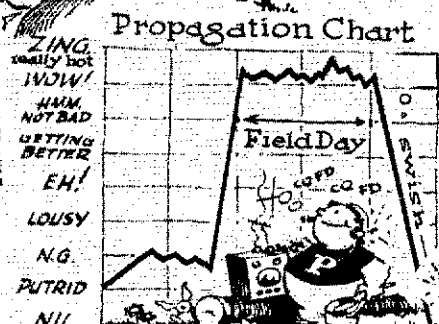


OST

CLEARLY

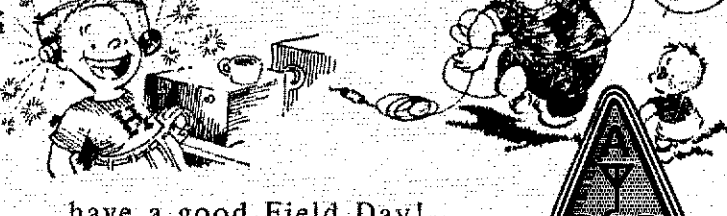
amateur radio

radio



2 days day the BIG day day 2 days after after FD

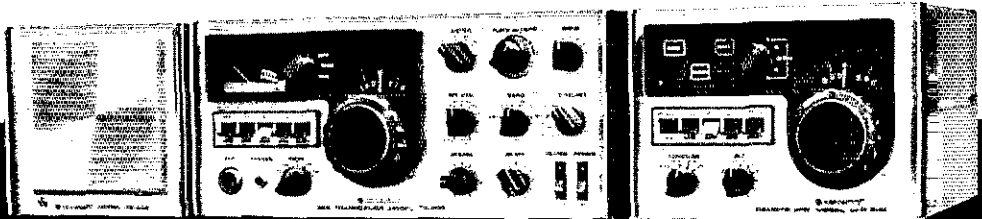
b4 b4 FD FD



... have a good Field Day!



amateur radio's new standard of excellence



KENWOOD'S SUPERB NEW SOLID STATE SSB TRANSCEIVER

TS-900

GENERAL SPECIFICATIONS: Frequency Range: 3.5 - 30 MHz Amateur Bands and WWV • Mode: SSB, CW, or FSK • Power Output: 150 watts PEP nominal into 50 ohms for SSB, 100 watts nominal into 50 ohms for CW, 50 watts nominal into 50 ohms for FSK • Frequency Stability: Within 100 Hz during any 15 minute period after warmup. Within ± 2 KHz during the first hour after 1 minute of warmup • Receiver Sensitivity: 0.5 microvolts for a 10 db (signal + noise)/noise ratio • Receiver Selectivity: SSB and FSK — 2.2 KHz bandwidth (6 db down), 4.4 KHz bandwidth (60 db down), CW — 0.5 KHz bandwidth (6db down), 1.5 KHz bandwidth (60 db down), (with optional CW filter installed) • Dimensions: 12.6" wide x 5.5" high x 12.6" deep • Weight: 26.5 pounds (32.5 pounds shipping weight) • Price: TS - 900 \$195.00, PS - 900 (AC Supply) \$120.00, DS - 900 (DC Supply) \$140.00, VFO - 900 (Remote VFO) \$195.00.

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

THE KENWOOD R-599 RECEIVER... 1.8 to 29.7 MHz (Amateur Bands) • Dial readout to $\frac{1}{2}$ KHz • Special detectors for SSB, AM, and FM • Transceive operation with T-599 • Built in 100 KHz and 25 KHz calibrators • Built-in 500 cycle CW filter • Provision for 2 meter and 6 meter coverage with accessory self-contained converters • 120/240 VAC or 12 VDC operation • All solid state • R-599 — \$389.00 Converters — \$31.00 S-599 Speaker — \$16.00.

THE KENWOOD T-599 TRANSMITTER... Clear, stable, selectable sideband, AM and CW • 4-way VFO flexibility plus RIT when used with the R-599 • Amplified ALC • Built-in VOX • Full metering • Built-in CW sidetone monitor and semi-automatic break-in CW • Built-in power supply for 120/240 VAC operation • Only 3 vacuum tubes • 200 watts PEP input nominal • Full amateur band coverage (3.5 to 30 MHz). T-599 — \$429.00

✓ *NOTE: The TS-511S still sells for the same low price... still the same high quality*

THE KENWOOD TS-511S TRANSCEIVER... a powerful five band transceiver (3.5 to 30 MHz, amateur bands) for operation on SSB and CW • Built-in VOX • Built-in crystal calibrator • Built-in noise blanker • Receiver Incremental Tuning (RIT) • 1 KHz frequency readout • Eight pole filter • Exceptional stability • Provisions for installation of an accessory high selectivity CW filter • 500 watts PEP input for SSB • .5 μ V sensitivity nominal • Full metering — Cathode current (IP), plate voltage (HV), ALC, and relative power output (RF) as well as an S-meter • Amplified ALC • Heavy duty 120 VAC external power supply. TS-511S — \$415.00 PS-511S — \$105.00 VFO-5SS — \$105.00 CW-1 — \$39.00

Prices subject to change without notice

EASY FINANCING • 10% DOWN OR TRADE-IN DOWN • NO FINANCE CHARGE IF PAID IN 90 DAYS • Good RECONDITIONED EQUIPMENT • Nearly all makes and 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. Export inquiries invited.

TED HENRY (W6UOU)

BOB HENRY (W0ARA)

WALT HENRY (W6ZN)

Henry Radio

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

Savoy

BASSETT

High efficiency mobile
and portable antennas
for all amateur bands,
20M, 15M, 10M, 7M,
6M, 5M, 4M, 3M,
2M, MARS, CB,
SECURITY,
PUBLIC SERVICE,
MARINE, AND
GOVERNMENT USE.

2-6-10-15-20-40-75

Identical size, cost,
and appearance

FULLY ADJUSTABLE
TO FREQUENCY
IN FIELD

Low weight, low drag,
high strength
fiberglass

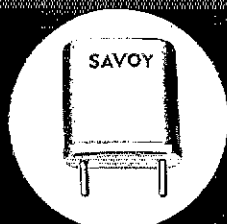
Polished
chrome brass
standard 3/8-24 thread

High gain collinear
on 2 meters

MODEL DGA-2M

\$29.50 postpaid

in U.S.A.

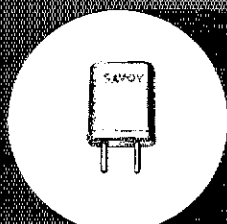


\$3.75

Postpaid in U.S.A.

TYPE 900 A

TYPE 901



HIGH ACCURACY CRYSTALS

FOR OVER 30 YEARS

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

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

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



BASSETT VACUUM TRAP ANTENNA SYSTEM

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

MODEL DGA-4075	\$59.50
MODEL DGA-204075	\$79.50
MODEL DGA-2040	\$59.50
MODEL DGA-152040	\$79.50

BASSETT VACUUM BALUN



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

MODEL DGA-2000-B \$12.95
Postpaid in U.S.A.

CONTACT YOUR DISTRIBUTOR OR WRITE FOR DATA

Savoy Electronics, Inc.

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

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



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



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

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

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

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

**You should be
talking with a
Hallicrafters.**

STAFF

JOHN HUNTOON, W1RW
Editor

WM. I. DUNKERLEY JR., WAZINB
Managing Editor

DOUG DE MAW, W1CER
Technical Editor

GERALD L. HALL, K1PLP
Associate Technical Editor

ROBERT M. MYERS, W1FBY
THOMAS McMULLEN, W1SL
Assistant Technical Editors

LEWIS G. McCOY, W1ICP
Beginner and Novice

TONY DORBUCK, W1YNC
Editorial Assistant

ROD NEWKIRK, W9BRD
WILLIAM SMITH, W7JNK
LOUISE MOREAU, W3WRE
JOHN TROSTER, W6ISQ
Contributing Editors

E. LAIRD CAMPBELL, W1CUT
Advertising Manager

I. A. MOSKEY, W1MYI
Circulation Manager

JOHN H. NELSON, W1GNC
Assistant Circulation Manager

OFFICES

225 Main Street

Newington, Connecticut 06111

Tel.: 203-666-1341

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

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

Copyright © 1973 by the American Radio Relay League, Inc. Title registered at U.S. Patent Office. International copyright secured. All rights reserved. *Quedan reservados todos los derechos.* Printed in U.S.A.

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

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

QST

JUNE 1973

VOLUME LVII NUMBER 6

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

— CONTENTS —

TECHNICAL —

A Simple Az-El Antenna System for Oscar	<i>Katashi Nose, KH6IJ</i>	11
A Kilowatt Amplifier for 6 and 2 Meters	<i>Robert M. Richardson, W4UCH</i>	16
Another Look at Reflections, Part II	<i>Walter Maxwell, W2DU</i>	20
A Modified 20-Meter Delta-Loop Beam	<i>Norman L. Fleming, W8PJ</i>	24
Automating the TR-44 Antenna Rotor	<i>Keith H. Sueker, W3VF</i>	28
A Practical Approach to Two-Meter Frequency Synthesis, Part I	<i>Peter J. Bertini, K1ZJH, and Richard Van Hoofst, WB2MBI</i>	31
A Medium-Power HF SSB CW Transmitter, Part II	<i>Timothy P. Hulick, W9MIJ</i>	37
New Apparatus		
Cush Craft AFM-44D Gain Antenna		45
Recent Equipment		
Regency Electronics HR2S and HR2MS FM Transceivers		50
The HAL ID-1A Repeater Identifier		52
The Fluke Model 8000A 3-1/2-Digit Multimeter		54

BEGINNER AND NOVICE —

A QRP Man's RF Power Meter	<i>Doug DeMaw, W1CER</i>	13
----------------------------	--------------------------	----

OPERATING —

Results, 1973 ARRL VHF Sweepstakes	<i>Rick Niswander, WA1PID</i>	61
July "Open" CD Parties		65
Results, 3rd ARRL 160-Meter Contest	<i>Rick Niswander, WA1PID</i>	66
The Bad and the Good		72

GENERAL —

VE3 Queen Elisabeth Hospital Calling		57
Putting Up Wire Antennas — the Easy Way	<i>Gary L. Foskett, W1ECH</i>	58
Oscar News		70
FM Repeater News		106

ARRL QSL Bureau	116	League Lines	10
Coming Conventions	91	Operating Events	117
Correspondence	95	Operating News	112
Feedback	47	Public Service	72
Hamfest Calendar	91	Silent Keys	90
Happenings of the Month	78	Station Activities	118
Hints & Kinks	48	World Above 50 Mc.	102
How's DX?	107	YL News & Views	100
I A R U News	92	W1AW Schedule	113
"It Seems to Us . . ."	9	25 and 50 Years Ago in <i>QST</i>	69

OUR COVER

FD fever is upon us! This collection of W1CJD gems from the past catches the incomparable flavor of our annual summer highlight. Full rules page 80. May *QST*.



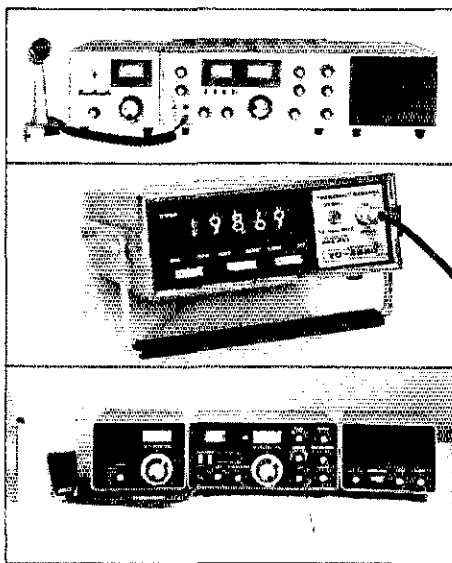
HAM & EGGS BY YAESU

Another American Favorite!

A discriminating ham and Yaesu products go together like that old American favorite, ham and eggs. That's why there's an ever-increasing demand for the complete line of amateur radio products now available from Yaesu Musen USA Inc.

Yaesu products are a natural for American hams because of their strict standard of high quality. And because Yaesu now has its own factory in the U.S. to provide direct service and to back up its dealers throughout the country.

Another American favorite. Ham and Yaesu.



YAESU MUSEN USA INC.

7625 East Rosecrans Ave., Unit #29,
Paramount, California 90723
Phone: (213) 633-4007

YAESU DEALERS:

HENRY RADIO STORES

Los Angeles, Anaheim, Calif.; Butler, Mo.

HAM RADIO OUTLET

Burlingame, Calif.

RACOM ELECTRONICS

Renton, Wash.

WILSON ELECTRONICS

Pittman, Nev.

ED JUGE ELECTRONICS

Fort Worth, Dallas, Texas.

AMATEUR ELECTRONICS SUPPLY

Milwaukee, Wis.; Cleveland, Ohio.

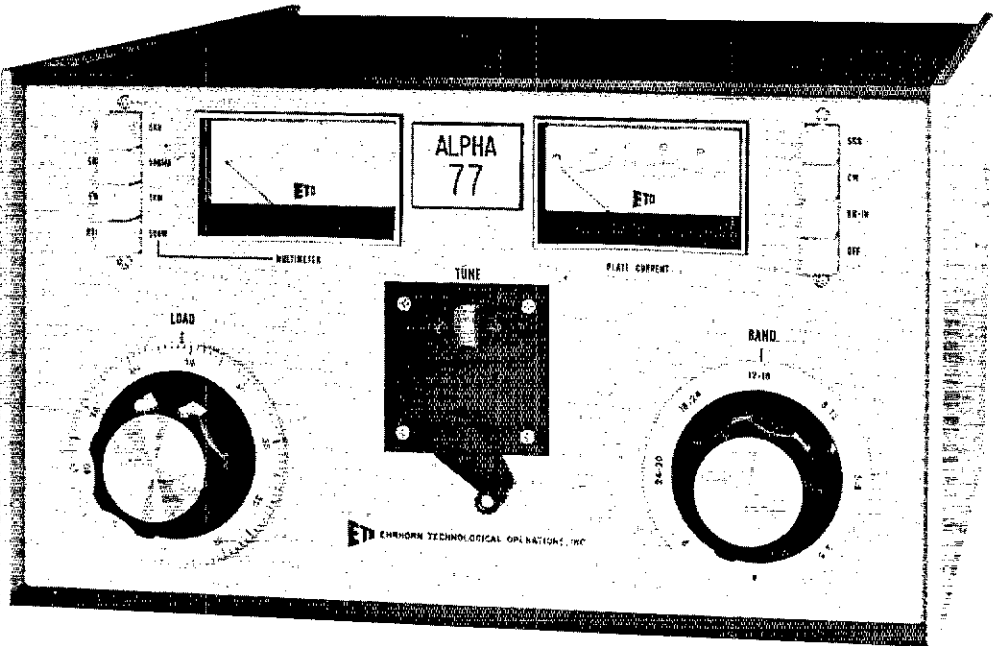
FRECK RADIO & SUPPLY

Asheville, No. Carolina.

HARRISON RADIO

Farmingdale, New York, Valley Stream, N.Y.

FOR THE MAN WHO ENJOYS OWNING THE VERY FINEST...



*THE NO-COMPROMISE **ALPHA 77** MAXIMUM LEGAL POWER LINEAR AMPLIFIER*

- LOAFS AT CONTINUOUS MAXIMUM LEGAL POWER IN ANY MODE
- DRIVES EASILY WITH ANY POPULAR EXCITER OR TRANSCEIVER
- KEEPS YOUR SIGNAL CLEAN, CRISP, AND OUTSTANDING
- CHANGES BANDS FAST -- WITHOUT 'CUT-AND-TRY' TUNE-UP
- STAYS COOL AND WHISPER-QUIET UNDER THE HARDEST USE
- CARRIES THE INDUSTRY'S MOST EXTENSIVE WARRANTY, BACKED BY ETO'S RENOWNED FAST FACTORY SERVICE

Why not move up to THE ULTIMATE? Call or write for the thoroughly illustrated ALPHA 77 brochure, answers to your questions, or an outstanding trade on your old gear.

ETO EHRHORN TECHNOLOGICAL OPERATIONS, INC.
BROOKSVILLE, FLORIDA 33512
(904) 596-3711

Section Communications Managers of the ARRL

Reports Invited. All amateurs, especially League members, are invited to report station activities on the first of each month (or 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 might be appointed ORS, OVS, OPS, OG and OBS. Technicians may be appointed JVS, ORS or V.H.F., P.A.M. SCMs desire application leadership posts of Sec'y, E.C., RM and PAM where vacancies exist.

ATLANTIC DIVISION

Delaware
Eastern Pennsylvania
Maryland-D.C.
Southern New Jersey
Western New York
Western Pennsylvania

W10KX
W3HK
W3IA
W2YFZ
K2KFK
W3NEM

Roger F. Cole
George S. Van Dyke, Jr.
Earl R. Medrow
Charles E. Traves
Richard M. Hefzouse
Robert E. Gawryla

345 E. Roosevelt Ave.
4607 Convent Lane
RD 1
State Police Drive
407 Woodland Rd.
1463 N. Allen St.

New Castle 19710
Philadelphia 19114
Dyersville 71035
Trenton 08678
Syracuse 13219
State College 16801

CENTRAL DIVISION

Illinois
Indiana
Wisconsin

W5PKN
W5RQD
W60MI

Edmond A. Metzger
William C. Johnson
Joseph A. Taylor

1520 South 4th St.
2838 Hillside Ave.
1954 Mulberry Ln.

Springfield 62701
Indianapolis 46218
Green Bay 54303

DAKOTA DIVISION

Minnesota
North Dakota
South Dakota

W44VAN
W9DM
W40CPX

Casper Schroeder
Harold I. Sheels
Ed Gray

10971 Quincy Blvd., N.E.
21 Euclid Ave.
1506 So. Maple

Blaine 55434
Grand Forks 58201
Rapid City 57701

DELLA DIVISION

Arkansas
Louisiana
Mississippi
Tennessee

W45VWH
W85AEH
W5NGB
W44GLS

Himmie L. Lowrey
Louis Mittlesten
Walker J. Coffey
O. D. Keaton

9301 Euper Lane
Box 937
RD No. 2
Rt. 1, Medearis Dr.

Fort Smith 72401
Metairie 70004
Oxford 38658
100 Hickory 37138

GREAT LAKES DIVISION

Kentucky
Michigan
Ohio

W4JID
W37FD
W5IMJ

Ted B. Huddle
Henry J. Ojingoose
William E. Clausen

604 Amanda Furnace Dr.
1327 Rose Dr.
403 Canyon Dr. S.

Ashland 41101
Detroit 48211
Columbus 4

HUDSON DIVISION

Eastern New York
N.Y.C. & Long Island
Northern New Jersey

K2SJK
K2LDG
W47UCD

Graham G. Berry
Fred J. Brunas
John M. Crosswell

50 Farcor Ave.
27 Erie Drive
436 Mt. Airy Road

New Rochelle 10801
Jericho 11753
Basking Ridge 07970

MIDWEST DIVISION

Iowa
Kansas
Missouri
Nebraska

K0YVU
K9BXJ
K4FVH
K6OAL

El Culbert
Robert M. Summers
Larry S. Phillips
V. A. Caslon

133 Box 406
3048 North 72nd
2482 W. Randolph
334 Pine St., Box 488

Charles City 50616
Kansas City 64104
St. Charles 63011
Chadron 69417

NEW ENGLAND DIVISION

Connecticut
Eastern Massachusetts
Maine
New Hampshire
Rhode Island
Vermont
Western Massachusetts

W1GVF
W1ALP
K1FEV
W1SWA
K1AAV
W1BRG
W1BVF

John J. McNassar
Frank L. Baker Jr.
Peter E. Sterling
Robert Mitchell
John E. Johnson
James H. Vieje
Percy C. Noble

218 Berlin Ave.
58 Solar Ave.
39 Latham St.
Box 137-A
50 Front St.
101 Henry St.
P.O. Box 5

Scarborough 06480
Braintree 02184
Portland 04106
Chester 03036
Pawtucket 02860
Burlington 05401
Lansboro 01717

NORTHWESTERN DIVISION

Alaska
Idaho
Montana
Oregon
Washington

KL7LVO
W77NN
W7RZY
K7WWR
W7PI

Kenneth R. Klopf
Donald A. Crisp
Harry A. Roylance
Dale T. Justice
Arthur Hennig

205 Steele Cr. Rd
1808 Alder Drive
P.O. Box 621
1460 N. E. Sunrise Lane
4516 N.E. 60th St

Fairbanks 99701
Lewiston 83501
Eatonville 97016
Hillsboro 97125
Seattle 98115

PACIFIC DIVISION

East Bay
Hawaii
Nevada
Sacramento Valley
San Francisco
San Joaquin Valley
Santa Clara Valley

W86DHH
KH6BZF
R770K
W4BIVD
W8NUT
K61PI
W40LFA

Paul I. Parker
Lee R. Wicat
Harold P. Leary
Norman A. Wilson
Thomas A. Gallagher
Ralph Saragan
James A. Hutter

2236 Whyte Park Ave.
P.O. Box 9274
1812 N. Saylor Way
Route 1, Box 725
Box 31365
6328 E. Loewensend Ave.
13085 Franklin Ave.

Walnut Creek 94595
Honolulu 96820
Las Vegas 89108
Woodland 94665
San Francisco 94111
Eureka 91707
Mountain View 94040

ROANOKE DIVISION

North Carolina
South Carolina
Virginia
West Virginia

W4WXZ
W447BI
K4GFR
W8JM

Charles H. Bridges
Joseph Rubin
Robert J. Single
Donald B. Morris

4901 Tiffany Ave.
P.O. Box 117
3515 S. 25th St., N.
1136 Morningstar Lane

Winston-Salem 27104
Fellon 29122
Arlington 22207
Farmington 26854

ROCKY MOUNTAIN DIVISION

Colorado
New Mexico
Utah
Wyoming

W40HLQ
W5N1J
W70CK
W7CQI

Olyde O. Penney
James R. Price, D.V.M.
John H. Sampson, Jr.
Wayne M. Moore

1626 Locust St.
320 Box 1128
3618 Mt. Orden Drive
142 South Montana Ave

Denver 80220
Las Alamos 87544
Ogden 84404
Casper 82601

SOUTHEASTERN DIVISION

Alabama
Catal Zone
Georgia
Northern Florida
Southern Florida
West Indies

W44EKJ
K7S77
W48YQ
W4RKH
*W4KKJ
K94AST

James A. Brashear, Jr.
James L. McMillen
Ray LaRue
Frank M. Butler, Jr.
John E. Parter
Pedro J. Piza

3001 Boswell Drive
P.O. Box 2809
2254 Hudson Drive
325 Elliott Rd., S.E.
6890 S.W. 51st St
Box 2001

Huntsville 35811
Bilbao
Lithton 30447
Fort Walton Beach 32544
Miami 33155
Tutu E. PR 00711

SOUTHWESTERN DIVISION

Arizona
Los Angeles
Orange
San Diego
Santa Barbara

W7CALF
W6INH
W6CPB
W65RS
W56DEI

Cary M. Hamman
Eugene H. Violino
William C. Weiss
Paul C. Thompson
D. Paul Gagnou

2813 E. Campbell Ave.
2839 Canada Blvd.
1753 Iowa St.
7371 Hamlet Ave.
1791 Hedon Cir.

Phoenix 85016
Glendale 91206
Costa Mesa 92626
San Diego 92120
Camarillo 93010

WEST GULF DIVISION

Northern Texas
Oklahoma
Southern Texas

W5LR
W5PML
W5KR

L. E. Harrison
Cecil C. Cash
Arthur R. Ross

1314 Holly Glen Drive
1802 Smith Ave.
P.O. Box 3561

Dallas 75237
Lawton 73501
Brownsville 78520

CANADIAN DIVISION

Alberta
British Columbia
Manitoba
Maritime
Ontario
Quebec
Saskatchewan

VE6FK
VE7FB
VE14FQ
VE1AMK
VE1BV
VE2ALE
VESRP

Don Sutherland
H. E. Savage
Steven Link
Walter D. Jones
Holland H. Shepherd
Joseph Unsworth
Percy A. Crustwaite

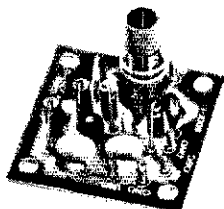
444-25th Ave., N.E.
4554 West 12th Ave.
14 Grandcrest St.
79 Waverley Ave.
3016 Cowan Cres.
164 Mgr. Bourget
R.R. 5

Calgary, Alta. 12E 1Y3
Vancouver 8 B.C.
Winnipeg 17, Manitoba
Montreal, N.B.
Ottawa K1V 8Y1
Quebec, P.Q.
Saskatoon S7K 3J6

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

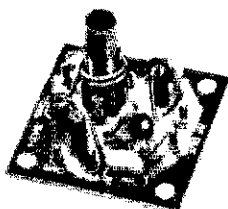
for the EXPERIMENTER!

INTERNATIONAL EX CRYSTAL & EX KITS
 OSCILLATOR • RF MIXER • RF AMPLIFIER • POWER AMPLIFIER



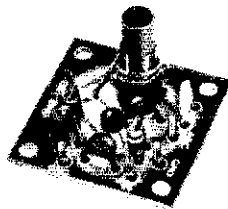
1. MXX-1 TRANSISTOR RF MIXER

A single tuned circuit intended for signal conversion in the 3 to 170 MHz range. Harmonics of the OX oscillator are used for injection in the 60 to 170 MHz range. Lo Kit 3 to 20 MHz, Hi Kit 20 to 170 MHz (Specify when ordering).....**\$3.50**



2. SAX-1 TRANSISTOR RF AMP

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



3. PAX-1 TRANSISTOR RF POWER AMP

A single tuned output amplifier designed to follow the OX oscillator. Outputs up to 200 mw, depending on the frequency and voltage. Amplifier can be amplitude modulated. Frequency 3,000 to 30,000 KHz.....**\$3.75**



4. BAX-1 BROADBAND AMP

General purpose unit which may be used as a tuned or untuned amplifier in RF and audio applications 20 Hz to 150 MHz. Provides 6 to 30 db gain. Ideal for SWL, Experimenter or Amateur.....**\$3.75**



5. OX OSCILLATOR

Crystal controlled transistor type. Lo Kit 3,000 to 19,999 KHz, Hi Kit 20,000 to 60,000 KHz. (Specify when ordering).....**\$2.95**



6. TYPE EX CRYSTAL

Available from 3,000 to 60,000 KHz. Supplied only in HC 6/U holder. Calibration is $\pm .02\%$ when operated in International OX circuit or its equivalent. (Specify frequency).....**\$3.95**

for the COMMERCIAL user...

INTERNATIONAL PRECISION RADIO CRYSTALS

International Crystals are available from 70 KHz to 160 MHz in a wide variety of holders. Crystals for use in military equipment can be supplied to meet specifications MIL-C-3098E.

CRYSTAL TYPES: (GP) for "General Purpose" applications
 (CS) for "Commercial Standard"
 (HA) for "High Accuracy" close temperature tolerance requirements.



write for CATALOG



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 06111.



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
ROBERT W. DENNISTON, W0DX, 1966 — 1972

Officers

President HARRY J. DANNALS,* W2TUK
16 Arbor Lane, Dix Hills, NY 11746
First Vice-President . . . CHARLES G. COMPTON,* W0BUO
1170 E. 90th St., Inver Grove Hgts., MN 55075
Vice-Presidents ROBERT W. DENNISTON, W0DX
Box 73, Newton, IA 50208
ROEMER O. BEST, W5OKF
P.O. Box 1656, Corpus Christi, TX 78401
Secretary JOHN HUNTOON, W1RW
Treasurer DAVID H. HOUGHTON
Honorary Vice-Presidents . . . CARL L. SMITH, W0BWJ
FRANCIS E. HANDY, W1BDI
WAYLAND M. GROVES, W5NW
General Manager JOHN HUNTOON,* W1RW
Communications Manager GEORGE HART, W1NUM
Technical Consultant GEORGE GRAMMER, W1DF
Assistant General Manager RICHARD L. BALDWIN, W1RU
Assistant Secretaries PERRY F. WILLIAMS, W1UED
MORGAN W. GODWIN, W4WFL
DAVID G. SUMNER, K1ZND
225 Main St., Newington, Connecticut 06111
General Counsel ROBERT M. BOOTH, JR., W3PS
1302 18th Street, N.W., Washington, DC 20036
Associate Counsel ARTHUR K. MEEN, O.C., VE3RX
7th Floor, Frost Building, Queen's Park, Toronto, ON

DIRECTORS

Canada
NOEL B. EATON* VE3CJ
Box 560, Waterdown, Ontario L0R 2H0
Vice-Director: A. George Spencer VE2MS
171 Kipling Ave., Beaconsfield, Quebec
Atlantic Division
HARRY A. McCONAGHY W5SW
470R Fenway Dr., Bethesda, MD 20034
Vice-Director: Jesse Bieberman W3KTT
RD 1, Box 66, Valley Hill Rd., Malvern, PA 19355
Central Division
PHILIP E. HALLER W9HPG
6000 S. Tripp Ave., Chicago, IL 60629
Vice-Director: Edmond A. Metzger W9PRN
1520 South Fourth St., Springfield, IL 62703
Dakota Division
LARRY J. SHIMA W0FAN
11417 Goodrich Rd. S., Bloomington, MN 55437
Vice-Director: Edward C. Gray WA9CPX
3306 South Maple, Rapid City, SD 57701
Delta Division
MAX ARNOLD W4WHN
612 Hogan Rd., Nashville, TN 37220
Vice-Director: Franklin Cassen W4WBK
925 N. Treecant St., Memphis, TN 38108
Great Lakes Division
ALBAN A. MICHEL W8WC
359 Bonham Rd., Cincinnati, OH 45215
Vice-Director: Richard A. Egbert W8ETU
6479 Red Fox Rd., Reynoldsburg, OH 43068
Hudson Division
STAN ZAK K2SJO
13 Jennifer Lane, Port Chester, NY 10573
Vice-Director: George A. Dioli W2THA
20 Wilson Ave., Chatham, NJ 07928
Midwest Division
RALPH V. ANDERSON K9NL
528 Montana Ave., Holton, KS 66436
Vice-Director: Paul Grauer W9PTR
Box 190, Wilson, KS 67490
New England Division
ROBERT YORK CHAPMAN W1QV
28 South Road, Groton, CT 06340
Vice-Director: John C. Sullivan W1HRR
Whitney Road, Columbia, CT 06237
Northwestern Division
ROBERT B. THURSTON* W7PGY
7700 81st Ave., N.E., Seattle, WA 98115
Vice-Director: Dale T. Justice K7WWR
1369 NE Sunrise Lane, Hillsboro, OR 97123
Pacific Division
J.A. "DOC" GRELIN W6ZRJ
10835 Willowbrook Way, Cupertino, CA 95014
Vice-Director: Albert F. Gaetano W6VZT
115 Old Adobe Road, Los Gatos, CA 95030
Roanoke Division
VICTOR C. CLARK* W4KFC
12927 Popes Head Road, Clifton, VA 22024
Vice-Director: L. Phil Wicker W4ACY
4821 Hill Top Road, Greensboro, NC 27407
Rocky Mountain Division
CHARLES M. COTTERELL W0SIN
430 S. Swadley St., Lakewood, CO 80225
Vice-Director: Allen C. Auten W0EGN
6722 West 67th Ave., Arvada, CO 80003
Southeastern Division
GARRY E. PRICE W4DQD
P. O. Box 2067, Georgia Southern Branch
Statesboro, GA 30458
Vice-Director: C. James Roux K4THA
P.O. Box 1710, Largo, FL 33540
Southwestern Division
JOHN R. GRIGGS* W6KW
1273 13th St., Baywood Park, San Luis Obispo
CA 93401
Vice-Director: Gary A. Striwell W8NJU
7164 Rock Ridge Terrace, Canoga Park, CA 91304
West Gulf Division
ROY L. ALBRIGHT W5EYB
107 Rosemary, San Antonio, TX 78209
Vice-Director: Jack D. Grant W5GM
521 Monroe, N.W., Ardmore, OK 73401
* Member Executive Committee

"It Seems to Us..."



