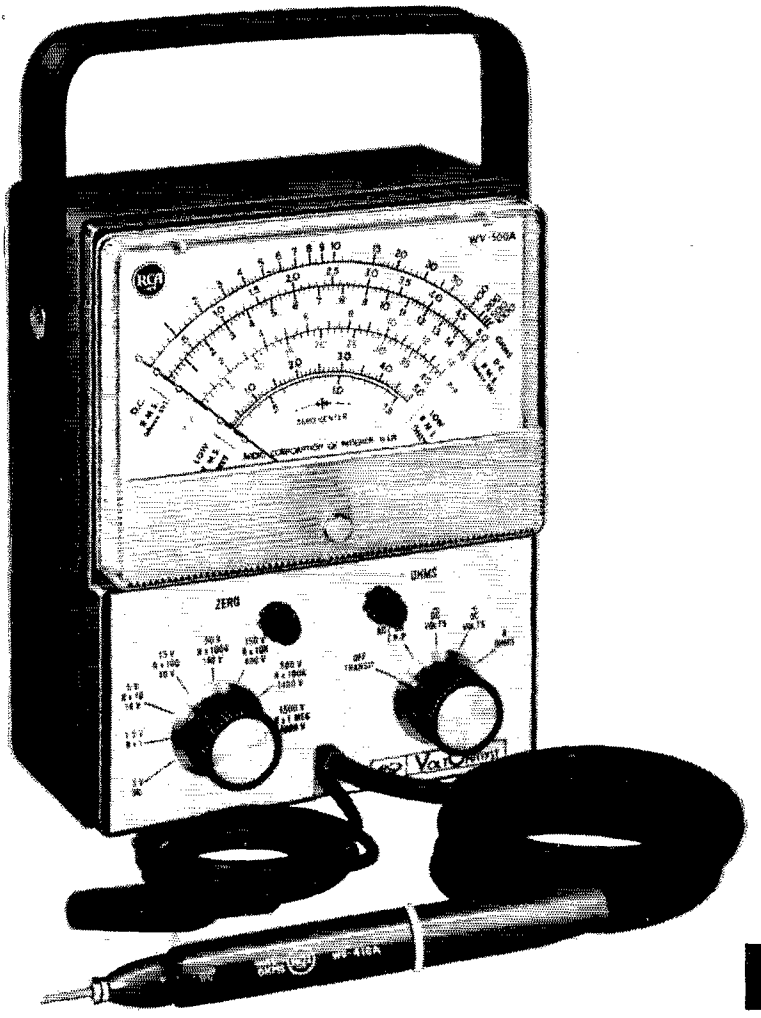
All solid-state battery operated voltohmyst® WV-500A

Eliminate warm-up time! Eliminate Zero-shift that can occur in tube-operated voltmeters! RCA's new WV-500A VoltOhmyst is an all solid-state battery operated, completely portable voltmeter that is ideal for service, industrial and lab applications. Seven overlapping resistance ranges measure from 0.2 ohm to 1000 megohms. Eight overlapping dc-voltage ranges measure from 0.02 volt to 1500 volts (including special 0.5 dc volt range), ac peak-to-peak voltages of complex wave-forms from 0.5 volts to 4200 volts, and ac (rms) voltages from 0.1 to 1500 volts. Input impedance of all dc ranges is 11 megohms.

All measurements are made with a sturdy, wired-in-single-unit probe with fully shielded input cable. The probe is quickly adapted to either dc measurement or ac and resistance measurement by a convenient built-in switch. And an accessory slip-on high-voltage probe is also available to make possible measurements up to 50,000 dc volts.

Solid-state reliability and convenience for only $75.00*

See it at your Authorized RCA Test Equipment Distributor, or write RCA Commercial Engineering Department C-37-W, 415 South Fifth Street, Harrison, N.J.



RCA