NEW EXAM QUESTIONS

THE FEDERAL COMMUNICATIONS Commission has issued two new (revised) sets of study questions to indicate the scope of written portions of basic amateur examinations. One (Bulletin SS 1035) is for Novice, Element 2; the other (SS 1035c) is for General, Element 3, which includes Conditional and Technician. The new material, from which actual exam papers are already in use in some areas, is reproduced in "Happenings" this month.


And a "happening" it is — not just a routine or periodic updating similar to other revisions the Commission has accomplished from time to time in the past. Rather there is a definite new look, particularly for the Novice. The concept for this stepping-stone into amateur radio has long been to require minimal knowledge of the applicant. Mostly this has been limited to rules, "to keep him out of trouble" as he learns-while-doing. Indeed, the Commission's own public description of the Novice Class exam has, for quite some years, said simply, "a five word per minute code test and an examination on basic radio law." Not one word about theory or practice. The actual rules do specify the inclusion of "sufficient elementary radio theory for the understanding of these rules." Over the years, written exams have reflected that instruction. But except for a transistor symbol which sort of freaked its way into the study material a few years back, the Novice has not had to contend with schematics. No longer. Now, among his 34 non-regulatory sample questions the Novice applicant will find eight requiring diagrams, or based on them.

Stress is still laid on basic regulations, as we agree it should be. But it is a bit of a surprise to note deletion of questions dealing with practical matters such as chirps and key clicks, and harmonic reduction. The latter in particular has been a problem in the Novice area. We recall that FCC on a number of occasions in the past has informally asked us to run basic *QST* articles on this subject periodically, to alleviate their monitoring and enforcement workload. Could it be that the current crop of Novices has exhibited considerably more ability than predecessors,

so that today there are fewer problems of rules enforcement? That would be a welcome situation, if true.

As to the General Class material, if the actual exam questions indeed follow the study guide, the applicant will find a lot more regulatory coverage than before. From only two questions in previous material (although admittedly any applicant is supposed to be familiar with *all* the rules), in the new bulletins there are 18 specific examples of regulatory knowledge stressed by FCC. All to the good. On the other hand, technical questions which once numbered 60 by our count, now total only 39. And not one mention of a schematic, formula or computation problem, which liberally dotted the old exam.

Again, the real situation depends on actual questions which might show up in the examination itself. But if the study samples are a true indication, it would appear that the Novice requirements have been upgraded, and the General (Conditional/Technician) lowered a notch. The status of the Novice exam is of particular concern. We recall that FCC's Chairman a few years back admonished us to be concerned over the "lessening of interest in the amateur service, at least numerically." The Hon. Rosel Hyde urged more attention to stimulating interest in the amateur service, "particularly in our youth." We find it a little difficult to reconcile the former Chairman's statement and the present revision of the Novice written exam to a more complicated level.

Things are changing — whether for better or worse, only time will tell. We all should keep a careful watch on whatever effects these changes have on our growth as well as quality of newcomers. And perhaps the best judges are those amateurs who volunteer to run classes for affiliated and other radio clubs. We'd appreciate reports from those of you in that field, in particular, as you work with the new material, appraising the effect on Novice license aspirants. Do the changes have a desirable effect, or not? 

League Lines . . .

April is now but a memory, but what a memory! It was our first address run on the new edp system. It was not without glitches, as the computer neglected to print out labels for the Life Members. We discovered this within a couple of days of the original run, and corrected the oversight, but then the post office lost the 4000 or so copies of QST somewhere between Concord, N.H., and Boston. As a result, many copies of April didn't arrive until the month was nearly over.

As reported in "Happenings" in this issue, the Commission has issued a Notice of Inquiry concerning RACES, seeking comment and suggestion concerning the future of the RACES program.

Interest in Life Membership continues at a brisk pace. We are only a few away from having 2500 elected Life Members of the League, with about another 2500 paying on a quarterly basis.

A self-addressed stamped envelope will bring you repeater enthusiasts some supplementary information released by the Commission to aid in the preparation of applications for repeater stations, control stations, and so on. Having this material on hand will be of considerable help to you.

The Commission has released a new set of study questions for the Novice and General Class license, which you'll find in the "Happenings" section of this issue, together with either the matching answers or a reference to current editions of the License Manual. This study material will also be contained in an updated edition of the License Manual, to be available about the middle of June.

Been a member of the League for 40 years? 40-year lapel pins are now available, upon your application and our verification of your membership records here.

Handsome ceramic wall plaques will be mailed about mid-June to those fifty or so members who have been members of the League for 50 years or more and who have already received the 50-year pin.

Last call! Last call! Emergency Communications Advisory Committee nominations wanted for this most important amateur activity. We're looking for top-notch people to help guide the course of the League in this field. Candidates can be nominated by three Full members of the League, as per suggestions on page 81 of the March issue.

The summer vacation season is upon us, and we're looking forward to the usual influx of visitors at ARRL Hq. The office is open weekdays from 7:30 in the morning until 5:30 in the afternoon, but the best visiting times would be from 9 a.m. until 4:30. WIAW is right next door, and also available for visiting during those hours.

June also means Field Day, the annual test for emergency-powered stations. It's a most popular exercise, so brush up on the rules on page 80 of the May issue, and CU there.

The League's Board of Directors will be meeting in Hartford during mid-July. Although an exchange of information between the Board and the members is a continuing process, this might be a good time to give your director any last-minute suggestions you might have.

The governments of Guatemala and the United States have agreed to permit the exchange of third party traffic by amateurs of the two countries, effective May 26.

Quote of the month from the Long Island Mobile Amateur Radio Club Log: "Your signal is full quieting, and I guess it will get even better as you get closer to the repeater."

A Simple Az-El Antenna System for Oscar

BY KATASHI NOSE,* KH6IJ

THIS ARTICLE describes an antenna system which was assembled in three hours using store-bought items in an attempt to meet the Oscar-AOC launch date advance. Other literature points out the necessity for a circularly polarized system and the methods used to produce that polarization.¹ The basic considerations in the design of this system were low cost and ease of assembly. In the matter of choice between a crossed-Yagi system and a helical antenna, the main factor was that Yagi antennas can be bought off the dealers shelf, but most helical antennas can not.

The Crossed Yagi

To obtain circular polarization, one has to feed two Yagis in proper phase quadrature, which means that one antenna must be fed with coaxial cable that is one-quarter wavelength longer than the feed line to the other. The preferred method is to use a grid-dip meter to check the sections of coax for correct length.

Fig. 1 shows the overall assembly of the array. The antennas used are Hy-Gain Model 341 eight-element Yagis. Fig. 2 is a head-on view of the array, showing the antennas mounted at 90 degrees with respect to each other and 45 degrees with respect to the cross arm.

Coupling between the two Yagis is minimal at 90 degrees and is somewhat greater at 45 degrees, following the greatly simplified formula:

$$E = E_0 \cos \theta$$

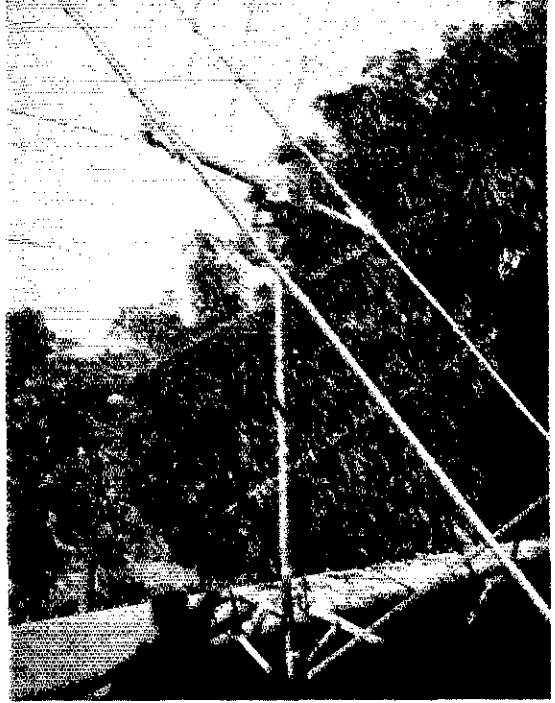
Where E = induced voltage

E_0 = inducing voltage

θ = axial angle between the two Yagis.

* Dept. of Physics and Astronomy, 2565 The Mall, Univ. of Hawaii, Honolulu, HI 96822.

¹ Nose, "Crossed Yagi Antennas for Circular Polarization," *QST*, January, 1973.



By setting the angle at 45 degrees with respect to the cross arm, coupling is minimized but not eliminated.

Length "D" in Fig. 2 should be the minimum necessary for the elements to clear the tripod base when the array is pointed straight up and rotated. In my case a five-foot section of TV mast served the purpose.

The Phasing Section

Phasing problems are covered in another article (see footnote 1). The method of phasing and

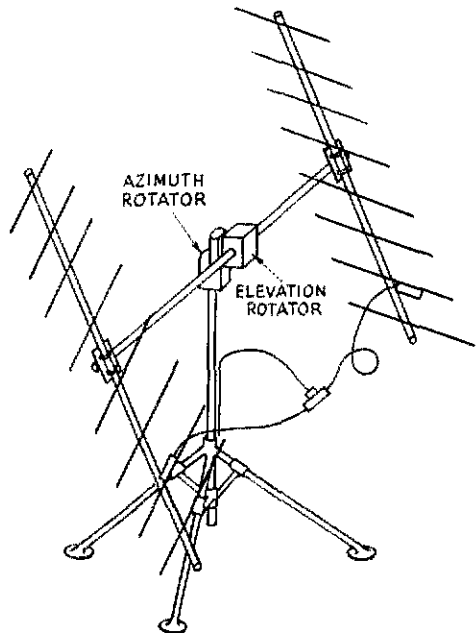


Fig. 1 - The antenna system can be assembled using off-the-shelf components such as Hy-Gain Yagis, Cornell-Dubilier or Blonder-Tongue rotators, and a commercially made tripod.

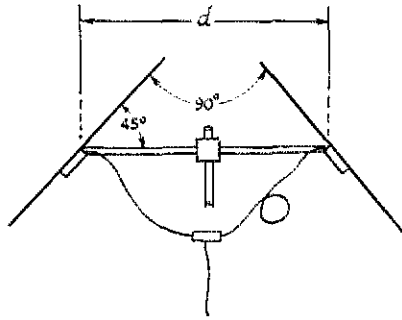


Fig. 2 - An end-on view of the antennas show that they are mounted at 90 degrees to each other, and at 45 degrees to the cross boom.

cutting cables to length is described briefly, using paralleled lengths of coax cable to match the feed impedance. Alternatively, one can bring two separate feed lines to the shack, one a quarter wave length longer than the other, then selecting the polarization that gives the best response. The latter method is not too good with circular polarization, or if the linearly polarized signals are undergoing rapid Faraday rotation.

The Mounting Tripod

A mounting tripod could be made by using aluminum railing, called "NuRail," which comes with all manner of swivels, crosses, and T fittings. However, the cheapest method is to purchase a TV tower such as Lafayette No. 18-56233W, which is a collapsible tripod. It is made by the South River Metal Products Company, South River, NJ 08820. Their model number is HDT-5. This tower sells for such a low price that there is little point in constructing your own. Spread the legs of the tripod more than usual to assure greater support, but be sure that the elements of the antenna will clear the base in the straight-up position.

Elevation-Azimuth Rotators

The azimuth rotator is a Cornell-Dubilier AR-20, which sells for approximately \$25. The

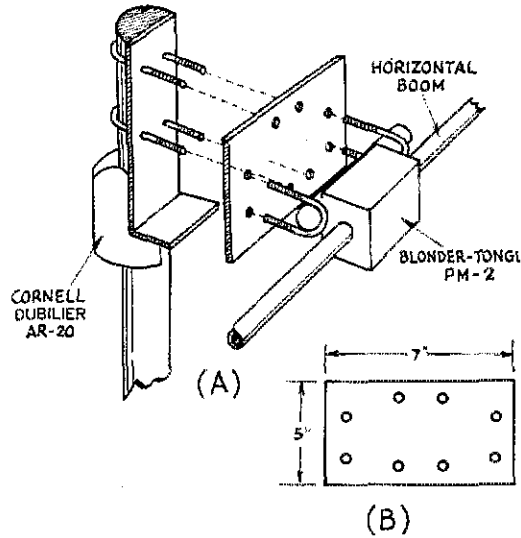
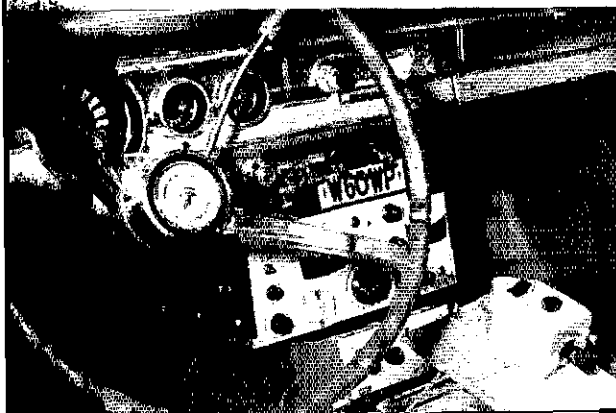


Fig. 3 - The method of mounting two rotators together. A pair of PM-2 rotators may also be used. The adapter plate (B) may be fabricated from 1/4-inch-thick aluminum stock, or a ready-made plate is available from Blonder-Tongue.

elevation rotator is a Blonder-Tongue Prismatic PM-2, which sells for about \$35. The latter is one of the few on the market which allows the boom of the Yagi to rotate on its axis when supported at the center.

Fig. 3 shows the detail of the method of mounting the two rotators together. Notice that the flat portion of the AR-20 makes an ideal mounting surface for the PM-2. If you want to utilize commercially fabricated components throughout, a mounting plate similar to that shown in Fig. 3B can be purchased. Blonder-Tongue makes an adapter plate for their heavy-duty CATV antennas. It is called a YSB Stacking Block and costs \$13.75. The PM-2 rotator fits horizontally on this plate even though this was not the intended application. The adapter plate may be used to fasten two PM-2 rotators together. QST

Strays



How's this for a nifty mobile set-up? Strictly cw, of course, as befits our longtime West Coast code practice stalwart W6OWP. Bart tells us that it is only for 40 meters and although no real effort has been made DX-wise, two JAs and a UA were worked one weekend while driving through the Nevada desert.

• Beginner and Novice

A QRP Man's RF Power Meter

BY DOUG DEMAW,* WICER

THERE ARE a lot of pint-size hf-band signals being transmitted nowadays, and this upsurge in QRP enthusiasm suggests a need for some specialized test equipment. An rf power meter/SWR indicator is certainly one piece of apparatus that all operators have frequent need for, but most instruments that have been described in amateur journals are keyed to the QRO (high) power level. Rigs with less than five watts of output barely move the needles on medium- or high-power wattmeters or SWR indicators. Some kinds of indicators — the Monimatch for one — are frequency sensitive, making it impractical for the user to establish meaningful rf power calibrations for so-called all-band use (3 through 30 MHz).

Because of the writer's interest in QRP work, it was decided to fill a personal need with respect to owning a low-power measuring device. The circuit described here satisfies the requirement, and can be calibrated for any rf power range up to 30 watts. The model shown in the photos was calibrated for 0 to 5 watts, and is suitable for operation from 80 through 10 meters. It is not "frequency conscious," so it will provide the same meter deflection per watt on all of the bands mentioned.

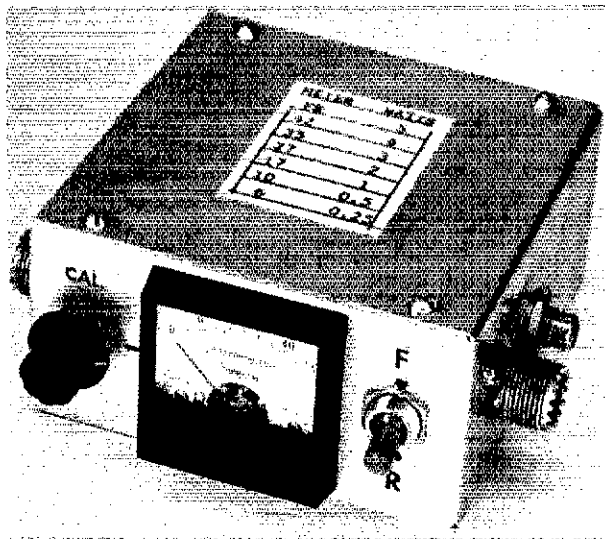
With the sensitivity control set at maximum, only one watt of rf energy is required to provide a full-scale meter reading. The user may wish to calibrate the instrument for some range other than five watts full scale. If so, he need only follow the calibration procedure discussed later, but set the sensitivity control at the appropriate point to provide the desired range.

Circuit Information

The circuit for the instrument is given in Fig. 1. It is based on the classic Bruene design¹ and was

* Technical Editor, *QST*.

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



mentioned in an earlier *QST* article.² It is not arranged (physically) for operation above, say, 25 watts. At the higher levels of rf power there is not enough isolation between the various parts of the circuit to ensure a complete null when setting up the bridge circuit. The null will, however, be complete at 25 watts or less. Those desiring to build a small power meter that will work well from 25 to 1000 watts should consider constructing one of the units described in the article referenced by footnote 2.

A toroidal transformer, T1, is used in the rf-sampling circuit. A two-turn link assures sufficient pickup to provide full-scale meter deflection (T1 primary). The two trimmer capacitors, C1 and C2, in combination with C3 constitute the network for nulling the bridge. A pair of surplus 5-pF glass piston trimmers were used in the author's model. Subminiature air-dielectric variable capacitors can be substituted, provided the minimum capacitance is 1.5 pF or less. Alternatively, one can substitute a piece of double-clad pc board, 1/4 x 3/4 inch in size, for each of the trimmer capacitors. Each side of the board then becomes a plate for the homemade capacitor. A bus-wire lead is soldered to each plate near one end. The capacitor is adjusted by snipping off a bit of the board, continuing the process until a null is obtained (a piece of glass-epoxy pc board of the foregoing dimensions exhibits approximately 6 pF of capacitance).

Construction

The QRP power meter is housed in a 4 x 4 x 2-inch utility box. Other types of enclosures can be used if desired. Phono jacks are connected in parallel with SO-239 type jacks on each side of the instrument. This was a convenience feature desired

² DeMaw, "In-Line RF Power Metering," *QST*, December, 1969.

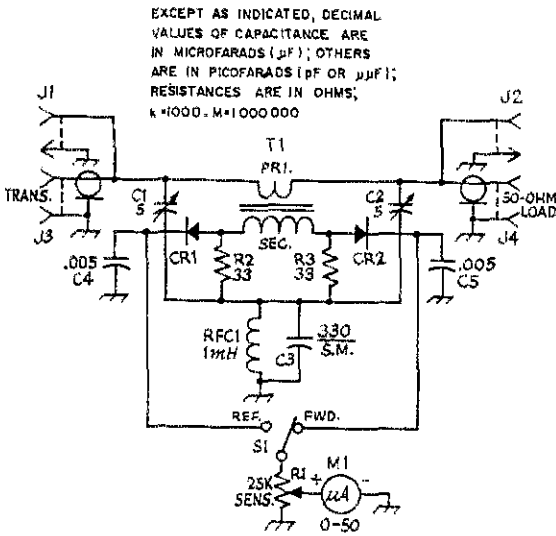


Fig. 1 - Schematic diagram of the QRP power meter.

C1, C2 - 0.5- to 5-pF trimmer (see text).

C3 - 330-pF silver mica.

C4, C5 - Disk ceramic.

CR1, CR2 - Germanium diode, 1N34A or equivalent.

J1, J2 - Phono jack.

J3, J4 - SO-239 type connector, or coax fitting of builder's choice.

M1 - 50- μA panel meter (see text).

R1 - Linear-taper 1/4- or 1/2-watt, 25,000-ohm control.

R2, R3 - 33-ohm, 1/2-W composition resistor (matched pair recommended).

RFC1 - 1-mH rf choke (Millen J300-1000 or equiv.).

S1 - Spdt toggle.

T1 - 60 turns No. 28 enam. wire, close wound on Amidon T-68-2 toroid core (secondary). Primary is 2 turns of small-diameter hookup wire over T1 secondary.*

* Amidon Associates, 12033 Otsego St., N. Hollywood, CA 91607.

by the writer and need not be employed if just one type of fitting is preferred.

Most of the small components of the circuit are contained on a pc board. The pattern is given in Fig. 2. It is important that all of the components in the rf portion of the circuit be mounted with the least amount of lead length. This will assure minimum inductive and capacitive reactance, thereby making the job of nulling the bridge much easier.

A 1-1/2-inch square Simpson meter is shown in the photograph of the completed instrument. Any meter with a 0- to 50- μA movement will suffice. For power levels in excess of 2 watts a 0- to 100- μA meter will be suitable. Those wishing to avoid the expenditure connected with purchasing a meter can use an existing VOM or VTVM for visual indication. Simply install a pair of test jacks to permit connection of an external indicator to the existing metering circuit. Use one of the low-voltage ranges on the VTVM for your measurements.

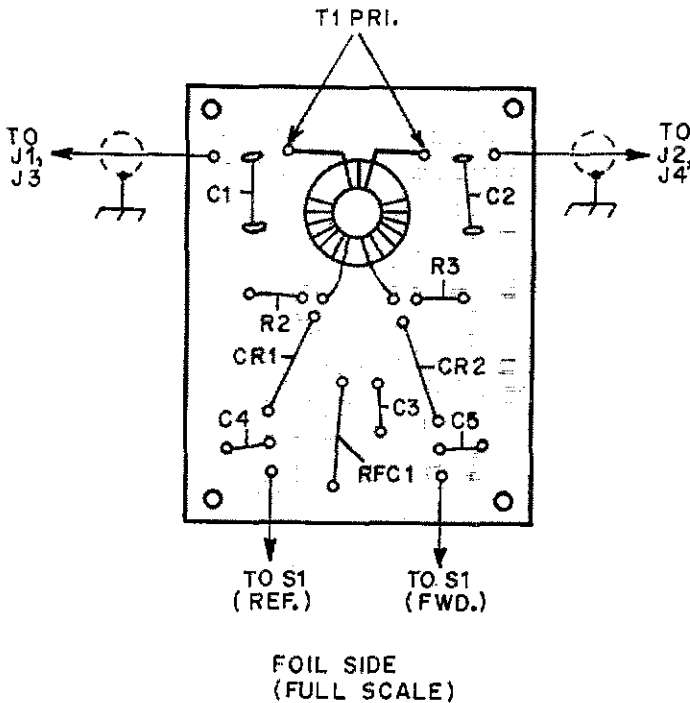


Fig. 2 - Scale template of pc board.

This is an interior view of the QRP power meter. Visible at the lower left are the piston trimmers used for nulling the bridge. Toroidal transformer T1 is located between the trimmers. The pc board is mounted to the bottom plate of the utility box by means of two 1-inch-high metal standoff posts which are attached to the ground foil of the board.

Adjustment

It will be necessary to have a nonreactive 50-ohm dummy load for initial adjustment of the power meter. A Heath Antenna was used by the author, but a 2-watt 51-ohm composition resistor (5 percent) will work fine if the leads are kept short, and if no more than 5 watts of rf power are applied during any ten-second period.

Connect the dummy load to one port of the instrument and apply rf power to the remaining port. S1 should now be thrown back and forth to determine which position gives the highest meter reading. This will be the FORWARD position. Adjust the sensitivity control for full-scale reading of the meter. Now, move the switch to the opposite (REFLECTED) position and adjust the trimmer nearest the transmitter input port for a null in the meter reading. The needle should drop to zero. It is recommended that these adjustments be made in the 10- or 15-meter band. Next, reverse the transmitter and load cables and repeat the nulling procedure while adjusting the trimmer on the opposite side of the pc board. Repeat these steps until a perfect null is obtained in both directions. The switch and the coax connectors can now be labeled, TRANSMITTER, LOAD, FORWARD, and REFLECTED, as appropriate.

Meter calibration can be effected at any frequency from 80 through 10 meters. It will be necessary to measure rms voltage across the 50-ohm load by means of an rf probe and a VTVM.³ Those having access to a wide-band scope can do the calibrating by reading pk-pk rf voltage across the 50-ohm load, then converting the value to rms volts:

$$E_{\text{rms}} = \frac{E_{\text{pk-pk}} \times 0.707}{2}$$

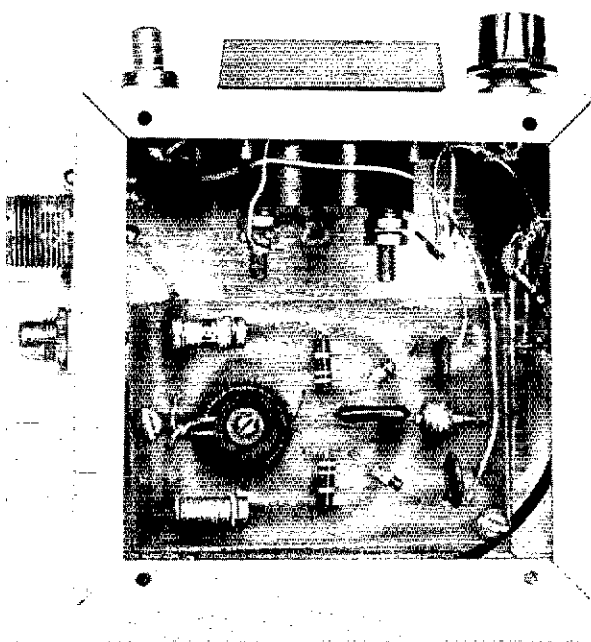
Rf wattage can then be found by:

$$W = \frac{E_{\text{rms}}^2}{R}$$

$$\text{Example: } W = \frac{10^2}{50} = \frac{100}{50} = 2 \text{ W}$$

It will be necessary to vary the transmitter output power by means of the drive control, or by detuning the tank circuit of one of the early stages,

³ Construction information on rf probes is given in the chapter on measurements, *ARRL Radio Amateur's Handbook*, all recent editions.



to obtain the rms voltage across the load that corresponds to the desired full-scale reading versus rf watts. Calibration points on the meter scale can be selected by adjusting the rf voltage across the load to a known value versus power, then noting the meter reading and preparing a chart. The required voltage can be determined by:

$$E_{\text{rms}} = \sqrt{W \times R}$$

Example: To find the rms voltage across 50 ohms for 1 watt, $E_{\text{rms}} = \sqrt{1 \times 50} = 7.07 \text{ V}$. If the builder has an rf ammeter or milliammeter he can do the calibration by using the formula: $W = I^2 R$. Thus, if 0.2 A of rf current is flowing through the 50-ohm load, the power equals 2 watts ($.04 \times 50 = 2$). Be sure the rf ammeter is rated for reasonable accuracy at the operating frequency.

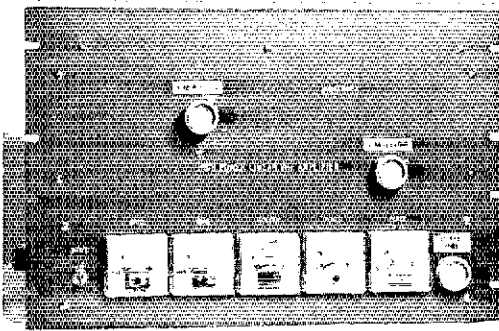
Some Final Remarks

The power meter can be used for adjusting an antenna for minimum SWR, or in tuning a Transmatch.⁴ Place S1 in the REFLECTED position and make the required adjustments to provide a meter reading of zero.

If a zero reading can't be obtained while adjusting a Transmatch or antenna, it is likely that the transmitter has an abnormal amount of harmonic energy in its output. A resonant load will not accept the harmonic current, causing it to register on the SWR indicator as reflected power, even though the SWR at the desired frequency may actually be 1. A harmonic filter can be installed between the transmitter and the power meter to reduce the harmonic output, thereby making measurements more accurate.⁵

⁴ DeMaw, "A Transmatch for QRP Rigs," *QST*, February, 1973.

⁵ McCoy, "Getting Rid of Low-Frequency Harmonics," *QST*, April, 1968.



A Kilowatt Amplifier for 6 and 2 Meters

BY ROBERT M. RICHARDSON,* W4UCH

EVERY TEN OR FIFTEEN YEARS the urge to build a new set of kilowatt amplifiers for the vhf bands overcomes the author's common sense; DXing activity ceases, and much effort is put forth seeking to evoke the Princes of Serendip.¹ Since the days of fifty-cent 826s and two-dollar 450THs on the surplus market are well behind us, the 4CX1000A tetrode was chosen because of its more than adequate plate dissipation, low-drive requirements, and excellent F_p/I_p ratio (high-perveance).

By using half-wavelength grid and plate lines for 2 meters, and lumped-constant grid and plate circuits for 6 meters, the result is a novel two-band linear amplifier that does not require any switching or retuning when shifting bands. In addition, the tube cost per band is cut in half.

Construction is no more difficult than building a Heath dc power supply, as illustrated by the photographs and schematic diagram. As in all vhf amplifiers, there are a few "have-to-do" items that most authors hide in their write-ups which most builders discover when their new creation is turned on. To eliminate such unpleasantness, please read the later section carefully. To those enterprising and creative engineers who wish to modify the layout and design, we wish you good luck, but you do so at your own peril.

* Miskel Farm, RFD 2, Sterling, VA 22170.

¹ Richardson, "High-Power VHF Triode Amplifiers," *QST* July, 1959.

Whether you are a seeker of vhf DX, or are an avid contest operator on the very highs, a good amplifier is a convenience, or even a necessity. Here is a design that has made W4UCH familiar to many operators. The author has found a combination that puts a two-band PA behind one panel, saving space and expense at the same time.

Construction

The chassis is a Bud AC-427, 10 × 17 × 4-inch aluminum base. When you purchase it, also obtain the bottom plate. The front panel is a Bud PA-1107, 19 × 12-1/4 × 1/8-inch aluminum. The only discomforting metal work is cutting the tube-socket hole in the chassis and five meter holes through the front panel as shown in Fig. 2.

The Shurite series 850 meters are used because they are both attractive and cheap. At \$3.40 each, they not only tell you everything that is going on or what you are doing wrong, but also serve as relatively expensive fuses. They are, from left to right, facing the front panel:

GRID	BIAS	SCREEN	PLATE	PLAT
0-10 mA	0-150 V dc	0-200 mA	0-3000 V dc	0-1 A

While you are cutting holes in the chassis, you might as well finish the job on the rear apron, Fig. 2 (B). The blower used is a Universal Electric Model 19-113, obtainable from Burstein-Applebee in Kansas City. Its capacity at the rated 2700 RPM is about four times that needed and it sounds like a squadron of the Red Baron's Fokkers is taking off. Since the writer is a retired airline captain who hates both noise and Fokkers, the blower was tamed by placing a 20-watt, 50-ohm resistor in series with one of the AC leads. RPM is thereby reduced to 600, still providing more than enough cooling air and, most importantly, it runs quietly.

Except for the .015-inch thick Reynolds Wrap aluminum cover, which can be cut with scissors, the "nastys" are now done with and the fun begins. Eimac Division of Varian makes a wide selection of tube sockets for their 4CX1000A tetrode. Buy the Eimac SK-810 which includes a 1500 pF built-in screen bypass capacitor. Three homemade Z-shaped clamps hold the top of the socket firmly against the bottom of the chassis, centered in the tube-socket hole.

Grid Circuit

It is interesting that the tube has an input capacitance of 35 pF. Though a quarter-wave

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

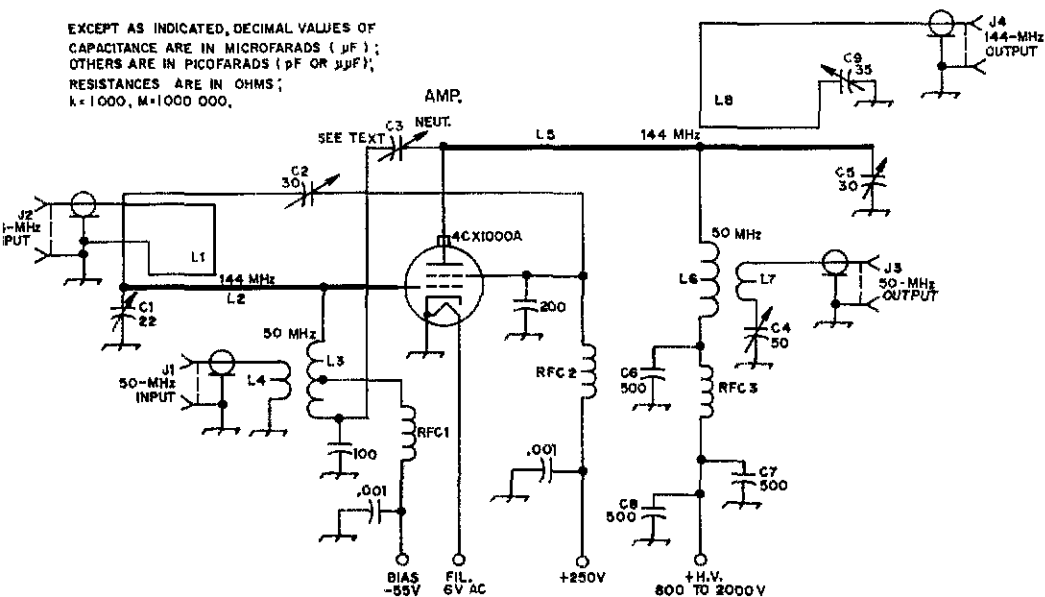


Fig. 1 -- Schematic diagram of the two-band amplifier. Decimal value capacitors are in μF , others in pF.

- C1 - 5- to 22-pF air variable (E. F. Johnson 160-0211-001 with stators connected in parallel).
- C2 - 3- to 30-pF mica compression trimmer.
- C3 - See text.
- C4 - 5- to 50-pF air variable (Hammarlund HF-50X) or 4- to 60-pF (James Millen 20050).
- C5 - 3- to 30-pF vacuum variable (ITT Jennings ECS-30, 10 kV).
- C6, C7, C8 - 500-pF, 30-kV, doorknob type capacitor or Centralab 858S-500.
- C9 - 3- to 35-pF air variable (Hammarlund

HF-35X) or 2.8- to 40-pF (James Millen 20035).

J1-J4, incl. - Coaxial connectors, SO-239 or Amphenol 82-24 (UG-58/U, type N).

L1-L6, incl. - See text.

L7 - 3 turns No. 12 enam. 1-1/4-inch dia \times 3/8-inch long. Leave 3-1/4-inch leads for connection.

L8 - Brass strap, 1/16-inch thick \times 1/2-inch wide, 6-3/4 inches long. Bend into U shape, with one leg 2-inches and the other 1-1/4-inches long. Short leg connects to C9.

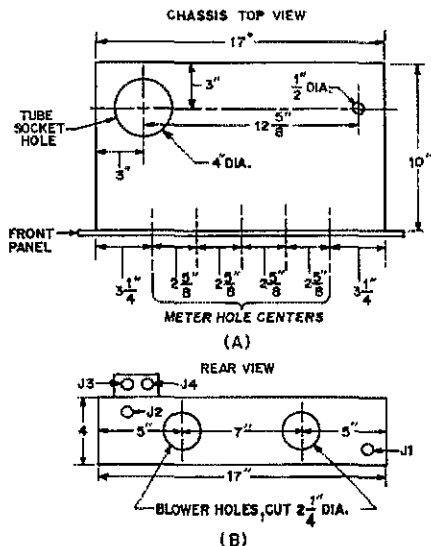
RFC1, RFC2 - Ohmite Z-50.

RFC3 - 11 turns No. 16 enam. on 3/4- \times 5-inch ceramic standoff insulator. Winding spaced to occupy 1-1/2 inches.

lumped-constant grid-circuit may be used on 50 MHz, a half-wave line was used to facilitate neutralization. A half-wave grid line is a must on 144 MHz, as the quarter-wave point is at or slightly within the socket or tube. Begin building the grid circuit (L2) by soldering six 1-1/2-inch pieces of No. 16 or heavier hookup wire to the six grid connectors on the tube socket. These should go almost straight down to slightly below the tube base where they are soldered to a 2-inch dia wire circle as shown in Fig. 3A.

The center of this circle is, fortunately, the electrical midpoint of a half-wave line at 144 MHz. The remaining portion of L2 is constructed from 1/8-inch OD copper tubing (see Fig. 3B).

Fig. 2 - Top and rear plans for the chassis layout. The meters used by the author were Shurite Series 850. If meters of another make are used, the size and location of the holes in the front panel should be changed to match. Similarly, the blower holes in the rear of the chassis should match the cooling system if not the same as that described by the author.



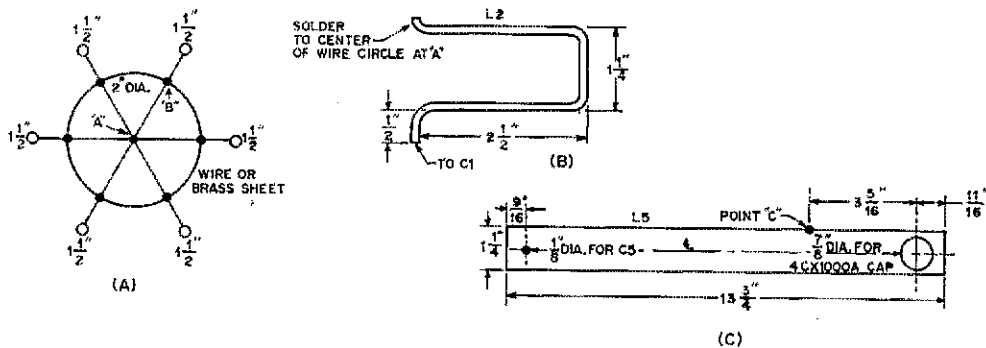


Fig. 3 — The grid-connecting ring (A) and the 144-MHz grid circuit (B). The plate line for 144 MHz (L5) is made from brass strap 1/16-inch thick, as shown at C.

The 50-MHz grid coil is four turns of No. 12 wire 1/2 inch dia by 1 inch long, soldered to point "B" on the ring described in Fig. 3A. The other end of this coil is soldered to a 100 pF disk capacitor, which is soldered to the cathode terminal. L1, the two-meter input link, is formed from No. 12 wire, just inside L2. The input link for six meters consists of two turns of No. 12 wire, 7/8 inch OD x 1/2 inch long, wound over L3.

Now is a good time to adjust C1 for resonance at 144 MHz as indicated on a grid-dip meter. After this step, squeeze or expand the turns of L3 for 50-MHz resonance without retuning C1. Your grid circuit is now complete and should not require retuning for operation on either 6 or 2 meters. If you feel compelled to operate at both ends of each 4-MHz band, you can solder a shaft to C1, as I did, and peak the grid circuit; C1 tunes both L2 and L3.

Plate Circuit

The half-wave 144-MHz plate line, L5, is made from 1/16-inch-thick brass strap, as shown in Fig. 3C. For 50 MHz, L6 is wound from 1/8-inch OD copper tubing, three turns 1-1/2 inch OD x 1-1/4 inch long, plus a 3/4-inch lead at one end and a 1-1/2-inch lead at the other. The 3/4-inch lead is soldered (silver if available) to L5 at point "C," and the 1-1/2-inch lead is connected to the 500 pF capacitor, C6. Using a grid-dip meter as you did for the grid circuit, adjust C5 for 144-MHz resonance, and without changing the setting of C5, squeeze or stretch L6 for 50-MHz resonance.

"Have-to-Do"

- 1) C3, the neutralizing capacitor for 50 MHz, is merely a 2-inch length of No. 16 hookup wire soldered to the end of the 50-MHz grid coil. The wire is brought through the tube socket hole, and bent toward or away from the anode to achieve minimum feedthrough of the 50-MHz drive. With plate and screen voltage removed, apply enough 50-MHz drive to obtain an indication on your grid-dip meter. Peak by adjusting C5, then bend C3 in or out to achieve a null. For 2-meter neutralization, solder a 3 to 30 pF mica trimmer from the stator of C1 to a screen terminal and adjust as above with 2-meter input.

- 2) Though the 4CX1000 filament is rated at 6.0 volts, reduce it to 5.5 for much longer tube life. Two of my three 4CX1000As are ten years old and still going strong.

- 3) Mount the filament transformer in the chassis; 12.5-A filament current sure heats up No. 22 wire.

- 4) For the plate-voltage meter, use a Shurite Model 850, 0-300 V dc meter. Remove the scale cover and add a zero to each of the 100, 200 and 300 numerals with a pencil. Make the voltage-dropping resistor from five 2-watt, 100,000-ohm resistors and one 68,000-ohm resistor — adjust as needed.

- 5) Use a Variac on the plate-voltage power supply. The amplifier will operate efficiently down to a plate voltage of 800, as long as the recommended screen voltage of 250 is used. It is pointless, rude and crude to run a kilowatt to talk across town. The amateur who runs only enough power to ensure an S-9 contact obviously knows what he is doing and serves as a good example to both the newcomer and those with miserable operating habits.

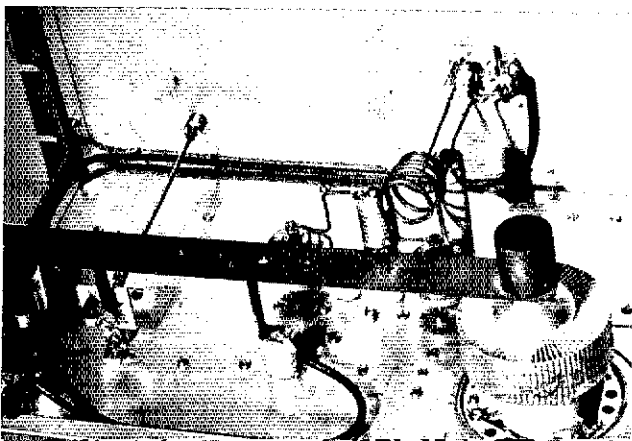
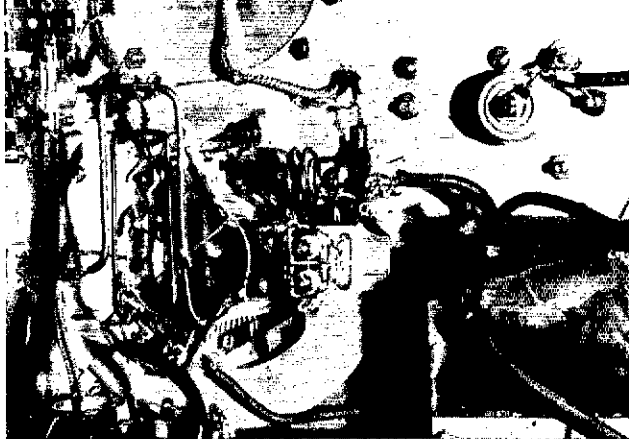


Fig. 4 — Rear view of the amplifier. The 50-MHz loading capacitor, C4, is mounted on the front panel. C9 may be seen under the left end of the plate line, near the vacuum variable, C5. A flexible shaft extension connects C9 to the control on the front panel. The chimney has been removed for photographic purposes.

Fig. 5 — The ring used to make connection to the grid pins on the tube socket may be seen at the lower left. L2 connects between the center of this ring and the small air variable (C1) on the left wall of the chassis. Part of the filament transformer is visible at the lower right.



6) The amplifier is admirably stable and will feed either 50- or 75-ohm coax lines with SWR up to 2 to 1. The key to high-gain AB1 amplifier stability is to keep the plate circuit heavily loaded.

7) As the photographs illustrate for short coax runs under the chassis, as well as the plate-voltage feed, use Belden 58/U coax. This is *not* RG-58/U, but cellular low-loss polyethylene coax. Should you have any problems, substitute RG-8/U, as it is rated at 5000 V dc maximum.

8) The ITT Jennings vacuum variable capacitor, type ECS-30, 2 to 30.6 pF at 10 kV, may be purchased surplus, lab tested, from Barry Electronics, 512 Broadway, New York, NY 10012 — or you may buy a new one from your local distributor.

9) Drive requirements on both bands are negligible, as an AB1 amplifier draws no power at the grid. At all costs, avoid driving the tube into the grid-current region as it is totally unnecessary and will dramatically shorten tube life.

Operation

Tune-up is recommended initially with 1000 V on the plate and a grid bias of -55 V. Plate current should run about 250 mA while idling, kicking up to 300-400 mA on voice peaks. At 2000 V on the plate, I run the grid bias up to -65 and when working extended ground wave, meteor scatter, or contests, adjust the ssb or cw drive to a maximum of 500 mA plate current on voice peaks or with the key down. In all cases, this has allowed me to work everything I could hear. Stay legal by not exceeding the 1-kW maximum dc input level when the antenna is connected.

For 2-kW PEP operation on ssb, use a dummy load and load the amplifier to 1 A with 2000 V on the plate or 667 mA at 3000 V. Plate efficiency of

the unit is about 55 percent on 6 meters, and 50 percent on 2 meters, as measured with a Bird Thru-line wattmeter. As usual for most AB1 amplifiers, the linearity is outstandingly good. Second-harmonic suppression exceeds 50 dB on both bands.

Every "how-to-built-it" article includes at least a brief paragraph as to the marvelous and wonderful DX worked with the writer's newest creation — so we will not disappoint you. The first try on 6-meter ssb was a 5 × 15-over-9 report from W3BWU in Pittsburgh, Pa. The first 2-meter DX worked was W8Y10 in Manchester, Mich., and W8DGF in Brunswick, Ohio. Both bands were "closed" at the time. Nevertheless there was little excitement as they are all regularly worked with the excitors "barefoot!" The writer would appreciate hearing from amateurs who build this unit. It is extremely flexible and a pleasure to operate.

Acknowledgments

Thanks to: Ed Clegg, of E. T. Clegg Associates, who kindly made the front panel; Jim Eberly and Bill Eitel, formerly of Eimac, who gave us two of the tubes and sockets to play with (they will be happy to know I paid for the third tube and socket); Ed Tilton, for his continued encouragement over the past 20 years. His accomplishments and contributions to vhf/uhf during the past 35 years constitute an impossible act to follow.

QST

Strays

QST Congratulates . . .

Howard O. Lorenzen, W3BLC, who has received the Navy's highest science award, the Captain Robert Dexter Conrad Award for Scientific Achievement s.

J. Foy Guin, W4RLS, who was elected chairman of the Alabama Judicial Commission.

Francis Kelly, WN5DYR, elected regional vice-president of the Vocational and Industrial Clubs of America.

Clarence Dengler, W2LK, on being presented with the first Antique Wireless Association Grand Old Man Award for his long and distinguished association with radio communication.

Bob Ellis, WA4UUQ, whose songs were used in the MGM film "Hot Summers Week."

Kirk Kubias, WN0FSX, and Jim Hoover, WN0FSX, for receiving first prize at their junior high school science fair with a demonstration of amateur radio.

Sir Martin Ryle, G3CY, who has been appointed Astronomer Royal by Queen Elizabeth II.

Marvin Eichorst, W9RUK, on receiving a Naval public service award

Another Look at Reflections

Part II -- Countdown for a Journey . . . From Mythology to Reality

BY M. WALTER MAXWELL,* W2DU/W8KHK

PART I OF THIS SERIES of articles appeared in *QST* for April, 1973. In that part we saw that obtaining a low SWR is relatively unimportant for an efficient transfer of power when line attenuation is low. Four steps to assist in understanding the operation of lines with reflection were suggested, and the concept of matching the complex impedance at the line input in the presence of reflections, called conjugate matching, was introduced. The paragraphs which follow present for consideration some of the basic principles involving efficient power transfer through any line terminated in a mismatch.

A conjugate match exists throughout the entire system when the internal resistance of the source is made equal to the resistive component of the line-input impedance (or vice versa) and all residual reactance components in the source and line-input impedances are canceled to zero. In this condition the system is resonant. All available power from the source enters the line, and reflections from any terminating mismatch or other line discontinuities are compensated by a complementary reflection obtained by introducing a nondissipative mismatch at the conjugate match point. This nondissipative mismatch is one which, if placed in the system by itself, would produce the same magnitude of reflection, or SWR, as is produced by the mismatched line termination. The result is a precise and total reflection of the arriving reflected wave. Andrew Alford makes a magnificent presentation of this concept (*ref. 39, pages 10-15*).[†] Although it sounds very complicated, this entire set of conditions is automatically fulfilled simply by completing a correct tuning and loading procedure. It matters not whether a transmitter having sufficient matching range feeds the line directly, or whether an external transmatch is used where additional range is required. If the source generator is now replaced by a passive impedance equal to its

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

[†] This and all subsequent references in italics refer to the bibliography which appeared at the end of Part I of this series.

internal impedance⁵ the line can be opened at any point. And looking in either direction, one will see the conjugate of the impedance seen in the opposite direction -- whatever $R + jX$ value is seen in one direction, $R - jX$ is seen in the other.

Contrary to our prevalent, deeply ingrained belief, it is therefore not true that when a transmitter delivers power into a line with reflections, a returning reflected wave always sees the internal generator impedance as a dissipative load and is converted to heat and lost. It can happen under certain conditions of pulse-type transmission; for instance, if the generator is turned off after delivering a single pulse into the line while retaining its internal impedance across the line, the returning pulse wave will be absorbed. But if a conjugate-matched generator is actively supplying power when the reflected wave returns, the reflected wave encounters total reflection at the conjugate match point and is entirely conserved, because it never sees the generator resistance as a dissipative terminating load. This is because the source and reflected voltages and currents superpose, or add at the match point, just as if the reflected power had been supplied by a separate generator in series with the source. And since the source voltage is generally greater than the reflected, the sum of their voltages yields a net current flow which is always in the forward

⁵ To satisfy the conjugate conditions when the generator is a Class B or C amplifier, the impedance replacing the generator must be made equal to its optimum load impedance, the load into which the generator delivers its maximum power to the loaded tank. For a Class C amplifier this is roughly twice its internal impedance. The reason for this difference may be more fully appreciated when we consider that the classical network generator has a maximum efficiency limit of 50 percent because it delivers its maximum available power when its load impedance equals its internal resistance. But in the Class C amplifier the effective internal ac impedance is about half of its optimum load impedance because the current pulses which excite the loaded tank are of high peak value and short duration, while the instantaneous anode voltage during current flow is very low. This results in proportionately less power lost in the generator and more delivered to the load, enabling it to operate at an efficiency as high as 75 percent or more.

direction.⁶ The reflected power adds to the source power, deriving reflection *gain* which compensates for the reflection loss suffered at the mismatched termination.

Line Losses

All reflected power reaching the source is returned to the load, as part of the forward or incident wave. The only reflected power lost is because of line attenuation, during its return to the source and once again during its return to the load. The higher the line attenuation, the less reflected power reaches the source to add to the forward power. Thus, the lower the line attenuation, the higher the allowable SWR for a given loss because of SWR. *No* reflected power is lost in a lossless line, *no matter how high the SWR*, because it *all* gets ultimately to the load. This is why open-wire line functions efficiently as a tuned line with any reasonable mismatch value -- its attenuation is almost negligible. Attenuation (being higher in coax) imposes lower limits on the mismatch and may require calculation of the loss penalty for a given SWR. *Both the attenuation and SWR must be quite high* to incur any substantial additional loss over and above the matched-line loss.⁷

Coax has higher rf losses than open wire at hf chiefly because of its lower impedance, causing higher current flow at lower voltage for the same power. This results in higher I^2R loss for the same effective conductor size. (Electric power-distribution lines minimize I^2R loss by use of *high* voltage and *low* current). Skin effect increases the loss with rising frequency because of decreased effective conductor size, but only at vhf and higher does the dielectric loss become a substantial contributor to the attenuation factor. From this it is understandable why RG-8/U, especially the foam type with its larger center conductor (*ref. 23*), will allow higher SWR (more bandwidth) than RG-58/U for the same additional loss penalty. And for any cable, the shorter it is the less loss is added for a given SWR.

⁶ With a conjugate match all reactance has been canceled, leaving the reflected voltage polarity either pure in-phase aiding, or out-of-phase bucking the source voltage. If bucking, the explanation of the text is sufficient, because a source of smaller voltage can never cause a reverse power flow through a larger voltage source. Whether bucking or aiding, if the loading adjustment leaves the generator impedance lower than the line-input impedance, the reflected wave is still totally reflected, but the generator is undercoupled and not delivering all available power. But any loading adjustment or matching error which leaves the line-input impedance lower than the generator impedance results in overcoupling, or overloading, and *this*, not reflected power, directly causes excessive generator dissipation and lowered efficiency.

⁷ Detailed instructions (plus examples) on calculating the additional loss because of SWR for given line attenuation and SWR values will be presented later. The data may also be taken from Part I, Fig. 1, which comes from the Transmission Lines chapters of *The ARRL Antenna Book* and the *ARRL Handbook*, or from bibliography ref. 33 p. 573.

A fifth step in improving our understanding of the reflected-power problem is to view the situation objectively, asking yourself, "Have I fallen prey to any of the erroneous teachings? Can I spot the wrong dope when I hear it discussed? Do I understand the principles well enough to convince others of the correct version if the opportunity arises?" Several pertinent short statements follow which may be used as self-test material. They highlight and summarize many reflection-related concepts known to be generally confused among the amateurs. All of the statements are TRUE. In the interest of brevity they are not intended to be completely self-explanatory, but sufficient material for obtaining a complete understanding of each point will appear in later installments, or is available in bibliography references included in Part I. Support for nearly every statement can be found in *The ARRL Antenna Book* alone.

True or False?

1) Reflected power does not represent lost power except for an increase in line attenuation over the matched-line attenuation. In a lossless line, *no power is lost because of reflection*. Only when the flat-line attenuation and SWR are both high is there significant power lost from reflection. On all hf bands with low-loss cable, reflected power loss is generally insignificant, though at vhf it becomes significant, and at uhf it is of extreme importance.

2) Reflected power does not flow back into the transmitter and cause dissipation and other damage. Damage blamed on reflections is really caused by improper output-coupling adjustment -- not by SWR. Tube overheating is caused by either or both overcoupling and reactive (mistuned) loading. Tank-coil heating and arc-overs result from a rise in loaded Q caused by undercoupling. With some manipulation, proper output coupling (indicated by a normal resonant plate-current dip at the correct loading level) can be attained no matter how high the SWR. The transmitter doesn't "see" an SWR at all -- only an impedance resulting from the SWR. And the impedances are matchable without concern for the SWR. This is one of the most important points of confusion at issue.

3) Any effort to reduce an SWR of 2:1 on any coaxial line will be completely wasted from the standpoint of increasing power transfer significantly. (*See Fig. 1, Part I.*)

4) Low SWR is *not* proof of a good-quality antenna system or that it is working efficiently. On the contrary, lower than normal SWR exhibited over a frequency range by a straight dipole or a vertical over ground is a clue to trouble in the form of undesired loss resistance. Such resistance can be from poor connections, poor ground system, lossy cable, and so forth.

5) The radiator of an antenna system need *not* be of self-resonant length for maximum resonant current flow, the feed line need *not* be of any particular length, and a substantial mismatch at the line-antenna junction will *not* prevent the radiator from absorbing *all* real power available at the junction. (*refs. 3, part III, p. 20; 24.*)

6) If a suitable transmatch cancels all the reactance developed by a nonresonant-length radiator and a random-length feed line which is mismatched at the antenna feedpoint, *the antenna*

system is resonant, the mismatch effect is cancelled, maximum current flows in the radiator, and all the real power available at the feed point is absorbed by the radiator.

7) The majority of tower radiators used in the standard a-m broadcast band (from 540 to 1600 kHz) are of heights which are not resonant lengths at the frequency of operation.

8) SWR on the line between the antenna and transmatch is determined only by the matching conditions at the load, and is not changed or "brought down" by the matching device. "Low SWR" obtained by using the device indicates only the mismatch remaining between the input impedance of the transmatch and impedance of the line from the transmitter.

9) Adjusting the transmatch for maximum line current creates a perfect mirror termination for the reflected wave, causing it to be totally rereflected on arrival at the input. The tuner provides the proper reactance to cancel the equal but opposite reactance resulting from the amplitude and phase difference between the source and reflected waves at the input. This causes the reflected wave to add in phase to the source wave to derive the incident power, which is the sum of the source and reflected power.

10) Total rereflection of the reflected power at the line input is the reason for its not being dissipated in the transmitter, and why it is conserved, rather than lost.

11) With a good "antenna tuner" or transmatch and a well-constructed open-wire feeder, a 130-foot center-fed dipole will not radiate significantly more power on 80 meters than one 80 feet long for the same power fed from the transmitter (refs. 10; 21; 3, part III, p. 20; 7, pp. 50 and 126).

12) A dipole cut to be self-resonant at 3.75 MHz and fed with either RG-8/U or RG-11/U coax will not radiate significantly more on 3.75 MHz

than on 3.5 or 4.0 MHz with any feeder length up to 150 or 200 feet.

13) With the 3.75-MHz dipole the feed-line SWR will rise to around 5.0 at both 3.5 and 4.0 MHz, thus utilizing the coax as a tuned feeder, but with insignificant loss in radiated power across the entire 80-meter band.

14) With the use of a transmatch or a simple L-network at the line input, proper coupling between the transmitter and the tuned-coax feeder can be attained over the entire band with any random coax length.

15) From the standpoint of line loss because of SWR resulting from the change in quality of the impedance match between the line and antenna, changing the height of the dipole above ground or lowering the ends of a horizontal dipole to make an inverted-V will have an insignificant effect on the amount of power reaching it from the transmitter.

16) As a tuned line at 4.0 MHz, RG-8/U will handle 700 watts cw continuously, within ratings, at an SWR of 5:1. With the duty cycle of ssb it is far below maximum ratings at 2 kW PEP. With a 100-foot length, the total attenuation (SWR = 5) is just 0.8 dB (0.46 dB because of SWR), which is insignificant in terms of received signal strength.

17) If a line length is critical in order to satisfy a particular matching condition, the same input impedance can be obtained with any length of line, shorter or longer, by adding a simple L network of only two components: either two capacitors, two inductors, or one of each, determined by the specific impedance change required of it. This statement is pertinent to coiled-up coax in mobiles. (Refs. 19, pp. 118-128; 24; 30, p. 48; 31.)

18) High SWR in a coaxial transmission line caused by a severe mismatch will not produce antenna currents on the line, nor cause the line to radiate (refs. 32; 2, p. 101).

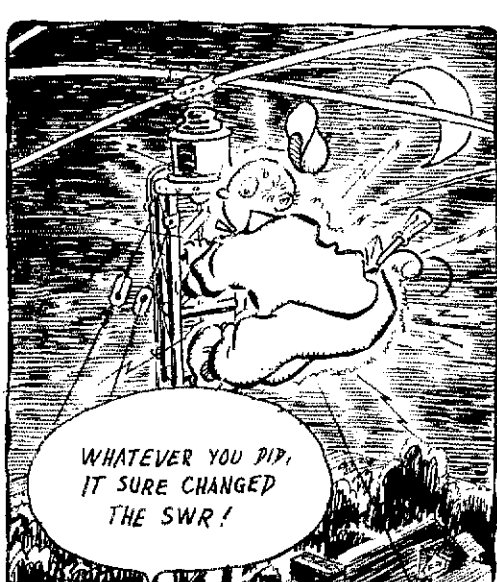
19) High SWR in an open-wire line at hf caused by a severe mismatch will not produce antenna currents on the line, nor cause the line to radiate, if the feed currents in each wire are balanced, and if the spacing is small at the wavelength of operation (also true at vhf if sharp bends are avoided. (Ref. 2, pp. 101, 106.)

20) Both coax and open-wire feed lines may radiate (ref. 32), though not at a significant level, by reradiating energy coupled into the line from the antenna because of asymmetrical positioning with respect to the antenna. The coupled energy results in antenna currents flowing on the outside of the outer coax conductor, or in-phase currents flowing in the wires of the open-wire line. But this condition has no relation to level of the line SWR in either case (ref. 2, pp. 101, 106).

21) SWR indicators need not be placed at the feed-line/antenna junction to obtain a more accurate measurement. Within its own accuracy limits, the indicator reads the SWR wherever it is located in the line. The SWR at any other point on the line may be determined by a simple calculation involving only the SWR at the point of measurement, the line attenuation per unit length (available in a later installment), and the distance from the measured point to the point where the SWR is desired.

22) SWR in a feed line cannot be adjusted or controlled in any practical manner by varying the line length (ref. 7, p. 51).

23) If SWR readings change significantly when moving the bridge a few feet one way or the other



The SWR on the line is determined only by the matching conditions at the load.

About This Series of Articles

in the line, it probably indicates "antenna" current flowing on the *outside* of the coax, or else an unreliable instrument, or both, but it is *not* because the SWR is varying with line length. Some writers insist the bridge must be placed at a half-wave interval from the load to obtain a correct reading. *This is incorrect.* All readings are invalid if they change significantly along the line, even though they may repeat at half-wavelength intervals (*ref. 2, pp. 101, 106, and 132*).

24) Any reactance added to an already-resonant (resistive) load of any value for the purpose of compensation to reduce the reflection on the line feeding the load will, instead, only increase or worsen the reflection. It is for this reason, though contrary to the teaching of several writers, that *lowest feed-line SWR occurs at the self-resonant frequency of the radiating element it feeds, completely independent of feed-line length.* Any measurements which contradict this indicate that either the measuring equipment or the technique (or both) are in error.

25) Of the several types of dipoles, such as the thin wire, folded, fan, sleeve, trap, or coaxial, none will radiate more field than another, providing each has insignificant ohmic losses and is fed the same amount of power (*ref. 3, part III*).

26) If coax at least the size of RG-8/U is used in mobile installations (80 thru 10 meters), any matching required to load the transmitter may be done at the *cable input end* without significant power loss compared to matching at the antenna terminals, and with improvement in operating bandwidth.

27) With center-loaded mobile whips of equal size having no matching arrangement at the input terminals, best radiating efficiency is obtained on models having the lowest measured terminal resistance (highest resonant SWR, model for model). Models having lowest SWR are wasting power in the loading coil, because of either a low value of coil Q or excessive distributed coil capacitance, or both.

As was mentioned earlier, all of these statements are *true*. These examples have been centered around 80-meter operation because bandwidth and dipole length on this band present the maximum SWR problem. Of all the amateur bands, 80 m has the largest bandwidth, 13.3 percent of center frequency, as compared to 4.2 percent on 40 m, 2.5 percent on 20 m, 2.1 percent on 15 m, and 5.9 percent on 10 m. Having the longest wavelength (excepting 160), of course, 80 m poses the greatest problem with respect to physical construction of radiating systems on existing real estate. Some properties just won't permit an entire half wavelength on 80. So these examples should have a special interest for the fellow who wishes to work 80 meters but is forced to use a short antenna. Since the bandwidth and antenna-length problem are really one and the same, the 80-meter examples have maximum practical value. But regardless of which band we select, the principles are the same. Practices recommended at the 80-meter level are also valid on the higher hf bands. Interestingly enough, as we go to the higher bands, where the line losses increase, the percentage bandwidth of the amateur band decreases. This means inherently lower maximum SWR values will be obtained during frequency excursions from the design center to the band ends.

The original idea for writing this paper was born while the writer was listening to and participating in many discussions concerning mismatch and reflections. It soon became apparent that if the twenty-seven true statements above were presented as a true-false test, many amateurs would mark them false. Those discussions also revealed that many experiments were performed in this area for which the results were predestined to futility, because the experimenter misunderstood the principles. In many cases, the experimenter was unaware of both the ultimate futility of his efforts and that the futility was a direct result of his misunderstanding. Then the appearance of the article by Drumeller (*ref. 14*) motivated the desire to do something constructive about the problem. Although the results of his experiment agree with the writer's teachings, Drumeller's preface implies that little is known on the subject of mismatch. This is not true, unless he was referring specifically to us amateurs.

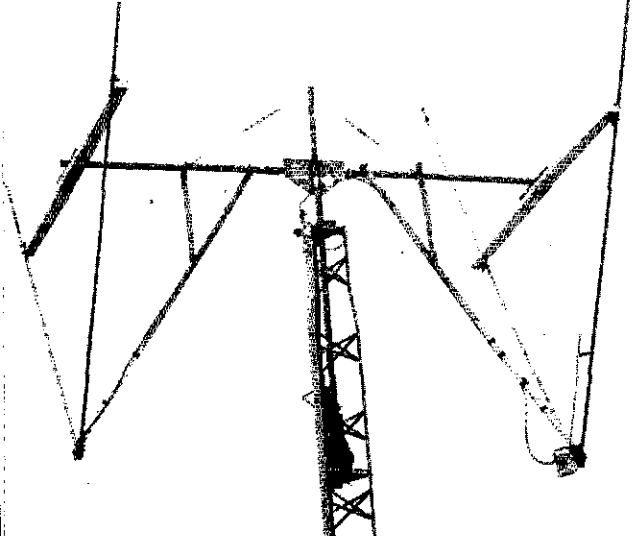
The limited equipment available for amateurs to make precise and complete measurements at rf, as compared to dc, low-frequency ac, and audio, understandably limits the quality of our experiments. But this doesn't excuse us from needing to know some of the fundamental principles of transmission lines — it actually makes knowledge of the fundamentals all the more necessary, so we can correctly diagnose and logically evaluate the limited measurement data we do obtain. Our experimental efforts can become more productive if we are able to visualize an accurate physical picture of the voltages, currents, and fields, and how they interact on the line.

So the writer initially planned to compile and publish an extensive bibliography of *accurate* references on the subject, references which are readily available to the amateur. But at one of the monthly Colts Neck meetings, a good friend and fellow 3999er, the late John Marsh, W3ZF, convinced the writer that a mere list of references would receive little attention. W3ZF then proceeded to fire real enthusiasm for writing an extensive paper which would not only complement and unify the references, but would also underscore the problem and stimulate interest in studying the subject. He felt strongly that this approach would make a more worthwhile contribution to amateur radio.

John's suggestion was followed, and as the work progressed it became apparent that additional references from professional engineering sources would be valuable in providing access to greater depth of study for the more advanced amateur, and by affording reliable sources for verification of points which have been clouded by controversy among amateurs.

During study of the numerous references for preparation of the manuscript, an interesting and valuable aspect emerged: the *ARRL Antenna Book* already unifies the other references, plus more,

(Continued on page 27)



This view shows the completed beam installed on the tower.

It is apparent that W8PJ has come up with the answer to keeping a 20-meter Delta Loop up in the air. We have had many queries from Delta Loop fans for a 20-meter design. This system looks hard to beat and we recommend it.

A Modified 20-Meter Delta-Loop Beam

BY NORMAN L. FLEMING,* W8PJ

LIVING IN A CITY that has a tight restriction on the height of antenna towers is very frustrating to any would-be DXer. Many tribanders and mono-band Yagi antennas, both commercial and home-made, have been tried by the writer with varying degrees of success at a height of 32 feet. It wasn't until a cubical quad was erected that DX stations were worked in the pileups with a fair degree of regularity. However, this feeling of achievement was short lived due to the fragile nature of most quads. More time was spent keeping it up in the air than in operating. After reading many articles on the Delta Loop beam in past issues of *QST*, I decided to build a 20-meter job.

My first attempt to mount a conventional Delta Loop up on the tower proved to be quite a struggle because of the antenna's physical size alone. In short order, the first windstorm that came along

* 15684 Galemore Drive, Middleburg Hgts., OH 44130.

turned the whole thing over on the mast mount, bending a 5/16-inch boom pinning bolt like a hairpin. I decided the center of gravity had to be lowered to eliminate some of the tremendous torque the 24-foot elements develop on the boom. This change would also make it easier to haul the antenna to the top of the tower in its upright position. Supporting the elements approximately 7 feet up from the bottom where they join takes much pressure off of the boom, provides a better overall mechanical balance, and keeps the elements from swinging wildly in a windstorm.

Construction

Two clear fir 2 x 4s eight feet long were just right for spreaders and element supports. I painted the wood with two coats of boiled linseed oil¹ and finished with a coat of white paint. Boiled linseed oil is also great on bolts and nuts as a rust preventative. (Ordinary pine 2 x 4s could be used but clear fir was used because it is straight and free from knots.)

Aluminum angle and steel U-bolts are used to secure the elements to the 2 x 4s as shown in Fig. 1. The proper positioning of the aluminum angles and steel U-bolts can be done best by assembling

¹ EDITOR'S NOTE: This doesn't mean one buys linseed oil and boils it. Boiled linseed oil is a wood preservative available at any hardware store. I

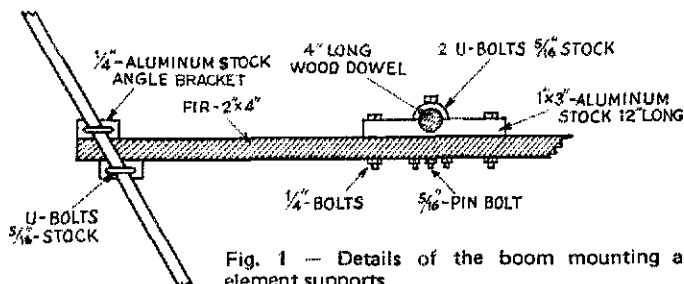
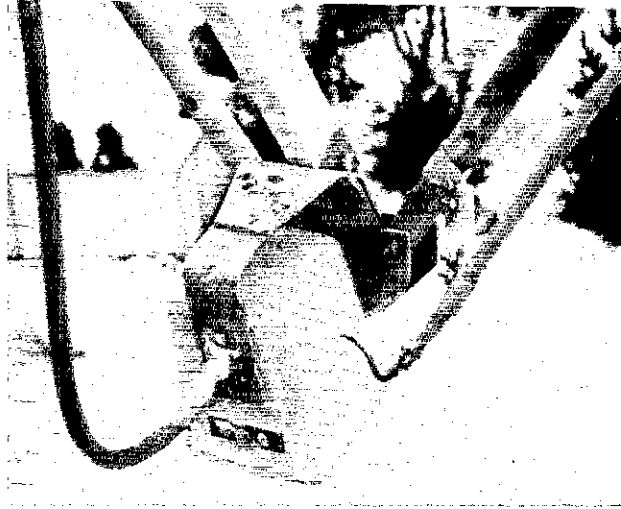


Fig. 1 — Details of the boom mounting and element supports.

The matching capacitors are installed in a freezer box. Note the weatherproofing compound on the fittings.



the completed loop flat on the ground. Then starting at the point where the tubing is joined measure up each element approximately 6 feet 10 inches, mark it, and slide a 2 x 4 under the tubing there. The angle at which the tubing crosses the 2 x 4 can now be marked off. The U bolts and angle stock can now be positioned and the mounting holes drilled. A 3/4 x 12-inch long hardwood dowel was pushed far enough into the tubing to be equally spaced under the U bolts to prevent collapsing the tubing during tightening. The elements are joined together at an angle of 75 degrees and held by two aluminum plates as shown in Fig. 2.

To maintain a Plumber's Delight type of construction, a piece of No. 10 solid electrical wire was connected to the bottom plate of each element and joined at the boom-to-mast mounting plate. Pieces of 1 x 2-inch wood strips 7 feet long were used as extra support and also as a means of carrying the No. 10 wire and coax cable up to the boom. Muffler clamps secure the 1 x 2s to the boom.

A 10-foot length of 1-3/4 inch OD electrical thin-wall steel tubing was used for the boom. Two U bolts clamp each 2 x 4 to the ends of the boom. To secure the 2 x 4 spreaders more firmly and prevent any twisting on the boom, two pieces of aluminum bar stock, 1 x 3 x 12 inches, were both filed out enough in the center to make a cradle for the boom and holes were drilled near each end to take a 1/4-inch bolt to mount to the spreader.

A wooden dowel 4 inches long was driven into each end of the thin wall tubing to prevent the boom from collapsing when the U bolts are tightened. Space the U bolts so a 5/16-inch bolt can be run between them through the boom, aluminum cradle, and wooden spreader, pinning everything in place as shown in Fig. 1.

Element Lengths

The elements are made of 6061-T6 aluminum tubing with a .058-inch wall thickness. Four

12-foot lengths of 7/8-inch OD, four 12-foot lengths of 3/4-inch OD, and one 6-foot length of 5/8-inch OD tubing are required.

The desired resonant frequency of the system was 14,225 kHz. The formulas of $\frac{1005}{f(\text{MHz})} = \text{length in feet}$ for the driven element and $\frac{1030}{f(\text{MHz})} = \text{length in feet}$ for the reflector were used to calculate the overall loop dimensions. These loop lengths turned out to be too long when the resonant frequency was checked out. The corrected lengths are shown in Fig. 3.

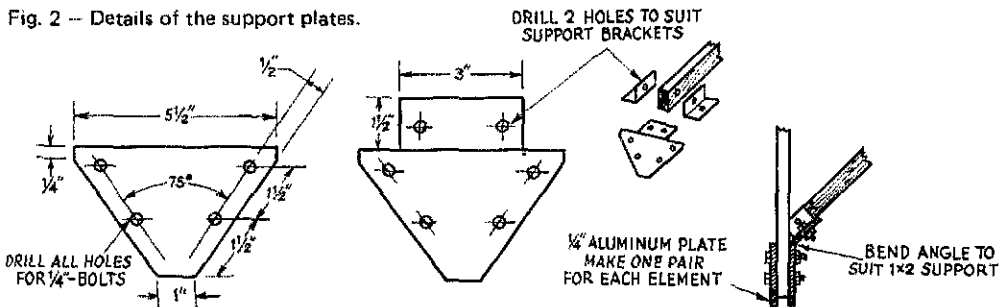
Each side is approximately 1/3 wavelength long. The top segment of each element is made of No. 12 wire, which is made slightly shorter than 1/3 wavelength in order to put tension on the wire. Add this difference equally to each side to maintain the total required loop length.

In one end of each length of the 7/8- and 3/4-inch tubing, cut a slot about 2 inches long through both walls with a hacksaw blade. Carefully remove all burrs to lessen the possibility of seizure after the tubes are telescoped.

Stainless steel hose clamps were tightened over the slots after the tubing was adjusted to the required length. Silicone-rubber bathtub caulking compound was then applied to the slotted joints to prevent any corrosion from forming. This compound was also applied generously to all other

Stainless steel hose clamps were tightened over the slots after the tubing was adjusted to the required length. Silicone-rubber bathtub caulking compound was then applied to the slotted joints to prevent any corrosion from forming. This compound was also applied generously to all other

Fig. 2 -- Details of the support plates.



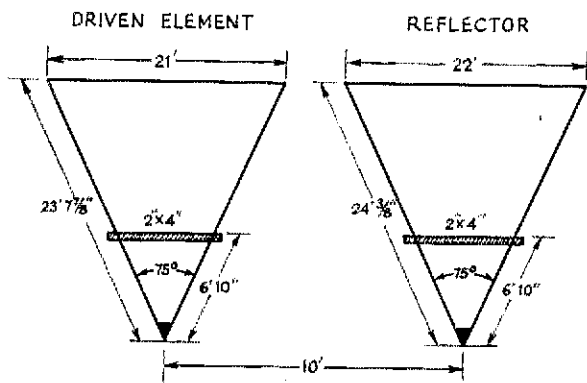


Fig. 3 -- Element lengths for the driven and reflector elements.

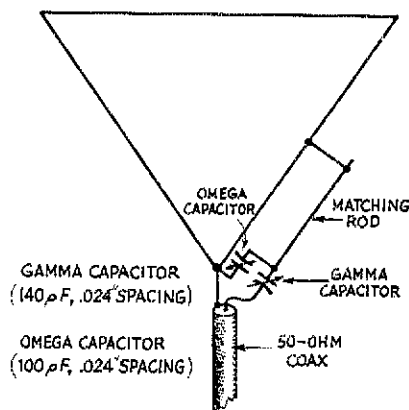


Fig. 4 -- Matching-section details.

places where copper wire was connected to aluminum.

A gamma match was first built but a trial run on the ground showed that I could not reach out far enough while hanging from the tower to make any final adjustments on the shorting bar. I could reach out to adjust the gamma capacitor with ease so it was decided to add an additional variable capacitor in the circuit configuration called the omega match (see Fig. 4). The electrical length of the matching rod is controlled by the setting of the omega capacitor. Increasing the capacitance effectively acts to lengthen the rod, and vice-versa. Now the shorting bar clamps could be tightened securely on the ground and any further length adjustment up in the air could be done electrically. This hookup is shown in Fig. 4.

A quart plastic freezer container was used to house the variable capacitors. The matching rod was made from a 3/8-inch OD x 30-inch length of aluminum tubing. The rod was spaced four inches from the element and held in place at one end by the shorting clamp made from 1/16-inch thick aluminum cut in a 1-inch strip. At the other end a piece of Plexiglas is used as an insulated spacer.

Adjustments

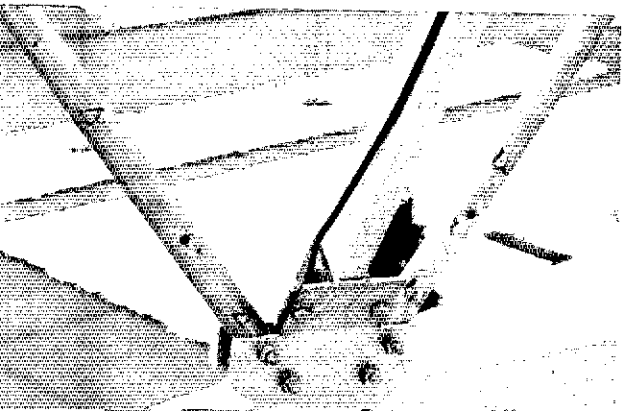
Not being able to tilt over the tower made it imperative that all adjustments, with the exception of the matching capacitors, be done on the ground,

so the antenna was erected on a guyed stepladder with the bottom of the elements only a foot off the ground. A simple impedance bridge, such as the one described in the ARRL *Handbook* in the measurements chapter, was used to make an initial checkout before applying any appreciable power from the transmitter.

A grid-dip meter with its frequency set to approximately 14.2 MHz was loosely coupled to the input of the bridge with a two-turn loop. The output of the bridge was connected with a 6-inch piece of 50-ohm coax to an SO-239 coax chassis connector on the plastic matching box.

The resistance dial of the impedance bridge is set to 50 ohms. The shorting bar was temporarily clamped near the end of the matching rod. The station receiver in the house was tuned to the desired frequency of 14.225 kHz. The volume control was turned on full and the window next to the antenna in the yard was opened wide. Needless to say, everyone in the house at that time left in a hurry. The grid-dipper coupling was increased until the bridge meter read at least half scale or better.

The grid dipper was slowly tuned back and forth until a zero beat was heard in the receiver. If your SWR meter reads a null or dip at this point you are in luck and all that remains is to juggle the settings of the two variable capacitors until a minimum null or zero is obtained. In my first attempt, the null occurred around 13 MHz, which meant that the elements were too long and had to be shortened. When the null occurs at the approximate center of the desired operating range and at the correct resistance value of 50 ohms, the antenna system is fairly well matched.

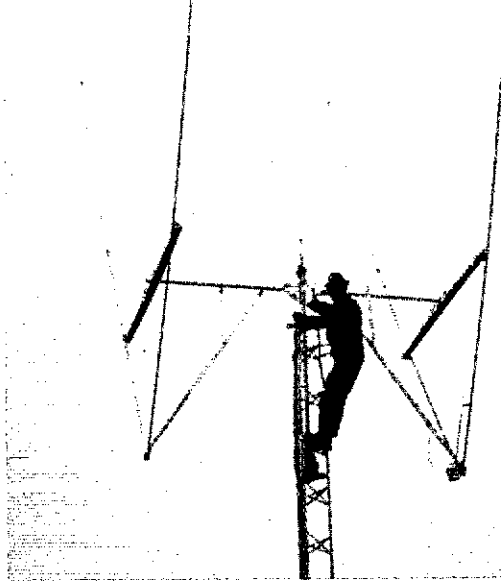


This close-up shot shows how the bottom element supports are installed.

Now all we need is a band opening!

The last step is to connect an SWR indicator directly at the input to the matching network with the short length of coax. A length of 50-ohm coax was run from the station exciter out the window to the input of the SWR indicator. The transmitter was tuned to the desired frequency and the input power increased until a full-scale meter reading in the forward position of the SWR indicator was obtained. The indicator was switched to the reflected position and the two capacitors adjusted alternately for a minimum meter reading. The matching rod length was decreased to 26 inches and clamped securely in place. Both capacitors were at about half mesh at this length. This setting provided a little leeway if considerable adjustment was needed after the antenna was up on the tower. SWR readings were less than 1.5 to 1 at either end of the 20-meter band. Very little change in SWR was noted after the antenna was up in the air.

Results with this beam have been as good and in some instances better than with cubical quads



and 3-element Yagis on my 32-foot tower, and best of all, the antenna has remained up where it belongs, all in one piece in spite of some very bad ice and wind storms. QST

Reflections

(Continued from page 23)

because in one handy volume it contains sufficient, well-presented material on every point of importance to the amateur's needs concerning antennas and transmission lines, including the fundamental principles! For the amateur who has no access to the other references, but could manage to acquire just one book, the *Antenna Book* is it! Every amateur who feeds rf into an antenna should have a copy — and read it! One would be surprised to learn how many antenna engineers have a copy in their own personal libraries.

With the exception of the *ARRL Antenna Book*, the details of the reflection activity in a length of line seem to be somewhat obscure in the amateur literature, so the beginning of the next part of this series presents a simplified treatment of the interaction of the fields, currents, and voltages in a line. Following that, a new vector-type presentation using the Smith chart is given.⁸ The presentation enhances the physical picture of standing-wave development, input impedance, and other activity along the line, and forms a basis for an arithmetical proof that the explanation presented is correct. The two-generator concept (*ref. 17, p. 133*) is used as the basis for determining

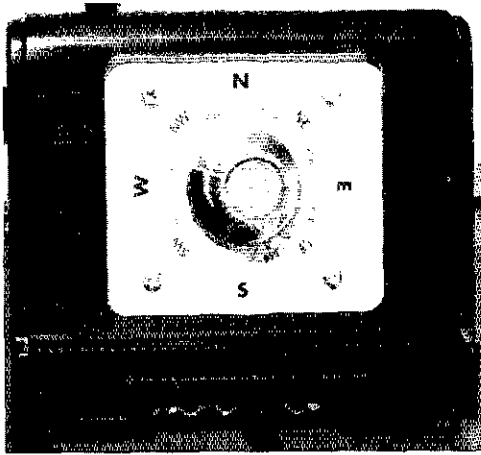
⁸Smith charts may be obtained at most university book stores. They may be ordered (50 for \$2.50 postpaid when remittance is enclosed) from Phillip H. Smith, Analog Instruments Co., P.O. Box 808, New Providence, NJ 07974. For 8 1/2 X 11-inch paper charts with normalized coordinates, request Form 82-BSPR. A brochure of Smith charts and accessories will be sent upon request. NOTE: Smith charts with 50-ohm coordinates (Form 5301-7569) are available at the same price from General Radio Co., West Concord, MA 01781.

line-input impedance, because this concept permits direct comparison of the incident- and reflected-wave vector presentation with simple series-equivalent circuits. This reduces the line-reflection problem to one of simple Ohm's Law calculations, and at the same time achieves a built-in proof of validity. This concept is simple to grasp, easy to remember, and will be recognized as a powerful tool for assisting the amateur in analyzing any feed-line situation from the viewpoint of matching the transmitter to the *line input* under any SWR condition. It uses simple arithmetic, but it is not short and it will require some study — there isn't any short cut to understanding reflections on transmission lines.

For those who are unfamiliar with the Smith chart it is easy to learn (*ref. 25, part 1*). The chart will be found to be a valuable tool. It has separate sets of circles for resistance and reactance. To plot a single complex impedance $R + jX$ one simply finds the point where the appropriate R and jX circles intersect. Knowledge of the Smith chart will be found helpful in understanding and devising matching circuitry; it is actually fun to use for this purpose. Additional references of interest are included in the bibliography.

The author wishes to express appreciation to his many friends who offered suggestions and criticisms, especially to Bob Allen, W8IO; Ken MacLean, W2KKM, the author's engineering supervisor for many years; and colleague Bert Sheffield, W2ANA. Their help has been invaluable. Acknowledgement with thanks is also given to Mr. Phillip H. Smith, ex-1ANB, for his kind permission to use the Smith chart in the studies which follow. Part III will appear in a subsequent issue of *QST*.

QST



A new indicator dial has been fabricated from heavy cardboard and has been mounted in place of the meter. The original meter could be connected "in parallel" with this mechanical indicator to provide the operator with an idea of the approximate position of the antenna while it is turning. Additionally, a great-circle-bearing map centered on the owner's QTH could be used to provide geographical headings if mounted directly under the control knob.

Automating the TR-44 Antenna Rotor

BY KEITH H. SUEKER,* W3VF

CONTRARY to the old adage, the mother of invention is laziness more often than necessity. The "invention" described in this article was spawned by the author's dislike for holding a control handle while the antenna turned its attention from "ZL" to "ZS." A set-and-forget system seemed like a highly desirable addition to the station.

The CDE TR-44, in common with many other rotors, uses a low-voltage ac motor which is connected to the drive shaft and a simple 360°

* 110 Garlow Drive, Pittsburgh, PA 15235.

potentiometer used for bearing indication. The complete schematic diagram is shown in Fig. 1. Power for the indicator circuit is controlled by the first set of contacts on a spring-loaded operating switch. The motor is activated by a second set of contacts which "make" on further movement of the control handle. The handle must be held in position until the desired bearing is reached (and therein lies the problem).

While examining the possible modifications to the control system, the principle of "maximizing laziness" was kept firmly in mind. This ruled out any changes in the rotor head since it is located in a position quite remote from the workbench. The design problem can be stated as: How does one make a simple servo system utilizing the existing hardware and control-cable wiring with a minimum of additional parts, expense, and effort? Exit synchros and similar sophisticated solutions — enter operational amplifier and relays.

Circuit Development

Since the TR-44 already had a Zener-diode regulated low-voltage supply, it seemed logical to

Bottom view of the rotor control. All of the components are mounted on Vectorbord which is connected to the rotor control box with small pieces of angle aluminum hardware.

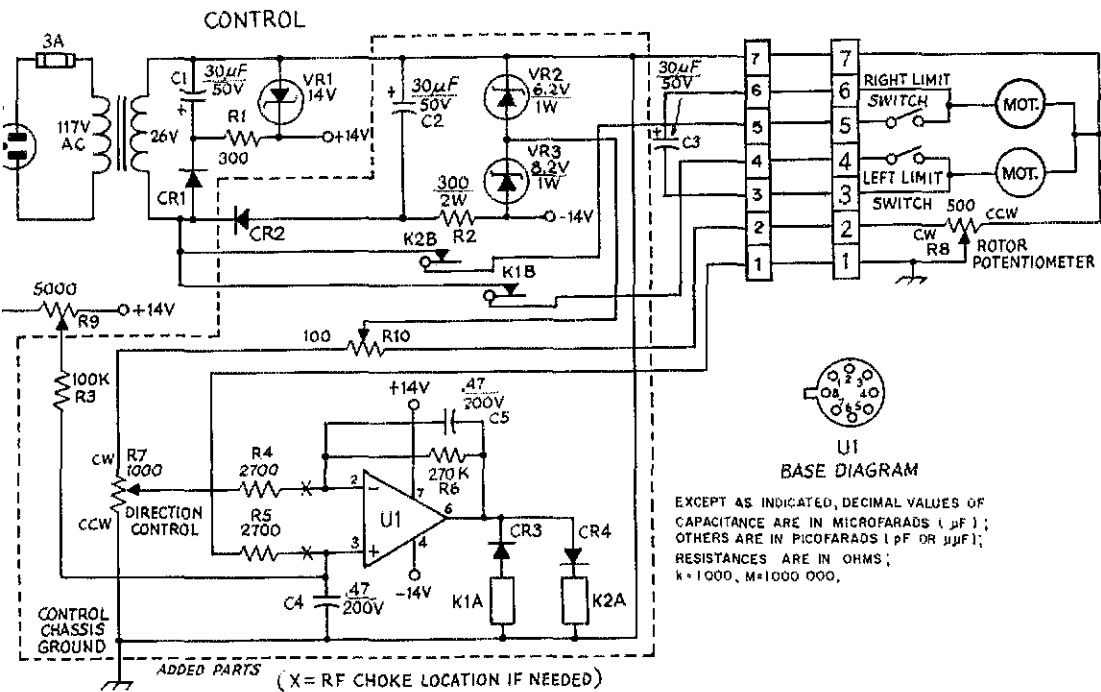


Fig. 1 — Circuit diagram for the modified rotor control. Component designations not listed below are for text reference. CR1-CR4, incl. — 100 PRV, 0.5-A silicon. C2 — 30- μF , 50-V electrolytic. C4, C5 — 0.47 μF , 200-V paper. K1, K2 — 12 V dc, 1000-ohm minimum resistance, 1-A contacts (Sigma 65F1A-12 dc or equiv.).

- R7 — 1000-ohm linear taper, wirewound, 360° rotation of arm. (Bouras 3438S or IRC Type 151 or equiv.).
 VR2 — Zener diode, 6.2 V, 1 watt (Motorola 1N4735).
 VR3 — Zener diode, 8.2 V, 1 watt (Motorola 1N4738).
 U1 — Operational amplifier (TI-SN72741L).

work around a simple dc relay system. More simply stated, the objective was to be able to set a "command" potentiometer to the desired heading, have a relay apply power to the motor (for the proper direction) and then have the relay drop out when the antenna reached the proper heading. A relay would be required for each direction of rotation since continuous rotation tends to confuse the coax and control cables!

Sensing the error signal between two potentiometers is difficult without using two isolated power supplies, Fig. 2 illustrates the problem. If both pots are at position A, the wiper voltages are both zero and the difference voltage is zero. A one-degree error in alignment will result in a difference voltage of $6 \times (1/360)$ and equals .017 volt. At position B, a one-degree error still results in a .017-volt difference but the pot arms are now 3 volts above ground. An amplifier is needed which can concentrate on the .017-volt "signal" and ignore the 3 volts. Fortunately, the operational amplifier offers a simple solution.

Fig. 3 shows a circuit for an op amp connected in a differential-input configuration. The circuit will ignore signals present simultaneously at both inputs (up to some voltage set by the op-amp

design), and respond to (amplify) the difference voltage only. The output voltage polarity of the op amp depends on the polarity of the input voltage difference. A number of inexpensive op amps will handle voltages up to 6 volts or so and still produce full output from differences of a few millivolts.

Putting It All Together

A circuit diagram for the completed rotor control is given in Fig. 1. All of the original TR-44 parts are used except for a 10,000-ohm resistor and the meter. The original power supply provides a positive 14 volts. The addition of CR2, C2, R2, VR2 and VR3 provide additional voltages of -6 and -14 V. The op amp IC is driven differentially

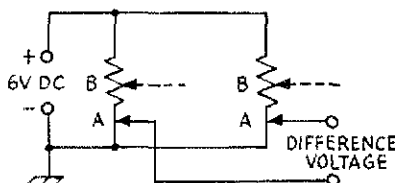


Fig. 2 — Sensing the voltage can be accomplished by an operational amplifier. See text for details.

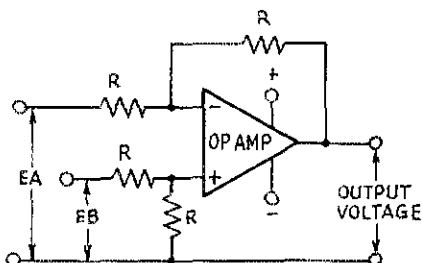


Fig. 3 - Typical circuit for a differential amplifier. The output voltage is determined by the voltage combination appearing at EA and EB. See text for details.

by R7 (located in the control box) and R8. CR3 and CR4 energize either K1 or K2 depending on the polarity of the error signal between R7 and R8. Since the electrical length of R8 exceeds its mechanical travel, R10 and R3 provide a means of balancing the voltage difference remaining when R7 and R8 are at the ends of their travel. R9 also functions to null the slight offset voltage present when there is no input to U1.

The sensitivity of the system is set by R6. Higher values than shown improve accuracy but may introduce some "hunting." As given, the system is accurate to about 5° of rotation. The "set" potentiometer should be a type having 360° rotation capability since this permits the use of a compass rose under the control knob. The system will work, however, with a 270° or 300° device. A linear-taper control is necessary.

C4 and C5 provide RFI filtering. In stubborn cases, 2.5-mH rf chokes may be inserted at points "X" shown in Fig. 1. The control-chassis ground connection should be made as shown. The chassis should *not* be connected to earth ground because the arm of the potentiometer mounted in the rotor is connected to the tower.

Construction

The parts may be mounted on a small piece of Vectorbord as shown in the photograph. The model described here has the direction-setting control mounted on a piece of one-eighth-inch thick cardboard which, in turn, is fastened to the original meter plate. The Vectorbord is mounted with small angle hardware bolted to either side of the meter plate. No special wiring precautions are needed. The op amp is quite rugged and will tolerate nearly any abuse *except* inverted power-supply polarity. The original control switch may be utilized if one of the 117-volt switch contacts are jumpered to allow the power supply to operate continuously.

Adjustments

Before applying power, check the circuit wiring carefully for correct voltage polarity. Apply power and turn the direction control fully *ccw*. The rotor should turn to the left and activate the limit

switch. Adjust R9 to allow the rotor to reach the left limit switch. Neither relay is activated at this point. Next, advance the control (R7) to the *ccw* end of its travel and adjust R10 until the rotor travels to the right limit switch (and neither relay is activated). The complete system now should function correctly. Changes in the setting of R7 should be accompanied by corresponding changes in antenna direction. If the system hunts or operates occasionally on windy days, the sensitivity can be reduced by decreasing the value of R6. If this is done, reset R9 and R10 as described above.

The unit may be calibrated directly if the control potentiometer arm rotates 360 degrees. If not, a 300° or 270° unit may be calibrated by temporarily connecting the original meter in series with a 4700-ohm resistor and a 5000-ohm pot across terminals 1 and 7. Set the pot so that the meter reads full scale (south) with the rotor turned against the right-limit switch. The meter now will show beam headings when R7 is set to various positions. The meter "loads" R8 slightly but only affects the accuracy by a few degrees.

Parts

All parts are listed in the Industrial Catalog of Allied/Radio Shack. If everything is purchased new, the bill will be about \$21. None of the parts are critical and surplus or junkbox items should work fine however. The 360° pot, for example, costs about \$8 new, but the author found one at a hamfest for fifty cents.

It is the author's hope that this article will serve not only as construction information for modifying the TR-44 but will also stimulate some thinking on similar systems. If so, the scientific value of "studied laziness" will be amply demonstrated.

QST

Strays

Ed Munsell, K6CL, writes headquarters pointing out that recent measurements have provided a more accurate value for the speed of light than was ever before available. Using laser technology at the National Bureau of Standards Laboratories in Boulder, Colorado, scientists have concluded that light travels at a velocity of 299,792,456.2 kilometers per second ± 1.1 meters. This is equivalent to 186,282,396.0 miles per second ± 3.6 feet. The previous margin of error was 300 feet. Information on these measurements, with photographs and a brief description of the technique, appears on pages 41 and 42 of *Optical Spectra* for January, 1973.

I would like to get in touch with . . .
 . . . pharmacist hams to form an informal net. - WB4YZZ
 . . . university, college and high school radio clubs to exchange experiences, courses of study, etc. - VF7BBQ
 . . . anyone in the Doylestown - New Britain area of Pennsylvania who is interested in forming an informal radio club. - W3GFB

The first author's synthesizer, is built into the same enclosure that houses a receiver and a transmitter. The controls associated with the synthesizer may be seen at the left on the front panel.

A Practical Approach to Two-Meter Frequency Synthesis

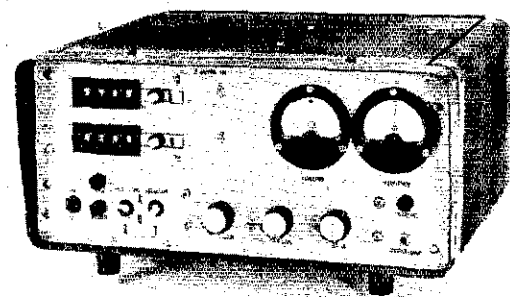
A Synthesizer for Transmitting and Receiving Applications

PART I

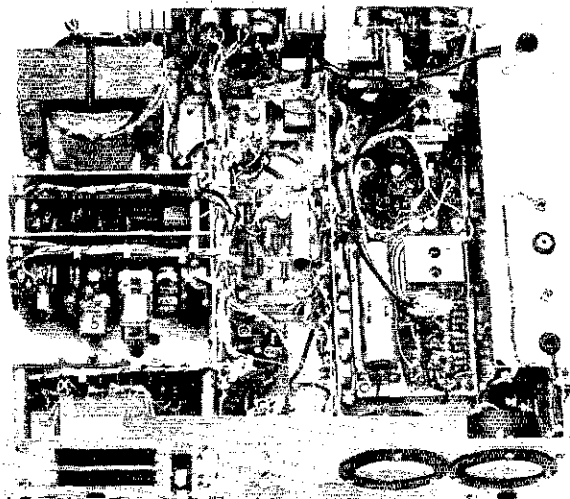
BY PETER J. BERTINI,* K1ZJH
AND RICHARD VAN HOOFT,** WB2MBI

THE GROWTH of fm communications has reached epidemic proportions as more and more amateurs become attracted to this exciting "new" form of channelized mobile operation. Repeaters now dot the countryside, and the manufacturers of amateur equipment, quick to capitalize on a new and highly lucrative market, are producing the rigs capable of holding the 12 to 22 pairs of crystals necessary in areas of large repeater density.

The fact that crystals purchased for a rig of one manufacturer often are not compatible with those of another is not a reassuring one, especially when trade-in time rolls around and the investment in crystals approaches that of the contemplated new rig! Such is the dilemma which for several months had faced the first author, from whose vantage point in northern Connecticut activity is prevalent virtually on every channel. Several VFO and VXO schemes were tried as a possible alternative to a huge crystal stockpile, but all were eventually discarded as being impractical for various reasons. It was then learned that the second author had already found the solution to our mutual problem. Using a mysterious black box, he was able to work any two-meter channel with 5-kHz separation with VFO-like versatility and crystal stability. And it was all done using only three crystals! Prying fingers soon revealed all the secrets the box held, and within a few weeks' time several synthesizers modeled after that of WB2MBI appeared on the air around Springfield, MA. The unit can be duplicated, and while enough information is presented here so



that any technically orientated amateur can construct a "carbon copy" of the unit, it is hoped that those who do build it will improve upon the basic design. With this in mind, suggestions and various circuit modifications are presented throughout the article for consideration of the prospective builder. Even as this is being written, several advanced models of the synthesizer, with both electrical and physical refinements, are being built and tested. There are several salient features which make this synthesizer stand out when compared to commercially available units or to previously published circuits of a similar nature. The MBI unit offers 5- or 10-KHz steps across its 4-MHz (or better) range; the operating frequency of the unit is read directly, with no cumbersome interpolation being required; the lockup time is typically 50 ms when going from receive to transmit; and finally the spurious output of the unit is well within accepted tolerances. All this is done with relative circuit simplicity. Obsolescence is unlikely since the versatile unit may be programmed to work with



Top view of the synthesizer-receiver-transmitter assembly. The synthesizer portion of the circuit is shown at the lower left in this view.

* 20 Patsun Rd., Somers, CT 06071.

** 41 Tryon Ct., Albany, NY 12203.

virtually any rig. Only a few jumpers need be changed to produce a variety of outputs. The one crystal that may ever need to be changed is the receiver heterodyne crystal, when changing to a receiver with a different i-f. The synthesizer has been used with a variety of different rigs with no difficulty.

Synthesized transmitter outputs of 6, 12, or 24 MHz are provided directly and, if desired, 18-MHz drive may be obtained with a simple tripler from the 6-MHz output. However, rigs requiring 18-MHz crystals usually quadruple to 72 MHz and often these rigs will triple the available 24-MHz output readily. No provision is made for a direct 8-MHz output but, if needed, a divide-by-three IC divider will produce this output from the 24-MHz signal. Here again, rigs that utilize 8-MHz crystals generally triple to 24 MHz in the first multiplier, so it would be reasonable to assume that either the available 6-, 12-, or 24-MHz outputs would directly drive such rigs.¹ The same outputs will feed

¹ In the case of 24 MHz the order of multiplication is reduced by a factor of three, and this may result in an inability to obtain a usable amount of deviation. In such cases, the use of the VCO modulation scheme should be employed.

receivers that use oscillator crystals in the 6-, 11-, or 22-MHz range directly.^{2,3} Rigs such as the Regency HR-2 which use 45-MHz crystals will require a doubler from the 22-MHz output, and in most cases the receiver oscillator itself is readily modified to work as a multiplier. Receivers such as the Pierce-Simpson Gladding 25 which use 76-MHz crystals can be modified similarly to use the 22-MHz output. Details for interfacing the synthesizer with various rigs will be covered in greater detail near the end of the article.

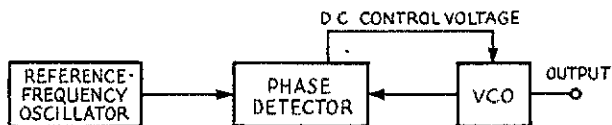
An excellent direct-fm audio system that may be incorporated in the synthesizer is also presented. This allows use of the synthesizer with a-m or cw 2-meter transmitters, or with transmitters which employ other than phase modulation (in-

² Some double-conversion receivers use only one crystal to provide injection into both mixers, such as the Motorola 5V and P33BAM series. These are not directly compatible with the synthesizer. With the inclusion of a separate second oscillator to fix the second i-f, it may be possible to use the synthesizer with these receivers.

³ The synthesizer HFO injection frequency for reception is on the low side of the signal frequency only.

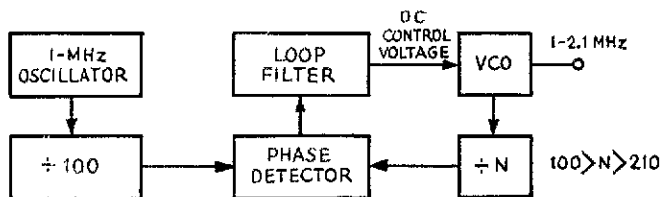
Table 1 -- Parts Availability

BCD coded thumbwheels and accessories	EECo switches recommended B and F offers surplus switches	
Regulators μ A7805, LM309K, surplus	Poly Paks, Solid-State Systems	
Motorola MPF102, MPS6571	Circuit Specialists, Cramer or Newark	
MC3062P, MC4044P, etc.	5 MHz available from Jan Crystals	
Crystals	CS1 International Crystals recommended for het. osc.	
Toroid cores	Amidon or ES Electronic Labs	
IC sockets, surplus	B and F	
Surplus 7490, 7492, 74192, 7400, and 741 ICs	B and F, Solid State Sales, Solid-State Systems, Poly Paks	
2N2222 transistors, surplus	Solid-State Systems, Solid State Sales, Poly Paks	
diodes	Weinschenker, Solid-State Systems	
Capacitors and resistors, surplus		
diodes		
HAL Devices and John Meshna Co. stock various semiconductor and parts. Refer to recent ads. Etched and drilled circuit boards for the WB2MB1 digital synthesizer are available at \$15 per set postpaid (add 50 cents for first class postage) from ARIES, Inc., P.O. Box 808, Peabody, MA 01960. The set consists of three different 3 x 5" G-10 glass-epoxy boards with 2 oz. copper and fused solder coat.		
Amidon Associates 12033 Orsego Street N. Hollywood, CA 91607	E. S. Electronic Labs Box 434 Excelsior Springs, MO 64024	Newark Electronics 500 N. Pulaski Rd. Chicago, IL 60624
B and F Enterprises P. O. Box 44 Hathorne, MA 01937	HAL Comm. Corp. Box 365 Urbana, IL 61801	Poly Paks Box 942 Lynnfield, MA 01940
Circuit Specialists Co. Box 3047 Scottsdale, AZ 85257	International Crystal Co. 10 N. Lee Street Oklahoma City, OK 73102	Solid State Sales P. O. Box 74 Somerville, MA 02143
Cramer Electronics, Inc. 85 Wells Ave. Newton, MA 02159	JAN Crystals 2400 Crystal Drive Ft. Myers, FL 33901	Solid-State Systems, Inc. Box 773 Columbia, MO 65201
	John Meshna, Jr. Box 62 E. Lynn, MA 01904	Weinschenker, K3DPJ Box 353 Irwin, PA 15642



(A)

Fig. 1 — At A, block diagram of a basic phase-locked loop. At B, a simple synthesizer capable of providing an output in the 1- to 2.1-MHz range in frequency steps of 10 kHz.



(B)

VCO = VOLTAGE - CONTROLLED OSCILLATOR

cluding those that obtain fm by "swinging" the oscillator crystal), where the modulation system would ordinarily be disrupted by the use of a synthesizer. The cost of the synthesizer can be held to \$100 or less, and, of course, is related to the size of the builders junk box and his adeptness at scrounging and shopping at the various surplus outputs. A price breakdown of the major expenditures would have the thumb-wheel switches leading the top of the list. The two bays of four thumb-wheels, which provide the frequency read-out for the receive and transmit channels and the related BCD control of a divide-by- N chain, represents a total outlay of more than \$30. Eliminating from each array the last set of thumb wheels which are 0- to 5-kHz offsets, will drop \$9 from the cost of the switches and eliminate a small handful of associated parts. This may be done in areas where 15-kHz separation of channels is not yet popular. However, the increased versatility more than offsets the small cost differential.

The majority of the ICs, with the exception of the MC4044 and the MC3062P, are available surplus from several sources at continually dropping prices for a total IC cost of less than \$15. The two heterodyne crystals run from six to seven dollars each, and the 5-MHz reference crystal is available surplus from JAN Crystals for less than \$2. Garden-variety npn silicon planar rf transistors, such as the five-for-\$1 2N2222s, were used with excellent results throughout the unit. No attempt should be made at substituting another transistor type for the MPS6571s. Since parts procurement can be as hectic and discouraging as the actual building and debugging of a project, a list of surplus and retail dealers who carry the related items appears in Table I.

Theory of Operation

The WB2MBI synthesizer uses a phase-locked loop, with the output generated from an on-

frequency oscillator. This may be compared with the direct-synthesis method where the output is generated from several sources, all combined in mixers to derive the desired frequency. In general, the direct method is more complex, as it involves elaborate and expensive filtering techniques to reduce the spurious outputs to an acceptable level. The heart of the MBI synthesizer is the voltage-controlled oscillator (VCO), which is electronically "steered" and locked to the desired frequency. An oscillator with a Varicap diode across the frequency-determining tank coil would comprise a simple VCO circuit.

The operation of a phase-locked loop (PLL) is somewhat analogous to the afc system employed in many fm receivers. The basic concept of the PLL is shown in the simple diagram of Fig. 1A. Any difference in frequency between that of the VCO and the reference frequency would be sensed by the phase detector. This would cause a proportional shift in the dc control voltage to shift the VCO back into lock with the reference. This simple synthesizer is impractical, as it offers no real advantages over that of using the reference oscillator alone. In order to provide a practical function, the unit should be capable of generating a variety of outputs which could be done by changing either the reference frequency or the second input to the phase detector.

In Fig. 1B, a synthesizer is outlined that is capable of producing a variety of outputs. Any frequency between 1 and 2.1 MHz can be generated in 10-kHz increments at will. A practical application for this circuit might be to replace the local oscillator in a typical bc receiver. From the diagram it may be seen that the output from the 1-MHz oscillator is fed into a divider and is counted down to 10-kHz. This is the reference frequency and is fed into one input of the phase detector. The reference frequency represents the minimal intervals in which the VCO output may be

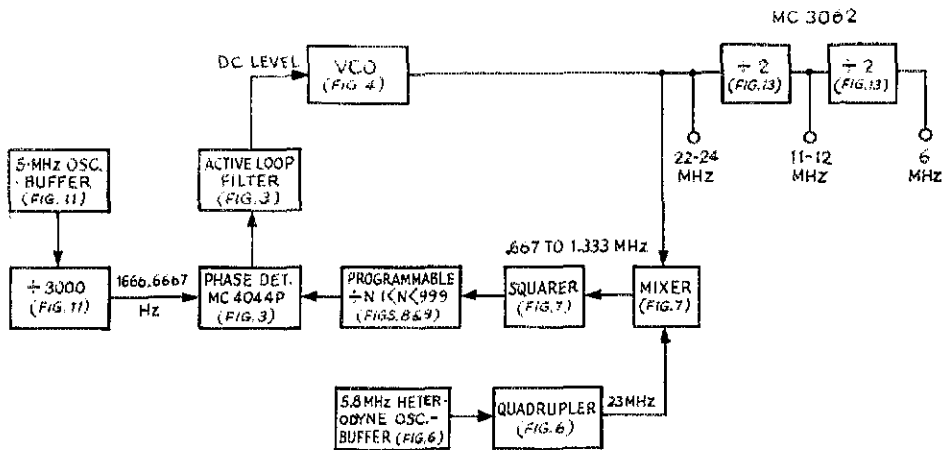


Fig. 2 - Block diagram of the 2-meter synthesizer. Figure numbers shown inside the blocks refer to the associated schematic diagrams.

stepped. The VCO output, which is between 1 and 2.1 MHz, goes through a special divide-by- N circuit before going to the remaining input of the phase detector. The divide-by- N circuit is a special array of flip-flops which, in this case, may be programmed to divide by an integral number between 100 and 210. MSI IC techniques have reduced to a single package preset-table divide-by- N chips that a few years ago would have required several discrete IC's to duplicate.⁴

To generate a synthesized signal of 1.5 MHz, the divide-by- N chain would be set to divide by 150. If the VCO were on a frequency other than 1.5 MHz, such as 1.7 MHz, for example, this would be divided down to 11.3333 kHz. The phase detector would sense a 1.3333-kHz difference and proportionally shift the control voltage accordingly, bringing the VCO onto 1.5 MHz and the corresponding divide-by- N output to 10 kHz.

The loop filter in Fig. 1B is a very important and integral part of the system. Usually it is no more than a simple low-pass or band-pass RC filter such as a Twin-T type. The main function of the filter is to remove all traces of the reference frequency present on the phase detector output

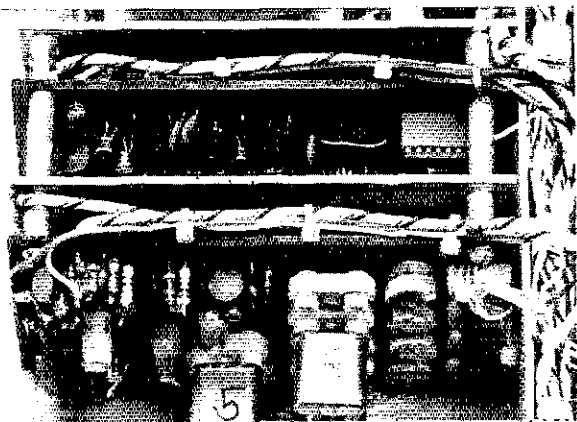
⁴ Boelke, "Frequency Synthesis," *FM*, April, 1969.

and to provide a clean well-filtered dc level to the VCO. It is obvious that any trace of ripple, such as the reference frequency, riding on the control voltage would readily frequency modulate the VCO. The loop filter affects several other important loop characteristics. Response time, stability, and capture range are all related to proper loop design. Often design compromises must be made in the loop filter, trading a slight degradation of one characteristic to bring another up to an acceptable level.

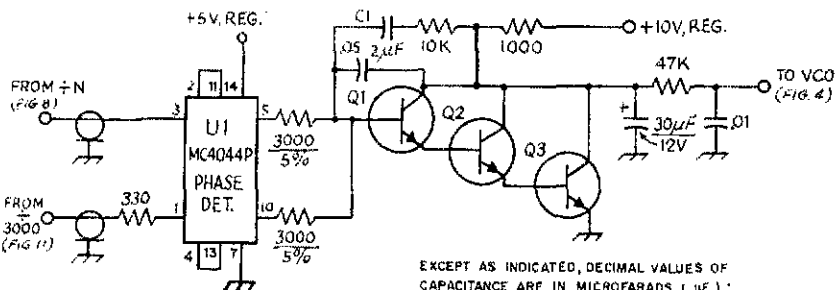
VCO "overshoot" may be best exemplified by visualizing a small time delay in the control voltage reaction time. This causes the searching VCO to require several successively diminishing swings across the desired frequency before lockup is achieved. Overshoot occurs to a certain degree in all phase-locked loops, but with a carefully chosen reference frequency and proper loop design, the amount and duration of the swings can be so minimized that lockup occurs in a matter of several milliseconds. Worst-case lockup time obviously will occur when a large frequency excursion is demanded of the VCO.

Circuit Details

The WB2MBI synthesizer is shown in block diagram form in Fig. 2. The temptation among many prospective synthesizer designers is to use some of the newer single-package PLL IC's now available, such as the Signetics NE561. Unfortunately these attempts seem to be doomed



A closer top view of the assembly shows the heterodyne and reference oscillator circuit boards.



EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (μF); OTHERS ARE IN PICO FARADS (pF OR μpF); RESISTANCES ARE IN OHMS; $\times 1000, \text{M}=1000000$.

Fig. 3 - Phase detector and active loop filter.
 C1 - Low-leakage type, Mylar polystyrene, or tantalum.
 Q1, Q2, Q3 - Motorola MPS6571 or equivalent.

NOTE: These three transistors may be replaced with a single MPS-A14 Darlington pair, if the builder desires.
 U1 - Motorola IC.

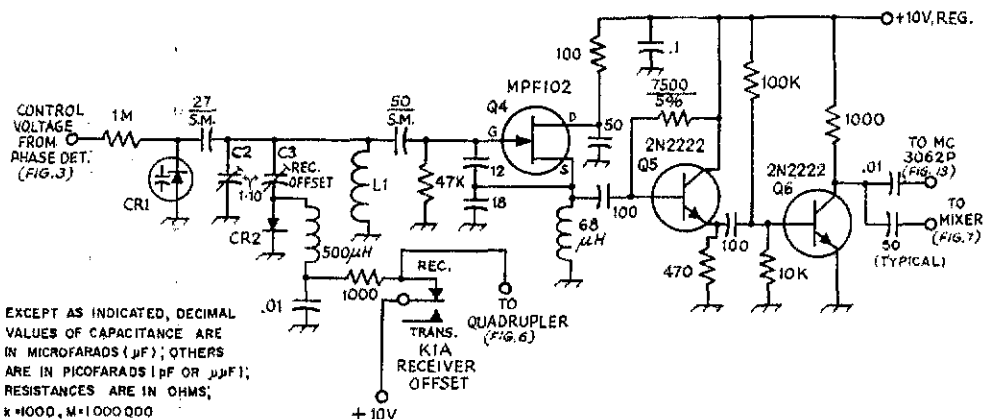
to failure as the required degree of interstage isolation is practically impossible to obtain with these devices. For this reason, discrete circuits were used for the phase detector, loop filter, and VCO in the synthesizer, with liberal shielding and bypassing used between the various PLL sections.

THE PHASE DETECTOR. The MC4044P phase detector, Fig. 3, is a positive-edge-triggered device, meaning that all comparator operations are performed on the rise of the input wave forms. This eliminates jitter that may be caused by time-relationship errors found in other forms of detectors which are not edge-triggered devices. The output of the MC4044P is not a dc level but is, rather, a series of pulses having a width directly proportional to the phase error. The greater the error, the wider the pulse width, and near zero

phase error they become almost indistinguishable spikes. The three-stage Darlington amplifier and associated circuitry on the MC4044 output comprises the active loop filter and integrator, producing a filtered dc level from the phase detector to steer the VCO.

THE VCO. The VCO, Fig. 4, is built around a simple Colpitts oscillator using an MPF102 JFET. The best-performing tuning diodes for use in the VCO were found to be silicon power diodes. Sarkes-Tarzian F-6 diodes gave the best range of those tried. Other similar silicon diodes should give like results. The available capacitive swing varies from diode to diode, so several should be tried if maximum range is desired. A VCO range of one megahertz can be obtained with some diodes to cover six megahertz at two meters.

The range of the VCO for the two-meter band will be from 24 to 24.667 MHz during transmit,



EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (μF); OTHERS ARE IN PICO FARADS (pF OR μpF); RESISTANCES ARE IN OHMS; $\times 1000, \text{M}=1000000$

Fig. 4 - VCO and amplifier circuit.
 C2, C3 - For text reference.
 CR1 - Tuning diode; see text.
 CR2 - Silicon diode such as 1N914 or equiv.
 K1A - Part of transmit-receive relay. The receive position should switch nothing other than the

two offsets, or improper offset operation may result.
 L1 - 18 turns No. 22 enam. wound on Amidon T-50-6 toroidal core.
 Q4 - Motorola transistor.

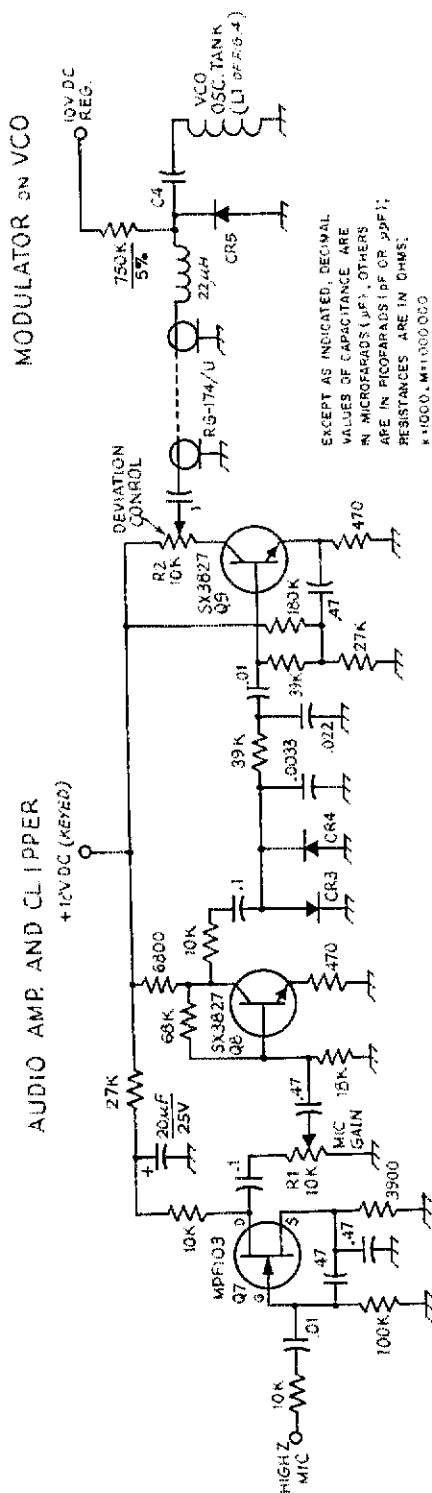


Fig. 5 — Frequency modulator. CR3, CR4, CR5 — Silicon power diodes. Q8, Q9 — Texas Instruments transistor. Q7 — Motorola transistor. R1, R2 — Audio-taper. C4 — Typical value, 1 pF.

EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (μF), OTHERS ARE IN PICOFARADS (pF OR pPF); RESISTANCES ARE IN OHMS; *1000, M11000, 000

and from

$$\frac{144 - 1 - F}{6} \text{ to } \frac{148 - 1 - F}{6}$$

during receive. The 1666.6667-Hz reference frequency provides 10-kHz steps when the VCO frequency is multiplied to two meters. Since the ultimate order of frequency multiplication always remains the same for the VCO output when it reaches two meters for both receive and transmit, the 10-kHz step intervals for both the transmit and receive channels are thus preserved. The VCO range is not large enough to cover the required frequency spread when going between receive and transmit, so it is necessary to switch additional capacitance into the oscillator tank coil to lower the VCO frequency during receive. Diode switching is used for this operation.

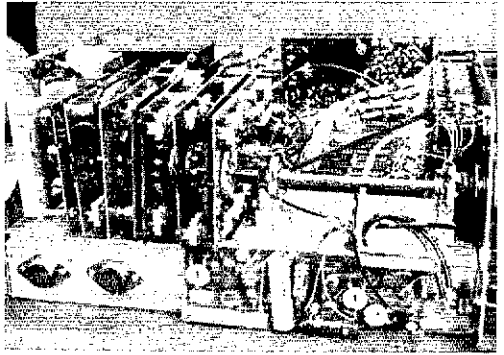
The mechanical construction of the VCO should follow the same techniques set forth for construction of a good VFO. All frequency-determining components in the VCO should be rigidly mounted. The oscillator toroid may be held in place with a few sparingly used drops of china or epoxy cement. The toroid is an Amidon T-50-6 or equivalent core, wound with enough turns of No. 24 wire to provide as high an L/C ratio as can be used at the VCO operating frequencies. This was in the area of 22 evenly spaced turns for several of the units that have been constructed. Rigid construction is important as the loop does not correct for audio-frequency variations, and therefore the VCO is susceptible to microphonics. The VCO is very sensitive to magnetic fields and should be isolated from nearby ac power supplies. It is imperative that if shielding be used to prevent stray transmitter rf from reaching the VCO, or a weird form of audio phase cancellation can result. Two stages of buffering follow the VCO to bring the output up to usable level. The VCO output feeds both the mixer and MC3062 frequency-divider stages.

THE FREQUENCY MODULATOR. Since the loop cannot compensate for audio-frequency variations because of the "inertia" present in the loop feedback system, it is possible to modulate the VCO directly. While this may be done by imposing processed audio directly onto the VCO control line, it is not desirable to do so because the voltage-to-frequency function of the VCO tuning diode is not linear, and the deviation level would vary noticeably from one end of the VCO range to the other. The modulator circuit shown in Fig. 5 eliminates this problem and, when used with the audio amplifier and clipper shown, is capable of producing excellent-quality audio. The amplifier and clipper were taken from the circuit used in the Regency HR-2. The 0.1-μF coupling capacitor from the deviation control must be a high-quality low-leakage unit. For some reason, several capacitors we tried caused a motorboating condition to occur. Also remember to remove B-plus voltage from the audio stages when not transmitting to avoid VCO modulation during reception.

Part II will appear in a subsequent issue of QST.



Board 12 is plainly visible against the chassis side while the vertical plug-in boards are (right to left) 8, 3, 4, 5, and 6. The foil side of board 1 is visible in the background. Notice how the large heat sink of the driver (board 5) comes forward around board 4, the predriver.



A Medium-Power HF SSB CW Transmitter

PART II

BY TIMOTHY P. HULICK,* W9MLJ/4

PART I of this series, published in *QST* for May, 1973, discussed the design philosophy used in the construction of this equipment. Circuit information was given for the balanced modulator and speech amplifier. The VOX and side-tone circuits were described also. Part II treats the transmitter mixer, predriver, and driver circuits. Additional circuit discussion covers the PA and internal VFO.

Transmitter Mixer Board

The transmitter mixer board shown in Fig. 5 contains two nearly identical IC balanced mixers. The VFO signal is injected at N through the 5.3-MHz link-coupled tuned circuit consisting of T302, C302, and C303 and through C304 to U301. T301 is tuned to the center frequency of 8395 and 8895 kHz, which is the range of the sum frequency of the two inputs to U301. The secondary of T301 is fed center tapped to U302 because it eliminates the need for two sets of bias resistors, one set to each of pins 1 and 7 of U302. The heterodyne oscillator output from the receiver is fed to U302 through P and C309. Output from U302 is connected to a separate resonant circuit for each band, switchable by means of S8A and B.¹

* 5257 Locke Lane, Virginia Beach, VA 23462.

¹ S8 contains many individual wafers, and is ganged by means of a switch shaft that engages the various wafers which are soldered to their respective plug-in pc boards. The wafers were taken from the author's junk box and are of unknown brand. A description of the switch sections needed, and how to mount them, is treated in a later part of this series.

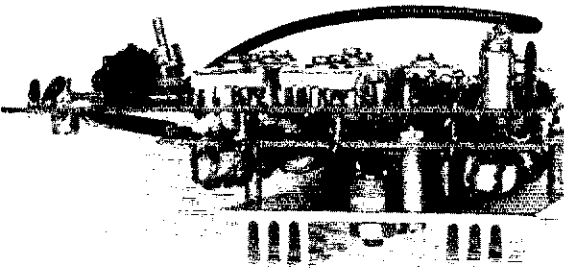
Output from the transmitter mixer board is link coupled to socket Q. The purpose of R309 is to lower the *Q* of the output transformers so that nearly equal signal levels exist across each band with one setting of tuning capacitors C311 through C315. The objective is to obtain broad-banded drive for the next stage and still have adequate harmonic rejection.

Although U301 and U302 are intended for use with two supply voltages (-6 and +6), allowing the inputs to be at ground for dc, the addition of biasing resistors R301, R304, R305 and R308 make possible single supply-voltage operation. The +12-volt supply is applied through K1, controlled by K201, and is present when the VOX or break-in circuits are activated.

Predriver Board (Board 4)

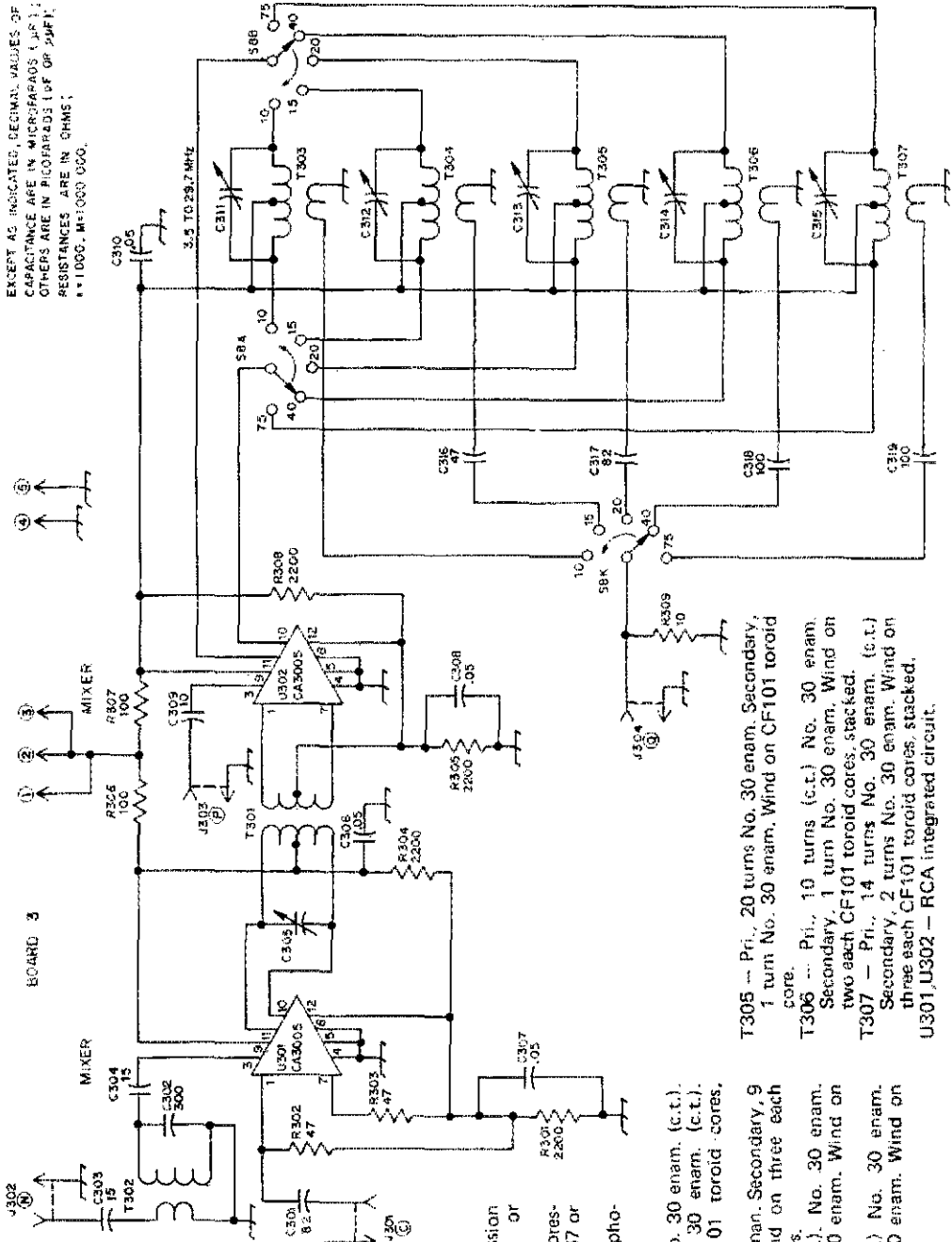
The predriver board consists of two cascaded transistors (Fig. 6). The link output of the transmitter mixer board at Q in Fig. 5 is applied through C401 to Class A amplifier Q401 in Fig. 6. The base is biased for Class A operation by R401, R402 and R404. Toroidal transformers T401 through T405 employ link-coupling output from Q401 to the base of Q402. R414 performs the same function as R309 on the transmitter mixer board, lowering the *Q* of the transformers so

(Continued on page 41)



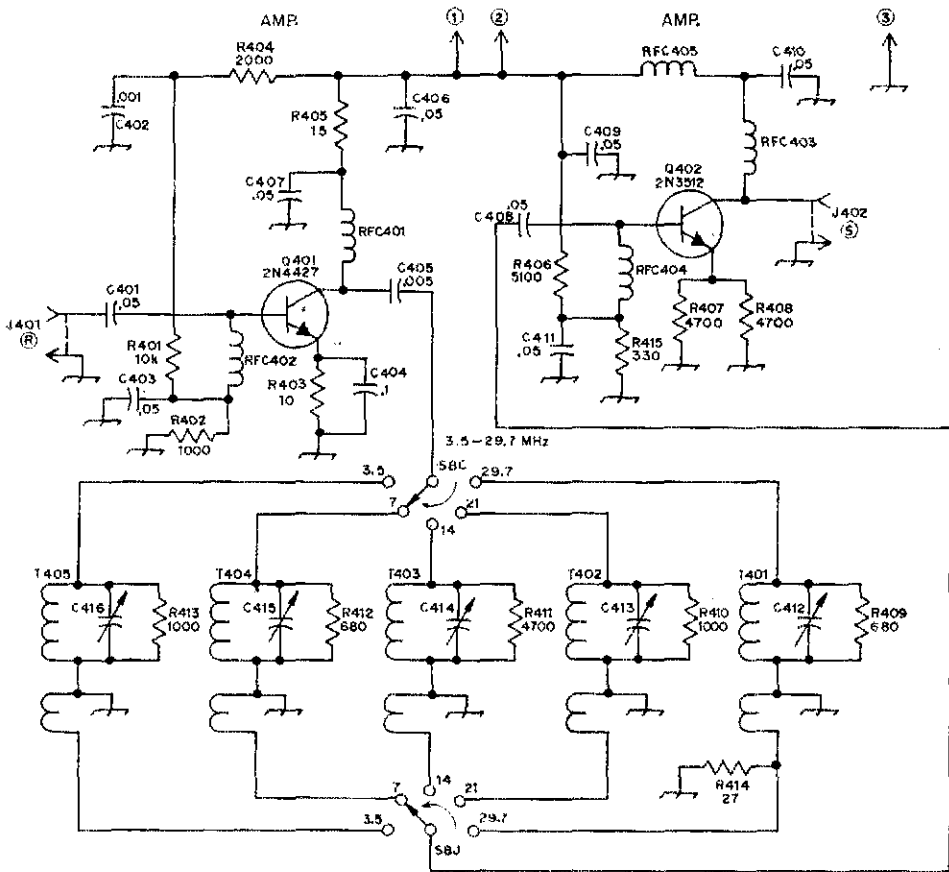
The three decks of the PA board are shown with one of the 2N6093s mounted on the heat sink. The broad-band input and output transformers are visible to the left and right of the 2N6093. The component side phono socket to the right is the PA drive input and the one on the extreme left on the foil side of the PA board is the rf output.

Fig. 5 - Schematic diagram of the mixer circuit. Resistors are 1/4-W composition. Fixed-value capacitors are disk ceramic. All toroid cores are of C2 material. Numbered components not found in the parts list are so identified for pc board layout purposes. This rule applies to all drawings in this article. C-305 - 50 to 380-pF compression trimmer (Eimenco 422 or equiv.). C311, C312 - 4 to 40-pF compression trimmer (Eimenco 461 or equiv.). C313 - 2.7 to 40-pF compression trimmer (Eimenco 461 or equiv.). C314 - 50 to 380-pF compression trimmer (Eimenco 465 or equiv.). C315 - 110 to 580-pF compression trimmer (Eimenco 467 or equiv.). J301-J304, incl. - Pc board photo jack.



- J302 - Mixer
- J303 - Mixer
- J304 - Mixer
- T301 - Pri., 2 turns No. 30 enam. Secondary, 9 turns No. 30 enam. Wind on three each stacked CF101 toroid cores.
- T302 - Pri., 10 turns (c.t.) No. 30 enam. Secondary, 1 turn No. 30 enam. Wind on two each CF101 toroid cores, stacked.
- T303 - Pri., 12 turns (c.t.) No. 30 enam. Secondary, 1 turn No. 30 enam. Wind on one CF101 toroid core.
- T304 - Pri., 12 turns (c.t.) No. 30 enam. Secondary, 1 turn No. 30 enam. Wind on one CF101 toroid core.
- T305 - Pri., 20 turns No. 30 enam. Secondary, 1 turn No. 30 enam. Wind on CF101 toroid core.
- T306 - Pri., 10 turns (c.t.) No. 30 enam. Secondary, 1 turn No. 30 enam. Wind on two each CF101 toroid cores, stacked.
- T307 - Pri., 14 turns No. 30 enam. (c.t.) Secondary, 2 turns No. 30 enam. Wind on three each CF101 toroid cores, stacked.
- U301, U302 - RCA integrated circuit.

BOARD 4



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

Fig. 6 - Schematic diagram of the predriver circuit. Resistors are 1/4-W composition. Fixed-value capacitors are disk ceramic. Arrows identified by numbers are pins on the edge of the plug-in pc board. This rule applies to all diagrams in this article. All toroid cores are of Q2 material.
 C412, C413 - 4 to 40-pF compression trimmer (Elmenco 403 or equiv.).
 C414 - 2.7 to 40-pF compression trimmer (Elmenco 461 or equiv.).
 C415 - 50 to 380-pF compression trimmer (Elmenco 465 or equiv.).
 C416 - 110 to 550-pF compression trimmer (Elmenco 467 or equiv.).
 J401, J402 - PC board phono jack.
 RFC401 - 25 turns No. 30 enam. wound on two each CF101 toroid cores (stacked), Indiana General Corp.
 RFC402 - 18 turns No. 30 enam. wound on one CF101 toroid core.
 RFC403 - 20 turns No. 30 enam. wound on two

each CF101 toroid cores (stacked).
 RFC404 - 20 turns No. 30 enam. wound on one CF101 toroid core.
 RFC405 - 16 turns No. 30 enam. wound on one CF101 toroid core.
 S8 - See text.
 T401 - 7 turns No. 30 enam. wound on one CF101 toroid core. Link is 2 turns No. 30 enam. over large winding.
 T402 - 8 turns No. 30 enam. wound on one CF101 toroid core. Link is 3 turns No. 30 enam. over large winding.
 T403 - 12 turns No. 30 enam. wound on one CF101 toroid core. Link is 3 turns No. 30 enam. over large winding.
 T404 - 12 turns No. 30 enam. wound on two each CF101 toroid cores (stacked). Link is 5 turns No. 30 enam. over large winding.
 T405 - 18 turns No. 30 enam. wound on two each CF101 toroid cores (stacked). Link is 7 turns No. 30 enam. over large winding.

BOARD 5

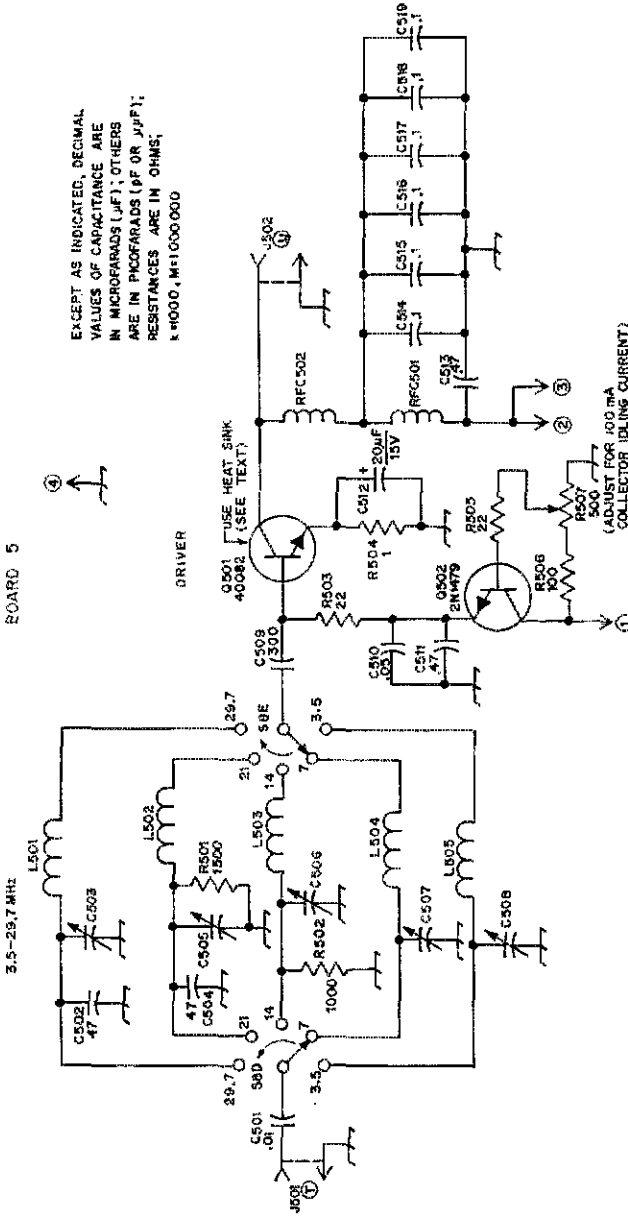


Fig. 7 -- Schematic diagram of the driver circuit. Resistors are 1/4-W composition. Fixed-value capacitors are disk ceramic. Polarized capacitors are electrolytic. All toroid cores are of Q2 material. C503 -- 4 to 40-pF compression trimmer (Eimenco 403 or equiv.). C505 -- 2.7 to 40-pF compression trimmer (Eimenco 461 or equiv.). C506 -- 50 to 380-pF compression trimmer (Eimenco 465 or equiv.).

C507 -- 110 to 550-pF compression trimmer (Eimenco 467 or equiv.).
 C508 -- 140 to 680-pF compression trimmer (Eimenco 468 or equiv.).
 J501, J502 -- Pc board phono jack.
 L501 -- 5 turns No. 30 enam. wire on one Indiana General CF101 toroid core.
 L502, L503 -- 7 turns No. 30 enam. wire on two each stacked CF101 toroid cores.
 L504 -- 16 turns No. 30 enam. on CF101 toroid core.

L505 -- 17 turns No. 30 enam. on CF101 toroid core.
 RFC501 -- 15 turns No. 30 enam. on CF101 toroid core.
 RFC502 -- 20 turns No. 30 enam. on two each stacked CF101 toroid cores.
 R507 -- 500-ohm pc-board mount composition control (CTS U201-R501B or equiv.).
 S8 -- See text.

(Continued from page 37)

that equal-amplitude rf energy is available throughout each band. R409 through R413 also aid in this purpose and help assure easy neutralization of Q401 and Q402. Paralleled resistors are used in the emitter of Q402 to ground. The resistors in parallel have half the internal inductance of one resistor. This method increases the efficiency of Q402 through reduction of degeneration. For the same reason C404 is the ceramic type. These capacitors have very low internal inductance.

Output from the predriver board delivers several hundred milliwatts of ssb or cw energy on the transmitting frequency, at S. Tuned circuits for the output of Q402 are located on the driver board.

The predriver board has +12 volts applied to it at edge pin 1 at all times. This +12-volt-line is not keyed, as opposed to the +12 volts applied to the mixer board.

Driver Board (Board 5)

Fig. 7 shows the driver circuit. Although the 4082 (Q501) was designed primarily for Class C Citizen's Band service, it functions well as a linear amplifier when biased and loaded properly. The driver circuit, because of its higher power level (3-1/2 W), departs from the conventional link-input link-output matching method of the low-level stages preceding it. An L network is used to match the input impedance of Q501 to the 100-ohm output of Q402. C501 and C509 are dc blocking capacitors. R503 limits the current that could be drawn by Q501 should the stage tend to be unstable during tune-up. C510 must be the ceramic type to ensure minimum inductive reactance. C511 and C512 should be high-grade tantalum capacitors. C514 through C519 are all of the disk-ceramic type — six being used to reduce unwanted inductance.

Q502 functions as a voltage-variable series regulator, controlled by R507. The bias voltage of Q501 can be varied between 0 and +5 volts. R507

is adjusted so that Q501 idles at 100 mA. Approximately 3-1/2 watts of drive are available at U. Two watts are available on 10 meters.

Power for the driver stage is supplied by the keyed +12 volts passed by K1 and the meter shunt to edge pins 2 and 3. A +5-volt potential is applied at all times to edge pin 1.

Power-Amplifier Board (Board 6)

The PA circuit is similar to that recommended by RCA.² Since the price tag on the PA transistors (2N6093) is \$75 each, one quickly learns that there is no room for foolhardy experimentation. Not desiring to reinvent the wheel, the author used RCA's basic circuit, except for a few minor items.

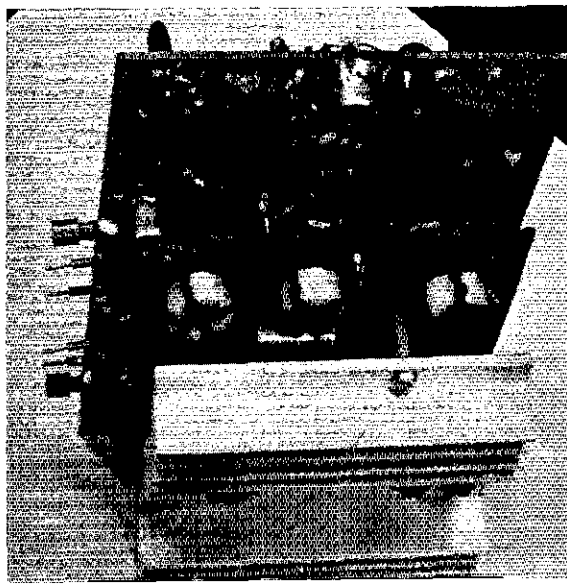
The PA input transformers consist of T601, T602, and T603. The broad-banded transformers described in reference 1 consist of toroidal cores³ different from those recommended in Fig. 8. RCA uses parallel metallic strips of critical spacing, width, and thickness for the transmission-line simulators. Their recommended construction is practically impossible to follow when using a toroid core, so their technique was discarded.

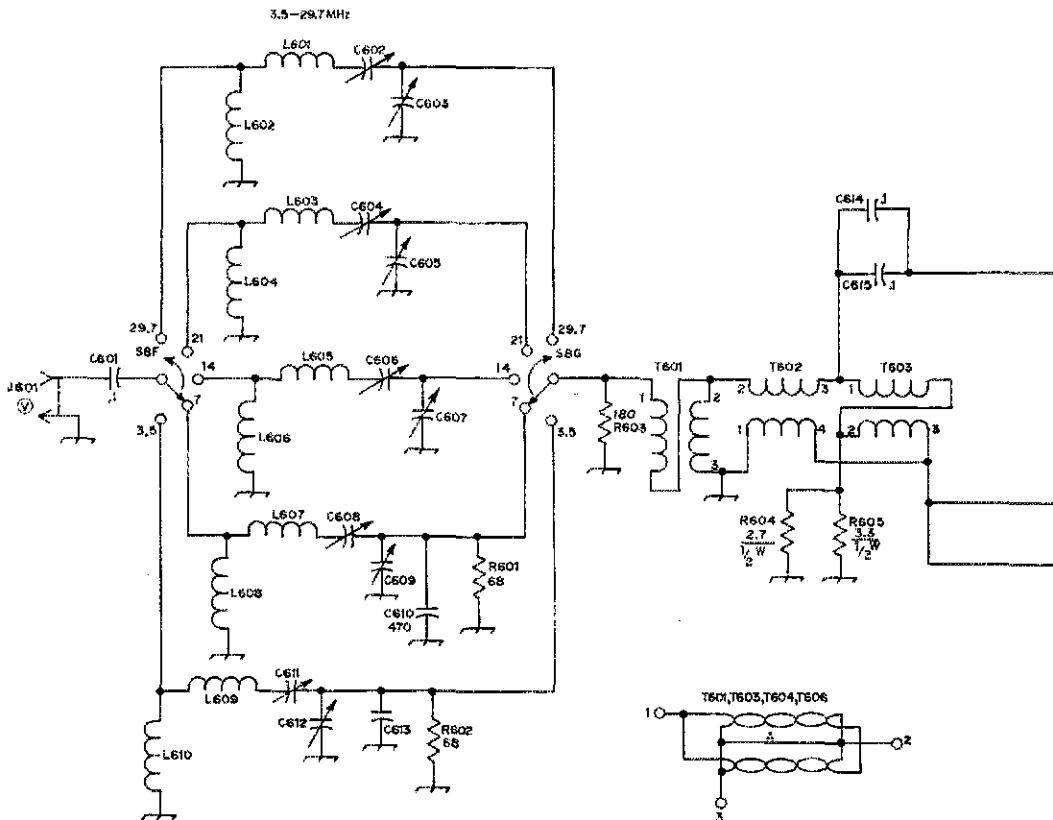
T601 and T603 are 4:1 toroidal baluns. They should be wound with a twisted-pair transmission line with a characteristic impedance equal to twice the lower impedance being transformed, and half the higher impedance to be transformed. In the case of T601, the impedance transformation is from 50 to 12-1/2 ohms. The paralleled twisted pairs (Fig. 8) will have a characteristic impedance of about 25 ohms before they are wound on the toroid core. The impedance of each twisted pair is 50 ohms. The toroidal transformer is useful from 2 to 30 MHz. Above 30 MHz core losses become significant and below 2 MHz the core permeability is too low.

² RF Power Transistor Note AN-4591, March 1971. Available from RCA Solid State Div., Somerville, NJ 08876.

³ Indiana General toroids are available from Permag Corp., 88-06 Van Wyck Expy., Jamaica, NY 11418.

T604, T605 and T606 are shown from left to right. The small pin shown soldered almost parallel to the plane of the boards on the largest deck (positioned above T604) is board pin 5. This pin is pointed out specially since it is not an edge pin. The phono socket at the top is the rf output, while the phono socket at the left (bottom of the deck nearest the edge pins) is W. The tops of the 2N6093 studs are barely visible at the center of the heat sink.

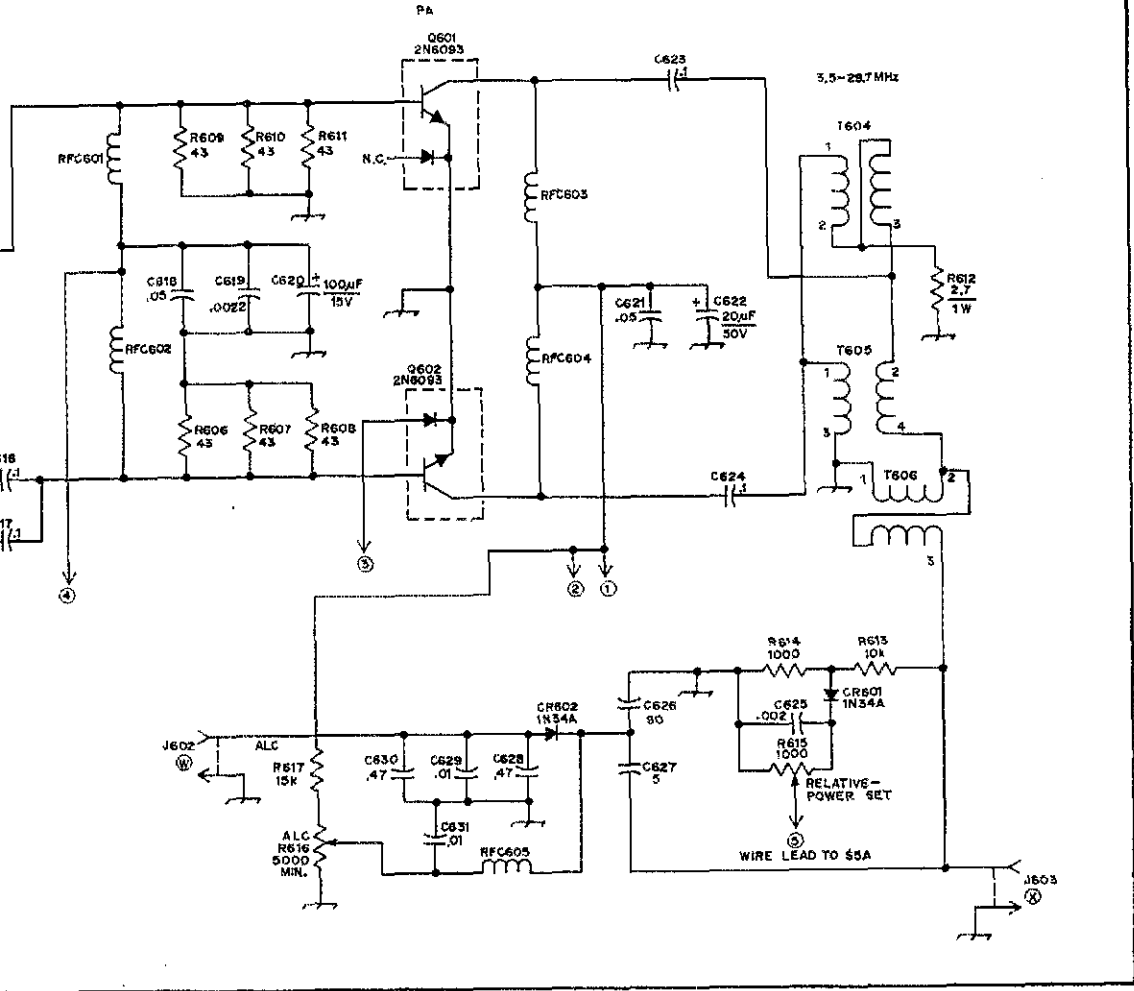




EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (μF); OTHERS ARE IN PICOFARADS (pF OR μμF); RESISTANCES ARE IN OHMS; k=1000, M=1000 000.

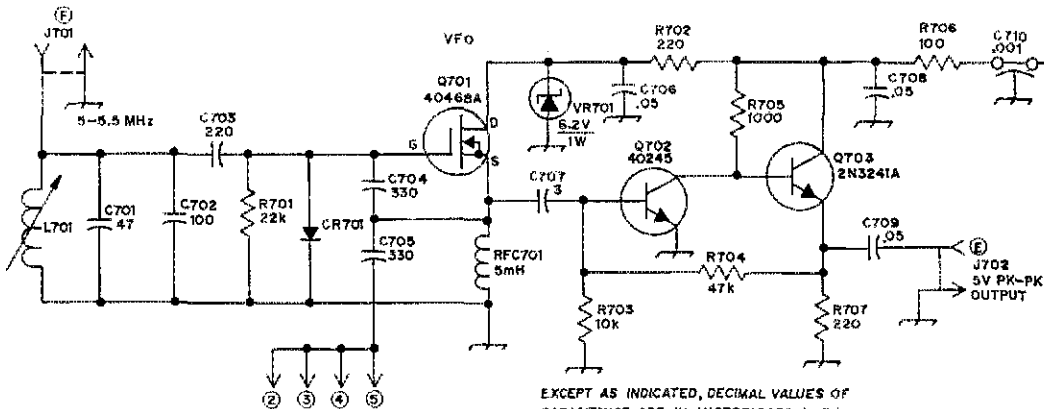
Fig. 8 - Schematic diagram of the power amplifier circuit. Resistors are 1/4-W composition unless otherwise noted. Diodes shown inside Q601 and Q602 blocks are internal parts of the transistors. Fixed-value capacitors are disk ceramic. Polarized capacitors are electrolytic. All toroid cores are Q2 material unless otherwise indicated.
 C602-C610, incl. - 110 to 550-pF compression trimmer (Elmenco 467 or equiv.).
 C612 - Same as C602.
 CR601, CR602 - Germanium diode. 1N34A, HEP134, or equiv.
 J601-J603, incl. - Pc board phono jack.
 L601 - 5 turns No. 30 enam. on CF101 toroid core.
 L602 - 3 turns No. 30 enam. on CF101 core.
 L603 - 8 turns No. 30 enam. on CF101 core.
 L604 - 5 turns No. 30 enam. on CF101 core.
 L605 - 10 turns No. 30 enam. on CF101 core.
 L606 - 7 turns No. 30 enam. on CF101 core.
 L607, L608 - 12 turns No. 30 enam. on CF101 core.

L609 - 16 turns No. 30 enam. on CF101 core.
 L610 - 19 turns No. 30 enam. on CF101 core.
 Q601, Q602 - RCA transistor.
 R615 - Pc-board control, 1000 ohms, composition (CTS U210-R102B or equiv.).
 R616 - Pc-board control, 5000 ohms, composition (CTS U201-R502B or equiv.).
 RFC601, RFC602 - 9 turns No. 30 enam. on CF108 toroid core, Q1 material.
 RFC603, RFC604 - 10 turns No. 30 enam. on CF108 toroid core, Q1 material.
 RFC605 - 25 turns No. 30 enam. on CF108 toroid core, Q1 material.
 S8 - See text.
 T601, T606 - Two twisted pairs No. 26 enam., 9 twists per inch. Twist the two pairs together, 8 twists per inch, and wind 5 turns on CF108 (Q1) toroid core as shown in inset.
 T602, T605 - Same construction as T602, but without wire connection "A."
 T603, T604 - Same construction as T601, but using 6 parallel twisted pairs of No. 30 enam.



T603 consists of six twisted pairs of smaller gauge wire, all tied in parallel. The impedances to be transformed are much lower (12-1/2 to 3-1/8 ohms). This transmission line, before winding, must have a characteristic impedance in the neighborhood of 6-1/4 ohms. T602 operates at 12-1/2 ohms and is a 1:1 balun transformer. T604, T605, and T606 are exactly the same as T601, T602, and T603, but in reverse order. The PA input transformers consist of T601, T602, and T603. These transformers, shown in Fig. 9, form a 16:1 unbalanced-to-balanced broad-band (2-30 MHz) transformer to match the 3-1/8 ohm base-to-base resistance of the 2N6093s. The input to pin 1 of T601 is 50 ohms, unbalanced. The amplifier is operated push-pull, Class B. R604 and R605 help prevent any imbalance of power distribution between the two bases. R609, R610, R611, R606, R607 and R608 form part of a base-biasing network which is external to the PA board. These resistors also present an unsymmetrical load to

T603, allowing the input transformers to provide the 16:1 impedance transformation. The transistor that is conducting (base to emitter) presents itself as a 1-1/2 ohm load, while the cutoff one has an infinite input resistance. The load seen is the three 43-ohm resistors (near enough to infinity compared to 1-1/2 ohms). The load, since it is not symmetrical, forces a 16:1 impedance transformation instead of 8:1, which is the case of the output network, even though the transformers are identical, but reversed. The collector-to-collector load impedance of Q601 and Q602 is 6-1/4 ohms, so a 1:8 transformation ratio is required here. R612 absorbs any unbalance of power in the two transistor outputs caused by any nonuniformities of components T604, T605, T606, Q601 and Q602. C614, C615, C616 and C617 should be ceramic to minimize unwanted inductance. C618, C619, C623, and C624 are ceramic for the same reason.



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

Fig. 9 - Schematic diagram of the VFO circuit. Resistors are 1/4-W composition. Capacitors are disk ceramic unless otherwise indicated.

C701 - 47-pF compensating capacitor, ± 600 ppm type.

C702 - 100-pF NPO compensating capacitor.

C703 - 220-pF NPO.

C704, C705 - 330-pF NPO.

C710 - Feedthrough capacitor.

CR701 - Silicon switching diode, 1N914 or equiv.

J701, J702 - Pc-board phono jack.

L701 - 16 turns No. 30 enam., close wound on 5/16-inch dia. ceramic slug-tuned form (2.9 μH).

RFC701 - 5-mH miniature rf choke.

VR701 - 6.2-V, 1-W Zener diode.

Relative power is metered from pin 5. C626 and C627 form a voltage divider, the junction of which connects to the alc rectifier. Alc is derived from the rf output of the PA. R616 provides an adjustable positive dc potential at the cathode of CR602 through R6C605 to establish the alc level. The alc time constant is fixed at about one half second. R616 can be set to determine the power-output level of the transmitter. The fact that alc is derived from the PA output rather than input makes the output power level constant from hand to hand. The amount of drive necessary to excite the PA to 100 watts PEP output varies between 250 mW on 75 meters to 5 watts on 10 meters. The alc causes the drive level to self-adjust to the proper amount so that on the lower frequency bands it is not possible to overdrive the PA. The full 100 watts PEP output cannot be realized on 15 and 10 meters because of the high drive requirements of the 2N6093s on those two bands. The 40082 in the driver can only deliver about 3-1/2 watts maximum.

The PA has a broad-band output circuit, providing transformation of the 6-1/4 ohms collector-to-collector impedance to a 50-ohm unbalanced load. It is not recommended that this transmitter be connected to an antenna without using a low-pass filter for the *hand* of operation. When on 40 meters, for example, a filter would be needed with a cutoff frequency below the 20-meter band to ensure that the second harmonic is attenuated. *If this precaution is not taken a pink ticket could be the reward! The Radio Amateur's Handbook has information on filter design and construction*

for any amateur frequency. The need for low-pass filters is not as significant if the broad-band PA is used to drive a high-power linear amplifier which has a tuned input network with reasonable selectivity.

A single power supply voltage is required to operate the PA stage. The +28 volts is connected to edge pins 2 and 3 after being fed through meter shunt R8.

Internal VFO Board (Board 7)

The internal VFO generates the necessary rf voltage to provide transmitter VFO control as selected by S2. The circuit of Fig. 9 is much the same as that published by RCA,⁴ but with a few exceptions. C707 replaces a series resistor-capacitor network. The LC ratio, compared to the original circuit, is different in order to achieve the desired bandwidth with the capacitor chosen for C2. The addition of CR702 and R702 eliminates the need for two supply voltages. C2 was obtained from an old BC-453 Command set. It is ideal as a VFO tuning capacitor because it is of "Sherman tank" like construction. It has a built-in no-backlash worm gear. Only a small portion of its tuning range is needed to cover the 500 kHz spread. Using only the center third of the capacitor range helps to assure linear tuning characteristics. The supply voltage required to power the VFO is +12, unkeyed, applied to circuit-board pin 1.

Part III of this series will appear in a subsequent issue of QST.

⁴ RCA Transistor, Thyristor and Diode Manual (1969).

● New Apparatus

Cush Craft AFM-44D Gain Antenna

Repeater operators and amateurs who operate fixed stations on 450 MHz should be interested in Cush Craft's latest offering to the market. Their new AFM-44D has just recently become available in single-lot quantity to hams, selling for \$38.50, complete with phasing harness. The buyer has to supply the supporting mast if the antenna is not to be side-mounted on a tower.

The photo shows WN1OYD, ARRL Technical Department secretary, holding the four-dipole array which is assembled on a 10-foot-long, 1-1/2-inch diameter steel mast. Her smile just might be an indication of her satisfaction resulting from the ease of assembly and tune-up common to this antenna. Assembly took 30 minutes, carton to mast mounting, and tune-up took an additional 30 minutes.

The AFM-44D is patterned after the 2-meter version (AFM-4D), described in an earlier edition of *QST*.¹ The 220-MHz enthusiast has not been forgotten, for the AFM-24D is available for use on that band. All three versions are the same electrically, using four half-wave dipoles which are spaced one-half wavelength apart, tip to tip (one-wavelength spacing between feed points). The dipoles are made of 3/4-inch-diameter aluminum tubing — plenty rugged — and are fed by means of gamma-matching sections made from smaller diameter tubing.

The phasing harness consists of sections of RG-59/U coaxial cable which is weatherproofed by means of molded rubber at the junctions. The feed impedance at the center of the harness is 50 ohms. All of the coaxial connectors (five) are of the uhf type. We had some reservations about the use of uhf fittings at this frequency, but SWR checks proved that a low value of reflected power existed after the matching sections were adjusted.

An antenna of this kind has a theoretical gain of 6 dB over a single dipole (omnidirectional). The manufacturer claims 6-dB omnidirectional gain for the vertically polarized array, and 9 dB for a cardioid pattern. To obtain an omnidirectional pattern it is necessary to stagger the dipoles around the mast at 90-degree intervals. For a cardioid

¹*QST* for January 1972 page 50.

pattern the dipoles are mounted in line on the same side of the mast. We cannot attest to the gain capabilities of the antenna because we do not have measuring equipment that is accurate enough for the purpose. Relative checks did indicate, however, that the system does have considerable gain over a single dipole, and that noticeable directivity does exist when the cardioid-pattern arrangement is used. The directivity during cardioid operation results from the mast serving as a reflector of sorts, though it is the writer's opinion that individual reflector elements, cut to the proper length, might do a better job.

Each dipole was tuned for minimum reflected power separately, using a Bird wattmeter and a 10-watt-output 450-MHz transmitter followed by a harmonic filter. An SWR of approximately 1.2:1 was obtained with each element of the array. The top dipole was the most tricky of the four to tune, requiring that the gamma capacitor be pulled out of the shrink-tubing seal by a length of 1/4-inch. The top dipole is mounted so that its upper tip is 3 inches below the top of the supporting mast. Since the remaining three dipoles have more of the mast behind them they tune as the instructions state they should, or at least this seems to be the logical explanation for the difference.

After the dipoles were adjusted for lowest reflected power the harness was connected and the SWR again checked. The reading was quite high, roughly 2.5:1 until the harness was taped securely to the mast. After that was done the reading dropped to 1.3:1. The antenna was mounted in the clear during the foregoing tests. While still erected it was sprayed with water from a garden hose, again observing the SWR. After being thoroughly

(Continued on page 77)



WN1OYD holds the assembled AFM-44D four-pole 450-MHz antenna with relative ease. The dipoles are mounted on a 10-foot-long steel mast. A 7-foot mast fulfills the minimum requirement for this antenna.

Technical Correspondence

HARMONIC CONTENT OF SINE WAVES APPROXIMATED BY STRAIGHT-LINE SEGMENTS

Technical Editor, *QST*:

The *QST* article, "An Audio Synthesizer," by WB6IMP,¹ is one of several appearing recently which use a digitally controlled signal generator to approximate sine (or cosine) waves with straight-line segments. The scheme is shown in Fig. 1. Other articles using this scheme have appeared in *Electronics* and *EDN*. None of these articles has discussed the harmonic content of such waves in a quantitative manner, nor is this analysis one of the usual reference-book cases. The analysis of such waves yields several interesting results.

Assume that a sine wave is approximated by M segments of equal length in time. M is greater than or equal to 3, and the values of the segments are the sine wave scaled every $360/M + X$ degrees, where X is an arbitrary phase constant. It turns out that the results are independent of X , except for phase. Thus for $M = 4$, the amplitudes of the harmonics are the same for $\sin 0^\circ$, $\sin 90^\circ$, $\sin 180^\circ$, and $\sin 270^\circ$, i. e., 0, 1, 0, and -1, respectively. They are also the same for $\sin 45^\circ$, $\sin 135^\circ$, $\sin 225^\circ$, and $\sin 315^\circ$, i. e., 0.707, 0.707, -0.707, and -0.707, respectively. Note that the last example is the ordinary square wave.

The Fourier series for the wave form is $f(t) = \sin(y) + [1/(M-1)] \sin[(M-1)y + x] + [1/(M+1)] \sin[(M+1)y + x] + [1/(2M-1)] \sin[(2M-1)y + x] + [1/(2M+1)] \sin[(2M+1)y + x] + \dots$, where $y = 2\pi ft$ and x is a phase constant depending on the start of scaling, M , and the harmonic number. The amplitudes of nonzero harmonics still fall off as $1/N$ as in the square wave, except as M increases, more and more of them are zero. In WB6IMP's article, $M = 16$. All harmonics up to the one with 15 times the fundamental frequency have zero amplitude. The frequency 15 times the fundamental has an amplitude of $1/15$ that of the fundamental, and should be easily filtered out. Here is a table summarizing some results.

¹ Drake, "An Audio Synthesizer, A Device to Generate RTTY Tones with Crystal-Controlled Accuracy," *QST* for April, 1972, p. 35.

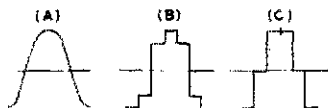


Fig. 1 - At A, a cosine wave (or a sine wave displaced by 90 degrees); at B and C, the same wave form approximated by straight-line segments. At both B and C, the value of M , as discussed in the text, is six, but the starting or sampling times relative to the cosine wave are displaced slightly.

M	Total harmonic distortion, percent	Comments
3	31.61	Poorer than square wave
4	18.94	Includes square wave
5	12.49	
6	8.81	
8	5.04	Three-bit counter
10	3.25	Decade counter
16	1.27	WB6IMP 4-bit counter
20	0.82	
32	0.32	Five-bit counter

The work in determining table values was done by a computer evaluation of the Fourier integrals. My work was checked by a couple of people who could find no errors. The results appear "reasonable." (Several people have started analytic derivations of these formulas, but none have fought it all the way through. They say that as far as they got, the results still seem valid.) I have not been able to find these results any place in the literature, and I felt that they would be of interest to *QST* readers. - Lorne D. Matheson, WA0EKO, 1360 Claremont Dr., Boulder, CO 80303.

MORE ON "TUNNEL" PROPAGATION

Technical Editor, *QST*:

The story presented by W1KGR on "tunnel" propagation is a most interesting one.² Some years ago I had an experience similar to his, except that mine took place on 40 meters at a time when sunspot activity was low. In January and February of 1963 I was located at Midway Islands, and in my spare time I frequently operated as KH6EGL/KM6. My amateur station was set up in a building removed by a half mile or so from our quarters, so it wasn't convenient to operate at all hours of the night.

One evening, as I usually did, I worked a run of stations on 40-meter cw before securing operation at 10:30 or 11:00 P.M. local time. The next morning prior to going to work, with everything still tuned up for 40 meters, I turned on the receiver just to see what was taking place on the band. This was at about 7:00 A.M. local time. Except for some very, very weak JA signals which were almost inaudible, the band seemed to be dead. Then all of a sudden out of the receiver noise leaped a ZS1 calling CQ, many dB over S9 in strength. We worked for better than a half hour, neither of us ever hearing any other signals near our frequency. When we signed off, neither of us received any other calls, and yet both of us would have been considered as DX by most U.S. amateurs as well as amateurs in other parts of the world. It was a strange experience, but I never gave it much more thought until after reading Blender's letter. It is interesting to note that his location and that of his ZL2 contact were very near to being at antipodes on the earth's surface, as were mine at Midway and the ZS1's.

Maybe being at antipodal points has something to do with the answer, but I don't have a good explanation for what was happening. Perhaps some

²Blender, "Tunnel Propagation at HF?" Technical Correspondence, *QST* for April, 1973, p. 57.

of the other readers of *QST* do, or if not, perhaps many have had similar experiences which, collectively, could point to an answer. — *K1PLP, Ex-KH6EGL.*

HIGHER ORDER ROOTS WITH MINI-CALCULATORS

Technical Editor, *QST*:

The formula for determining the square root of a number on pocket calculators (K4RFC's letter)³ can be generalized. For instance, the formula for the cube root is:

$$\frac{\frac{N/A}{A} + A + A}{3} = B$$

where N equals the number from which the root is to be extracted,

A equals the first estimate of the root, and

B equals the second estimate of the root (or final answer, as the case may be).

The general formula for any integral root, r , is:

$$\frac{\frac{N}{(r-1)} + A(r-1)}{r} = B$$

where r is the desired root.

The $(r-1)$ power of the A in the equation is obtained on a calculator by dividing N by A in chain fashion, $r-1$ times. $A(r-1)$ is obtained by adding A to our previous division result $r-1$ times. For high-order roots, it might be quicker to use the K or constant function of the calculator and determine $A^{(r-1)}$ and $A(r-1)$ before using the above generalized equation. For example, assume we need to know the twelfth root of 2, and our first estimate, A , is 1.05. By activating the K feature, entering 1.05, depressing the \times (multiply) key, and then depressing the $+/-$ key ten times, we determine that $A^{11} = 1.710339$ (rounded to six decimal places). Depressing the $+/-$ key one more time gives us the information that $1.05^{12} = 1.795856$, indicating that our first estimate is too low in value. Then by entering 11 and depressing the $+/-$ key, we see that $11A = 11.55$. After deactivating the K function and using the above values for A^{11} and $11A$ in the generalized equation, we obtain 1.059947 for a second estimate, which, raised to its 12th power, gives a result of 2.010992. The procedure may be continued if further accuracy is desired, and the fourth estimate is the one which reaches the accuracy limitation in most pocket calculators.

Actually these machines have amazing powers for performing calculations. With a K function, the machine can find reciprocals too.⁴ With the ability to find roots and reciprocals with a pocket calculator, one can solve with ease almost any electrical formula. I would like to find formulas for approximating the trig and log functions. I'm sure such exist; I just hope there are some which could be of practical use. — *Jeff Imig, K9KTR, 212 Prospect, Apt. U-196, Bloomington, IL 61701.*

³ Colby, "Determining Square Roots with Mini-Calculators," Technical Correspondence, *QST*, March, 1973, pp. 47 and 65.

⁴ See Wheeler, "Finding Reciprocals Easily with Pocket Calculators," Technical Correspondence, *QST* for May, 1973, page 39.

SERIES-SECTION MATCHING

Technical Editor, *QST*:

The Y match, described by W7PUG in *QST*⁵ appears to be a rather close relative of the series-section match⁶ which I think should be better known than it is. W7PUG describes two methods for determining the critical line lengths, $L1$ and $L2$. The first is a graphical method using the Smith chart, and the second is basically a computerized trial-and-error method, resorted to because a direct solution led to "severe difficulties." Having worked out the series-section match, I had doubts about these difficulties, but I've tried it, and it's true. A direct solution is possible, but it's pretty messy.

In most applications of the Y match, however, it would be expected that the input and load impedances would at least approximate pure resistances. If pure resistances are assumed, a direct solution is not hard and leads to the following results.

$$L1 = \frac{\text{arc tan } A}{360^\circ} \lambda$$

$$L2 = \frac{\text{arc tan } B}{360^\circ} \lambda$$

where

$$B = \pm \sqrt{\left(\frac{2-rs}{2rs-1}\right)\left(\frac{2s-r}{s-2r}\right)}$$

$$A = \left(\frac{2rs-1}{2-rs}\right) B$$

and where

$$r = \frac{Zs}{Zo}$$

$$r = \frac{ZL}{Zo}$$

Note that B may be either positive or negative. A positive choice would result in a length $L2$ of between zero and a quarter wavelength, whereas a negative choice would lead to a length $L2$ of between a quarter and a half wavelength. It is possible that the quantity under the square-root radical in the expression for B will turn out to be negative, leading to an imaginary value for B . This would mean that a match is not possible for the values of Zs and ZL chosen.

The example given by W7PUG is one in which both source and load impedances are purely resistive, so that this method may be used. The results obtained agree with his. For those cases where it is valid, this method is probably preferable to either of the others. It requires neither Smith chart nor computer and can provide good accuracy. — *Frank Regier, OK5CG/W3, 720 Loueay Rd., Pittsburgh, PA 15235.*

⁵ Ferrell, "The Y Match," *QST* for November, 1972, p. 40.

⁶ Regier, "Impedance Matching with a Series Transmission Line Section," *Proceedings of the IEEE*, Vol. 59, No. 7, July, 1971, p. 1133.

FEEDBACK

Guy Howe, K5KHA, calls our attention to two errors in the description of his low-cost 2-meter amplifier, in February, 1973, *QST*. The 8-Henry choke, L5, should be connected as shown in the

(Continued on page 56)



Hints and Kinks

For the Experimenter



VXO FOR OSCAR 6

Here's an idea for Oscar 6 users who are "rockbound" with their two-meter rigs. Put a 3- to 30-pF trimmer across the crystal and you can swing its frequency quite nicely. I employ one of the Phillips trimmers (it uses concentric cups, one fixed and the other threaded) and adjust it with a piece of plastic tubing cemented to the rotary part. I can QSY about 3 kHz with an 8-MHz crystal, which results in $18 \times 3 = 54$ -kHz variation on 2 meters. This gives me crystal stability, and VXO capability. The added capacitance lowers the frequency, but if you start from the right spot it works out quite well. This will not work with all oscillator circuits, but does very well with the circuit in my Ameco TX-62, and with the crystal oscillator used in the National VFO-62.

If you can't find a modern-day equivalent of the Phillips trimmer, you may not get as great a frequency change, because the Phillips has a very low minimum capacitance. The 4°C is large, whereas in ordinary trimmers the minimum-to-maximum ratio is not as good. — *Richard Smith, W1FTX*

SIMPLE ONE-SHOT CIRCUIT BOARDS

Solid-state breadboarding can take a variety of simple forms, but the technique discussed here is one of the most handy methods this writer has tried. The idea was supplied by Wes Hayward, W7ZOI, who learned of the technique from an associate, Gene Kauffman, K7OGG.

The main part of the experimental circuit board can be either single- or double-sided copper-clad material. Isolated pads can be cut to various sizes from scrap pieces of single- or double-clad pc board. The pads are glued to the main board by means of hot-melt glue. The latter is available in stick form from Sears Roebuck, and can be purchased at most hardware stores. The glue sticks

are intended for use with hot-melt glue guns, the kind used by the workshop handyman.

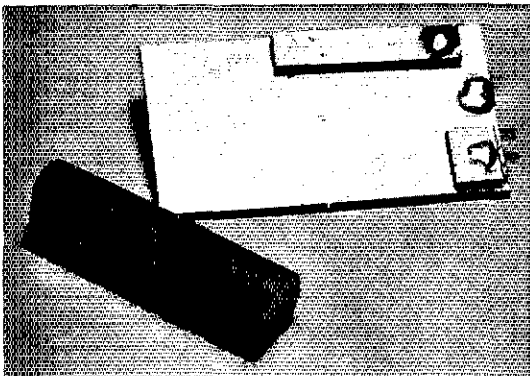
Use a knife to cut thin slices of glue from the stick, place a chip of glue between the isolating pad and the main circuit board, heat the pad for a few seconds with the tip of a soldering iron, and the pad will adhere to the main board. It will be some 30 seconds before the glue sets. Make sure to heat the pad sufficiently to permit the glue to become completely solvent. If not, the pad will come loose under stress.

The pads and strips can be added as the breadboard progresses, stage by stage. Long strips can be used as voltage buses. Small pads are suitable for mounting component parts. The capacitance between the pads and the copper foil on the main board is helpful in assuring stability at vhf and uhf when designing dc, audio, and hf equipment. The writer measured the capacitance between the conductor of a $1/4 \times 1-1/4$ -inch pad and the main board. The RCL bridge showed 6 pF. The amount of capacitance that exists will be dependent upon the dielectric constant of the insulating material of the circuit board, the board thickness, and the thickness of the layer of glue between the pad and the main board.

It is not recommended that this technique be used for finished products. However, if one wishes to keep the circuit for future use it is a simple task to place a bead of epoxy cement across each pad and affix it securely to the main board. — *WICER*

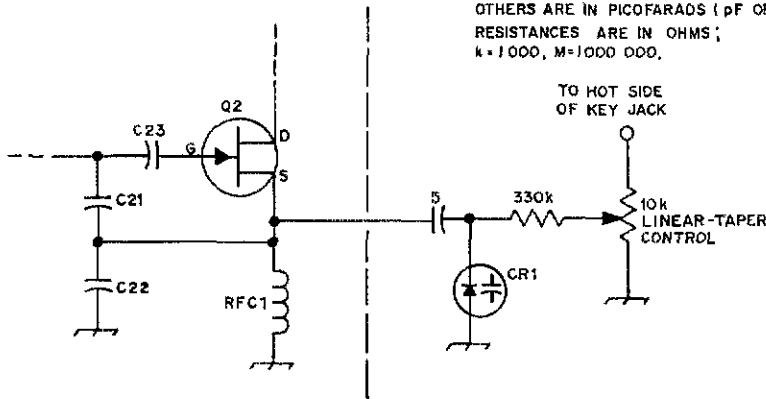
RECEIVER OFFSET TUNING FOR THE HW-7

The circuit modification shown to the right of the dotted line permits receiver offset tuning in the Heath HW-7 transceiver. This circuit permits the received frequency to be offset above the transmitting frequency from 0 to more than 1 kHz on 40 meters and to about 4 kHz on 15 meters. It is



The gray cylinder in the foreground is a stick of hot-melt glue. A package of several sticks costs approximately \$1. A piece of circuit board is shown here with two isolating pads glued to it. A bead of solder has been placed on each pad and on the main board to illustrate the utility of this technique.

EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (μF); OTHERS ARE IN PICOFARADS (pF OR $\mu\mu\text{F}$); RESISTANCES ARE IN OHMS; $k = 1000$, $M = 1000000$.



very convenient as it allows one to zero the station being worked and still obtain a pleasant beat note.

After installing the modification, the HW-7 should be recalibrated with the slider of the offset control set to the ground side (zero offset).

On 40 and 15 meters, I set the control for zero offset, and zero beat the station to be called with the main tuning dial. I then adjust the offset control for the desired beat note.

A silicon diode can be used as a Varactor diode (CR1). The reverse bias on the diode may be varied from zero to approximately 9 volts with the offset control. When the key is down, there will be zero volts bias, and the offset circuit will present its maximum capacitance across C22. On receive with the offset control set for maximum resistance, there will be about 9 volts reverse bias applied to the diode, and the circuit will present minimum capacitance across C22. This raises the oscillator frequency. — *Glen Carlson, W6KVD*

practical case shown here, an injection frequency on approximately 140 MHz was needed for converting a commercial fm receiver to two-meter operation.

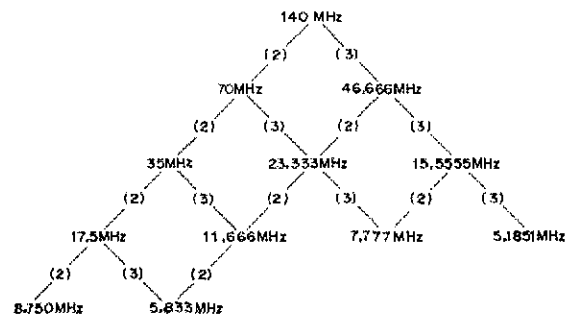
The method assumes that only doublers and triplers are being used. The multiplication factors are shown across the chart. With the products thus displayed, the constructor can choose a frequency based on his own particular requirements. For example, one can see that starting at 8.750 MHz is not good from the standpoint of spurious products, but the cost of surplus crystals which could be etched or ground to this frequency is attractive. The spurious products could be attenuated by careful design and the use of more tuned circuits. The middle frequencies of 17.5 MHz, 11.666 MHz and 15.555 MHz look like especially good prospects. Most crystal manufacturers have a change in their price structure in this area, and you may be able to get on the low side of a price difference by proper frequency selection. With multichannel fm receivers it is easy to invest a fortune in crystals and using this chart could result in considerable savings. — *Ed Valmore, K2EVJ*

AN INEXPENSIVE SUBSTITUTE FOR COIL FORMS

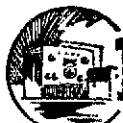
For low-power use, the plastic pill bottles available from any druggist or pharmacy make ideal coil forms. They come in a variety of sizes and diameters, and the smaller ones have a small enough ID to accept common-size ferrite rods. Male plugs (available in many pin configurations) can be cemented to the base of these bottles for plug-in coil use. Also, the coils can be cemented easily to a chassis or board by means of epoxy cement. — *George W. Smith, Jr., W5HIP/W5DPJ*

A SIMPLE FREQUENCY-MULTIPLIER CHART

Many times a vhf builder would like to see all the possible multiplication products to a given output frequency. This need most frequently comes up in planning receiver LOs (local oscillators) where the desired output frequencies are not as familiar as those of transmitter multiplier chains. The following simple chart allows one to see all possible choices at a glance. In the



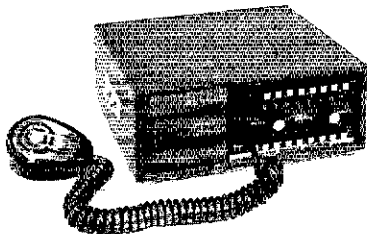
If only doublers or triplers are to be used, divide the desired output frequency by either 2 or 3. The locations of these numbers can be deduced from the example (second row). The multiplier factors are shown in parentheses. Divide the numbers obtained by the previous division and mark them down in the third row from the top. Continue the process until all the possible crystal frequencies are reached.



Recent Equipment



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



Regency Electronics HR2S and HR2MS FM Transceivers

The HR2MS is shown here. There is little difference between this unit and the HR2S in outward appearance.

THE ERA of solid-state equipment for amateurs was ushered in by Regency back in 1956 when it produced the ATC-1 Converter for 80 through 10 meters (Recent Equipment, page 19, *QST* for February, 1957). The company is still pioneering, to a degree, with its scanning transceivers for two meters, the HR2MS for mobile use, the HR2S for "base." While scanners have been popular in other radio services, this is the first known to this writer strictly for amateurs.

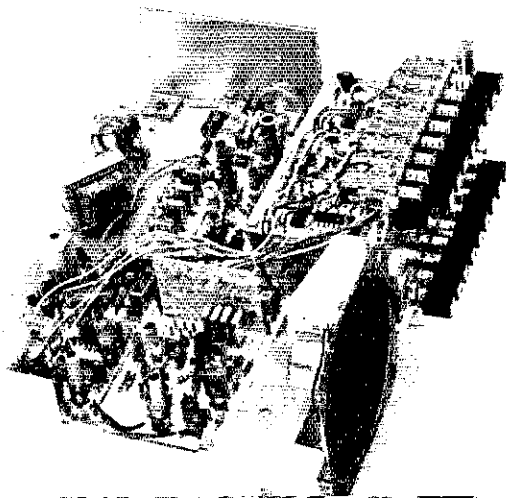
We'll touch briefly on the radio aspects of the equipment and then have a look at the scanner. Basically, the "works" of these sets are those of the well-known HR-2. All solid-state, the HR2MS employs 31 silicon transistors (including a pair of ruggedized balanced-emitter rf-power transistors producing about 15 watts output); six integrated circuits and 26 diodes. There's a ceramic filter in the second i-f stage of the double-conversion superhet receiver. It establishes the overall i-f bandwidth of the system. To dwell on this a moment, in the six months or so this unit has been in use, "monkey chatter" from other channels has been noticed only twice when several machines were in use. Along the same vein, chatting with

other staffers through the repeater, even when all were parked in the ARRL Hq. lot, has not been a problem. The receiver audio output of five watts provides good copy (though at freeway speeds the nearest window may have to be closed).

The transmitter provides 15 watts output with the supply voltage at 13.6. After six months and 10,000 miles of bouncing around in a station wagon, the power output still measured 12 watts. Repeaking the output stage brought the power back to normal. The transmitter audio repeatedly impressed operators of other stations worked: "You're the clearest, loudest signal on the band," was a typical reaction. The rig comes with one set of crystals installed; sockets for five more; and eight selector positions are available from the front panel. The two extra channels allow the use of the same rock twice: For instance, the model described here has ".28 direct" in channel 2, ".88 direct" in channel 3; and ".28/.88" in channel 7 (with appropriate use of jumpers).

Only two problems have shown up despite the long period of fairly heavy use. One driver transistor "went west" but it was easily replaced. A pilot lamp for the scanner went out; it, too, was a common type, so no real trouble. The manufacturer's schematic diagram is photoreduced almost to the point of disappearing completely and it shows only arbitrary component numbers (Q-401, CR401, IC401) instead of manufacturer's type.

The HR2MS exposed. Standard rotary controls are used on this model, with the on-off switch on the same shaft as the volume. Otherwise, the layout is almost identical to the ac-powered version, except for the power-supply components. The hefty choke at center left is part of a filter which keeps alternator whine out of the receiver, an improvement over earlier models.



QST for

EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (μF); OTHERS ARE IN PICOFARADS (pF OR μPF); RESISTANCES ARE IN OHMS; 1=1000, M=1000 000

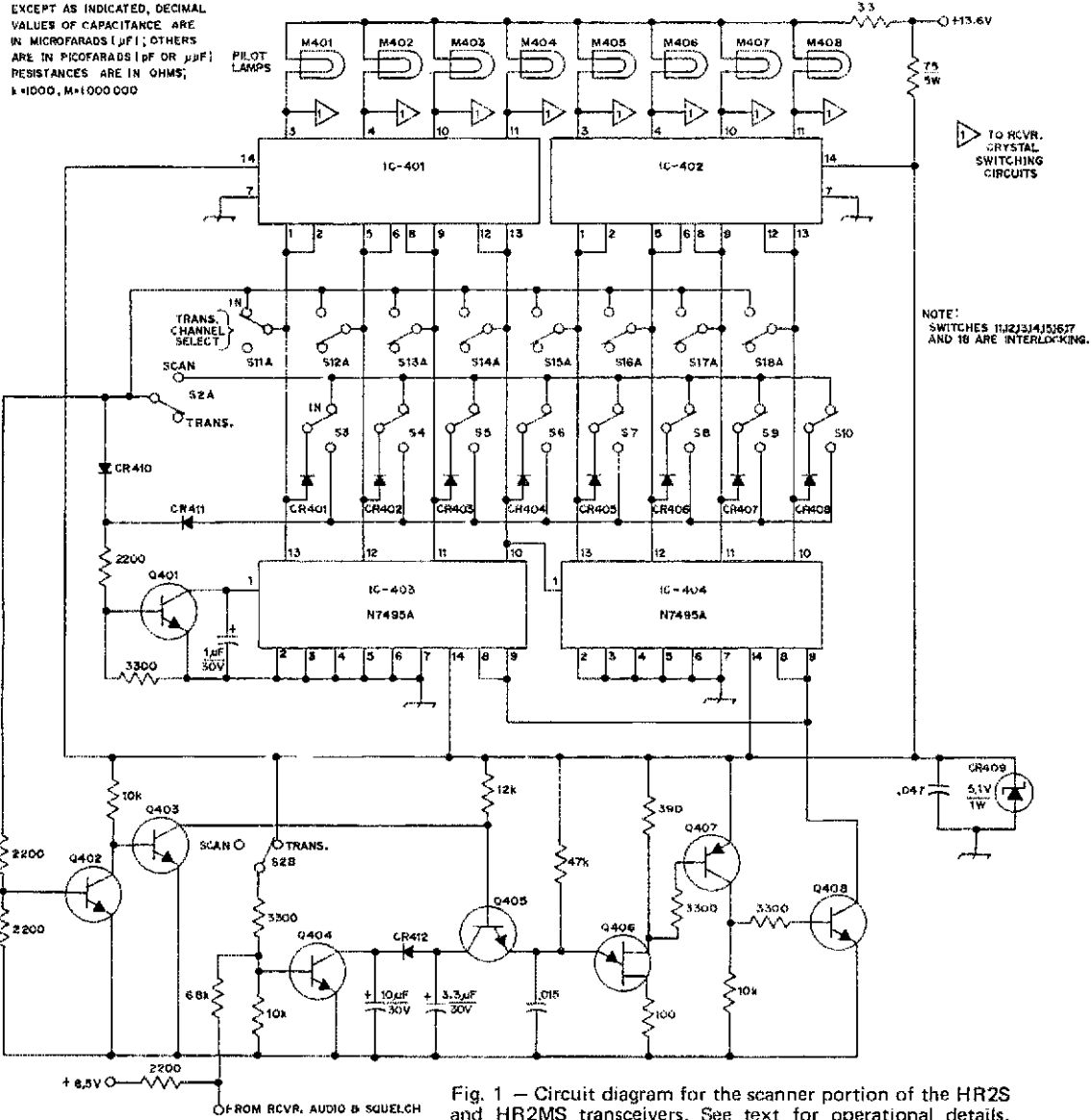


Fig. 1 — Circuit diagram for the scanner portion of the HR2S and HR2MS transceivers. See text for operational details. Component designations are those of the manufacturer.

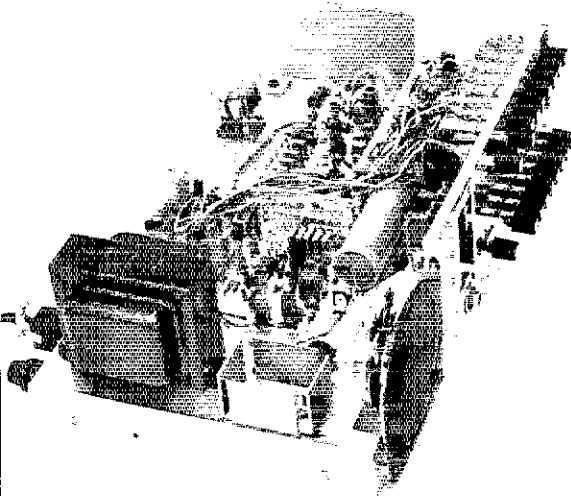
The Scanner

Now on to those blinking red lights: There are two rows of pushbuttons numbered 1 to 8. The top row, labeled RX, is in use when the scan button is actuated. It selects two to eight channels for scanning at a rate of 15 channels per second. The scanner divides its time equally and automatically between the channels selected; there are no pauses for channels which have been locked out. The "Transcan" is shown schematically in Fig. 1. It is coupled to the receiver audio and squelch circuits via a resistor connected to the base of Q404, which operates as a switch for the pulse generator (Q405-408 and associated components). Thus, the scanner will not scan if the squelch is open, since noise from the unsquelched receiver, as

well as signals, will cause a voltage to appear across the 68,000-ohm resistor, cutting off Q404. Similarly, when the TRANSMIT/SCAN switch is in the TRANSMIT position, a voltage appears across the 3300-ohm resistor, which is also connected to the base of Q404, again stopping the oscillator.

We pulled off the cover of the rig and discovered that ICs 403 and 404 were S7137/N7495As, which turn out to be 4-bit right-shift, left-shift registers. The right and left clock inputs (pins 8 and 9) are connected to each other and then to the pulse oscillator through Q408.

SW11 through SW18 are interlocking; only one of them can be pushed at a time. If, for instance, the rig has been scanning, and someone you'd like



The HR2S out of its case. The two white shafts are vertical sliders operating the volume and squelch controls. In the foreground is the ac power supply; just behind it, the receiver section; and in the "northwest corner," the transmitter. The scanning circuits are beneath the scan selector switches in the upper right corner.

to talk to appears on channel 7, push button 7 in the TX row. The receiver locks on that channel, the red light stays on, and the transmitter will operate as soon as the push-to-talk microphone is activated.

What are some of the practical advantages of a scanning rig? If you're using the HR2MS (in your car) away from your home territory, you can let it scan, and stop where the activity is. You can listen a bit, and if the group sounds congenial, give them a shout; if the conversation makes it appear a stranger wouldn't be welcome, or if those in QSO are too long-winded, simply pop out that channel's button and the rig will go back to scanning the remainder of the channels.

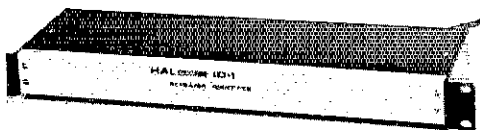
Concerning the home rig (HM2S), you can provide a great monitoring function for all the local channels while you tinker with your hf gear; just let the Regency sit there and scan. If a mobile comes up looking for assistance, the flashing light will stop at the proper channel; you can go over, push the corresponding TX button and answer.

In summing up, both of these rigs are quite "sanitary," to steal WICER's term, with mar-resistant vinyl finish. — *WIUED*

Regency HR2MS and HR2S FM Transceivers

- Transmitter power output: 16 watts.*
- Transmitter deviation: Factory set at seven kHz.*
- Transmitter crystal frequency: Operating frequency divided by 24.
- Channel capability: six pairs of crystals may be installed, two of which may be jumpered for additional combinations.
- Receiver sensitivity: 0.35 μ V for 20 dB of quieting.*
- Squelch sensitivity: Opens at 0.2 μ V-input signal levels.
- Receiver crystal frequency: Operating frequency minus 10.7 MHz divided by three.
- Power requirements: HR2S, 117-V ac, 90 watts transmit; HR2MS, 13.6 V typically for 2.9 amperes at the rated power output.*
- Dimensions (HWD) and Weight: HR2S, 3-3/4 \times 13 \times 8-1/2 inches, 9 pounds; HR2MS, 3-3/4 \times 13 \times 8-1/2 inches, 5.8 pounds.*
- Price class: \$350, each unit. Both models come with microphone and mounting bracket.
- Manufacturer: Regency Electronics, Inc., 7900 Pendleton Pike, Indianapolis, IN 46226.
- * Measured in the ARRL lab.

QST — QST — QST



The HAL ID-1A Repeater Identifier

NO ONE KNOWS better the difficulty of producing an operational repeater than those amateurs who have had the opportunity of building a machine from the "ground floor." For many installations, the most complex portion of the system is the control circuitry. The myriad of wires and relays astounds the uninitiated amateur

and even confuses the builder once in a while. A portion of this control system is usually responsible for the correct delivery of station identification at the proper interval to meet federal regulations. Hal Communications Corp. has developed a product, called the ID-1A, which can be used to "decomplicate" the control section of a

repeater by providing the proper i-d at prescribed times. All the repeater committee need do is attach a few leads to the rear apron, make a simple adjustment or two, and the "identifier" portion of the repeater complex is operational.

Functional Operation

Identification will be initiated on closure of the repeater COR (carrier-operated relay) at any time the repeater has been idle (not transmitting) for the previous three-minute period. If the repeater is activated by someone transmitting a carrier momentarily (to assure the repeater is functioning correctly) i-d will occur at the beginning of the repeater transmission. If the operator then decides to attempt communication by making a transmission shortly after the test, i-d will take place 2 minutes, 50 seconds after the beginning of the test transmission. If, however, the operator decides not to follow up his initial test, (within 2 minutes 50.7 seconds) the ID-1A will revert to a timing point of zero and will i-d upon any activation of the repeater. Should the transmitter be off the air when it comes time for i-d, the ID-1A will key-up the transmitter, provide the proper i-d message, and then allow the repeater to unkey. This automatic keyup happens only when the repeater has been used within the previous three-minute period.

A PAGE-CONTROL input is provided to inhibit identification when the ID-1A control line is grounded. This feature holds the identification sequence until the repeater is released, thereby preventing an i-d "on top" of someone's transmission. The page control is intended for use with a commercial type of repeater, but can be put to good use with an amateur installation. The timing duration must be adjusted, however, to assure that no two transmissions can encompass a period of more than five minutes, which might allow the page control to hold the i-d beyond the five-minute maximum time allowed under FCC requirements.

The timing-cycle duration is determined by a counting circuit which operates from 10,240 pulses derived from the 60-Hz ac line powering the equipment. The timer keys the identifier every 2 minutes, 50.7 seconds.

When the ID-1A is operated from 12 volts dc, an internally mounted oscillator may be used to control the timing clock. Since the oscillator frequency is adjustable, it can be used to develop a timer rate other than listed above. It may also be used with 117-volt operation; the manufacturer should be contacted for hook-up information.

Operation from 12 Volts

The ID-1A may be operated from a dc supply, should this be a requirement at the transmitter site. A 15-ohm, five-watt resistor at the input (marked 1.5 ohms on the schematic diagram which came with the unit) provides equipment isolation from the dc supply. The power source should be capable of providing the rated voltage at a current of approximately 500 mA. During our lab tests on the ID-1A, we discovered the logic circuitry would not

TABLE I —
CODING THE MEMORY FOR WA1LVI

Memory Location	Letter	Space Matrix*	Dash Matrix*	Element
1		1	0	space
2		0	0	dot
3	W	0	1	dash
4		0	1	dash
5		1	0	space
6		0	0	dot
7	A	0	1	dash
8		1	0	space
9		0	0	dot
10		0	1	dash
11		0	1	dash
12	I	0	1	dash
13		0	1	dash
14		1	0	space
15		0	0	dot
16		0	1	dash
17	L	0	0	dot
18		0	0	dot
19		1	0	space
20		0	0	dot
21	V	0	0	dot
22		0	0	dot
23		0	1	dash
24		1	0	space
25		0	0	dot
26	I	0	0	dot
27		1	0	space
28		0	1	dash
29		0	0	dot
30		0	0	dot
31	I	0	1	dash
32		0	0	dot
33		1	0	space
34		0	0	dot
35		0	1	dash
36		0	1	dash
37	I	0	1	dash
38		0	1	dash
39		1	1	end
40				

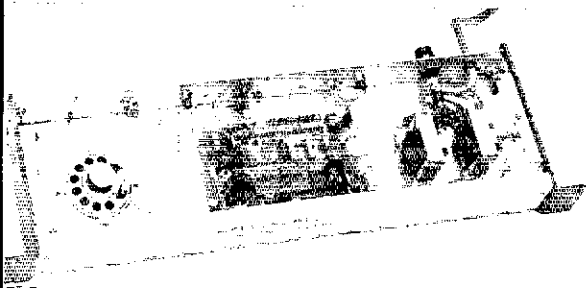
*A "1" indicates the presence of a diode, a "0" indicates the absence of a diode.

operate when connected to an external dc supply. The trouble was traced to an incorrectly installed diode within the ID-1A. Reversing the diode allowed the unit to function normally in all respects.

Controls and Adjustments

The few controls mounted on the rear apron of the ID-1A are adjusted at the time of installation and should not need to be readjusted unless the technical committee determines that they want to change the operational characteristics of the machine. Two test switches are provided; one allows the initiation of an i-d sequence each time it is depressed, and the other starts the 2-minute, 50.7-second timing sequence.

Internally mounted adjustments are provided for setting the voltage-regulator output, the



Inside view of the Hal Identifier. Most of the components are mounted on a single circuit board. The power supply is located at the right.

message keying speed, the oscillator timing frequency (as mentioned earlier), the tone pitch, and the level of the tone output. A built-in speaker is provided with the ID-1A to give aural indication of the i-d operation at the repeater site without the necessity of monitoring the repeater.

The Memory

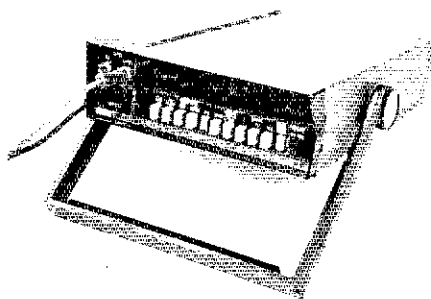
The memory is capable of storing forty elements consisting of dots, dashes and spaces. Two separate matrices are used, one for spaces and one for dashes. As the message is transmitted, each portion of the memory is read out sequentially, one element at a time. The output information is used to operate the keyer circuitry, which in turn "plays out" the message. The keyer automatically produces a short space, equal in length to a dot, after each code element is generated. The only time a space element need be programmed into the memory is when a space duration longer than this is desired.

Coding the memory is easy. Table I gives a sample call sign developed at Hq. as a test message. If a diode is placed at the location number one of the space-matrix printed-circuit board, a space will "appear" after the normal element space. When a diode is placed in the dash matrix, location number one, a dash will follow the normal element space. Without a diode at either location, a dot will be generated. A diode in each position signifies the message is completed. It's as simple as that! --
WIFBY

Hal Communications ID-1A Identifier

Dimensions (HWD) and Weight:
1-3/4 x 19 x 5 inches, 3-1/2 pounds.
Power requirements: 117 V ac or 12 V dc.
Colors: Two-tone gray.
Price class: Wired circuit board, \$75. Completely assembled in 1-3/4-inch rack, \$115.
Manufacturer: Hal Communications Corp.,
Box 365 A, Urbana, IL 61801.

QST ——— QST ——— QST



The Fluke Model 8000A 3 1/2-Digit Multimeter

IT IS BECOMING increasingly apparent that "digital" is in. One does not have to read very far in current electronic literature to find that almost anything from A to Z can be supplied in a digital readout of one style or another (except oscilloscopes, and someone is probably working on that).

Digital multimeters are not exceptional to this change to a readout technique that provides clear, easy-to-interpret numbers, visible at a distance far greater than that at which the pointer of most VOMs can be seen. There is nothing startlingly new about having digital multimeters (DMM) available. Many of the better laboratories and test facilities have had them for years. However, the more recent

versions are lighter in weight, faster in resolution time, and more reasonable in cost.

The Fluke 8000A is certainly a modern DMM. It is light, portable, easy to use and read, and embodies all of the functions that a multimeter should have for the laboratory, workshop, or service shop. The plastic case of the 8000A is handsome as well as tough. According to the manufacturer, the case (and the instrument) will withstand the 8-foot drop test. This writer just could not get up enough nerve to make that test in the ARRL laboratory, but then that is not the primary purpose of DMMs.

LED readouts provide a clear display while requiring only small amounts of power, com-

mensurate with a portable instrument. A rechargeable battery pack is available, affording many hours of use away from ac mains. The batteries are recharged when the instrument is plugged in for workshop use. Model 8000A/23 is a version that will operate from 230 V ac if such a need exists. These DMMs are not fussy about the line frequency either, accepting 40 to 400 Hz as a matter of course.

Functions and ranges are selected by means of push-button switches. At the low end, 200 mV, 200 μ A, or 200 ohms, full scale, are available. The upper range is 1200 V, 2000 mA, or 20 M ohms. All ranges are over-voltage protected. If the probe slips and contacts several hundred volts instead of the intended millivolts, no harm is done. No more pretzel-shaped pointers! The display will flash to call attention to the over-range condition. Current-measurement ranges are protected by a 2-A fuse in series with the test lead.

The mounting of this fuse is the result of a clever bit of planning. The panel has a marking beside the jack for the test lead, indicating that there is a latent fuse somewhere nearby. A quick look at the instruction manual clears up the matter; the input terminal (jack) can be turned, allowing it to pop out, revealing the fuse. If the fuse needs replacement, is it necessary to dig through the tool box or parts drawers for a new one? No, you just slip one out of the groove in the spare fuse holder, otherwise known as the handle. Such thoughtfulness! In addition to serving as a means of carrying the 8000A, the handle can be adjusted to several positions to prop the instrument at a convenient viewing angle.

Operation

The principle of operation of the 8000A is along conventional lines. Fig. 1 is a functional block diagram of the instrument. Ac or dc voltages or resistance information, as selected by the push-button function controls, are applied to the input divider network. This network divides the unknown voltage down to a basic range which the conversion circuitry can accommodate. Shunt resistors translate current into a voltage which is also in the correct range. Ac voltages are converted to dc in a circuit using an FET, an op amp, and diodes. An op amp also converts the proportional voltage from the resistance scales to the correct range for the later stages. An active filter is used to "clean up" the dc before it is applied to the analog-to-digital converter.

A/D Converter

Digital-display devices (readouts) can only indicate counted events. These events are usually presented to the readout circuitry in the form of pulses, each event causing an updating (or other change) of the number displayed. The application of dc information to such a readout system would cause an initial reading, such as 0001, and the reading would not change to follow any increase or decrease of the voltage. Therefore, to make the readout useful as an amplitude (voltage) metering

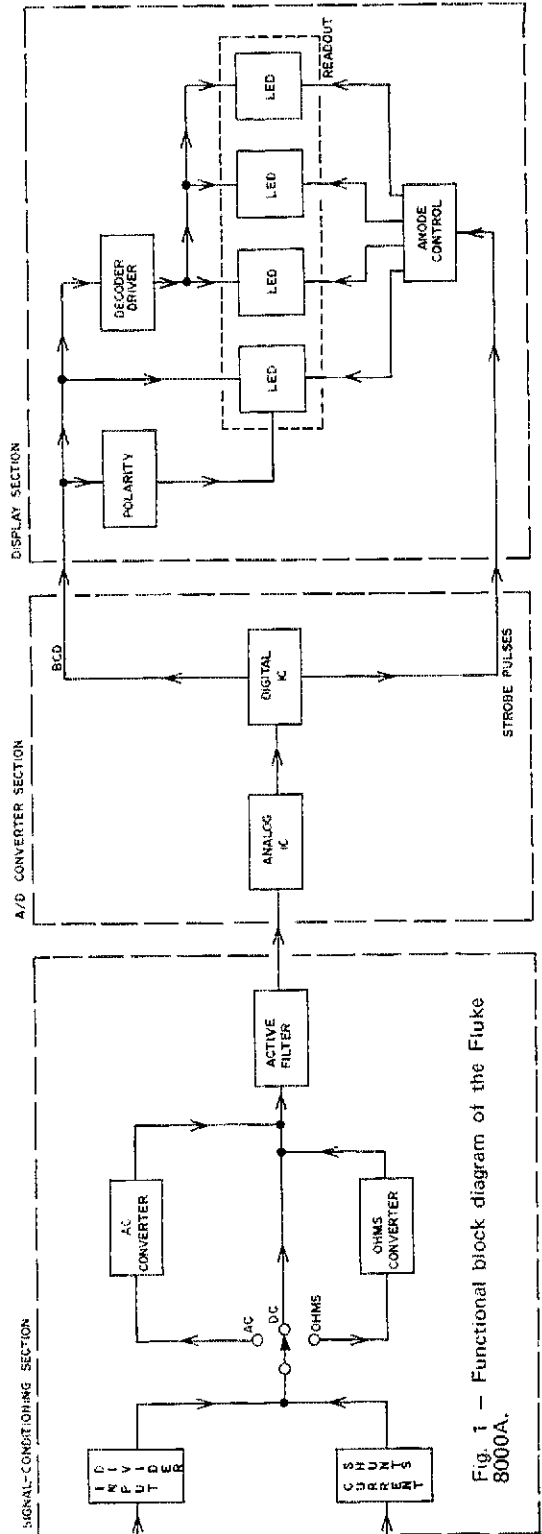


Fig. 1 - Functional block diagram of the Fluke 8000A.

device, the dc must be converted to a series of events, or pulses. A voltage-controlled oscillator can make this conversion, providing a change in frequency that is proportional to the amount of controlling dc that is applied. Fine! But how does it know the difference between a negative potential and a positive one?

The Fluke 8000A does this conversion in an analog IC that provides a rest frequency (no applied unknown voltage) of approximately 80 kHz. When a negative voltage is applied, the frequency is shifted downward. Conversely, a positive input will cause the frequency to shift higher. The display portion of the DMM is therefore a frequency counter, indicating the difference between the rest frequency and that to which the oscillator shifted as a result of the unknown voltage. Logic circuitry causes the appropriate + or - symbol to illuminate in the display.

An instruction booklet accompanies the DMM, giving complete operating instructions and a discussion of the theory of operation. Calibration and maintenance procedures are also described, enabling the user to retain accuracy and usefulness of the DMM. The booklet also contains schematic diagrams, board layout information, and a parts list.

Observations

The Fluke 8000A was put to good use in the ARRL Laboratory and in this writer's shack. In both locations it was quite often the first instrument reached for when there was a need to make some measurement. One especially pleasing feature was the isolation provided whenever it was necessary to measure the 117-V ac line potential. Although the power transformer in the DMM is of good quality, it is quite easy for the operator to

remove the power cord and allow the unit to work from the internal batteries. Such isolation is an asset when measuring voltages in equipment where the entire circuitry is above ground and might be disturbed by the presence of a connection to an electrical system. The plastic housing is also an added safety feature while such measurements are being conducted.

It took a considerable amount of use before any fault was found in the operation of the DMM. Even after the skeleton in the closet was discovered, it was considered with mixed emotions. The 8000A is greatly disturbed by the presence of rf - on the test leads or near the instrument itself. However, there are very few instances where one should be operating unshielded equipment that will produce a field strong enough to disturb the reading of the DMM. If the equipment is shielded but there is enough rf present on dc supply leads, filaments, the 117-V line, and the like to cause an erratic reading, then the DMM is sending you a message about decoupling and bypassing - or the lack thereof! - *WISL*

Fluke 8000A Digital Multimeter

Dimensions (HWD) and Weight:

2-1/2 × 8-1/2 × 10 inches, 2-3/4 pounds without batteries, 4 pounds with batteries.

Power requirements: 8000A/10, 100 V ac; 8000A, 115 V ac; 8000A/23, 230 V ac; all models, 40 to 400 Hz. Internal battery pack available as an option.

Price class: \$300.

Manufacturer: John Fluke Mfg. Co., Inc., P.O. Box 7428, Seattle, WA 98133.

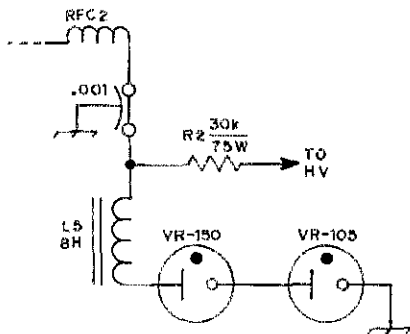
Feedback

(Continued from page 47)

accompanying diagram not as in Fig. 1 of the article. The difference would be noticeable mainly if the builder uses amplitude modulation.

Teflon insulation for the handmade tube socket assembly should be .003-inch thickness, not .030, the figure given the second paragraph on page 20.

As expected, this is proving to be a very popular constructional article. We've had a number of reports of construction projects using the K5KHA design, and several of the amplifiers are already on the air and performing well. - *W1HDQ*



Lo-Strays

Stolen Equipment

A Gonset G-76 No. 25682 with crystal calibrator No. 20560 was stolen in East Hartford, Conn. on March 17. Contact Robert Cooney, W1TUH, 56 Clinton Dr., S. Windsor, CT 06074.

An automobile containing an SB-102 No. 122-121105 with SB600, HP32A, HG12 and HG10B was stolen from Bob Reiley, WB2FHN, Box 235, Shelter Island Heights, NY 11965.

Stolen on March 10, 1973 in Berkeley, Calif: Regency HR-2, Serial No. 04-02879, SB-34, Serial No. 211828. Please notify Frank Inami, W6GSR, 1168 Hillcrest Court, Livermore, CA 94550.

Seiki VHF/FM handie-talkie Model V-018 (same as Varitronics HT-2, Mark II) two-meter transceiver; channel 1 Tx 154.710, channel 2 Tx 155.130, both channels Rx 154.710; in black leather carrying case with dual-tape antenna were taken from owner's vehicle during emergency search and rescue operation under control of law enforcement agency. Contact Bud Drake, W0IPT, P. O. Box 727, Fort Collins, CO 80521.

VE3Queen Elisabeth

Hospital Calling . . .

A BLUE SIGNAL comes down the mast and there's a bit of red on it. We make a yellow signal in the receiver and send it up to meet the red. All we want out of the mix is the red, and that red is the human voice.

Not the usual way, perhaps, of talking about oscillators and manageable i-fs, but this kind of teaching has been the key to creating one of Canada's most unusual and worthwhile ham shacks — VE3QEH at Toronto's Queen Elisabeth Hospital for the permanently handicapped.

Len Sumner, VE3DOR, has recently guided six new operators — Dot, Bessie, Lear, Jimmie, Ken and Ted — through to their first tickets, and the hardest job was persuading them that they had the ability to cope with the complexities involved.

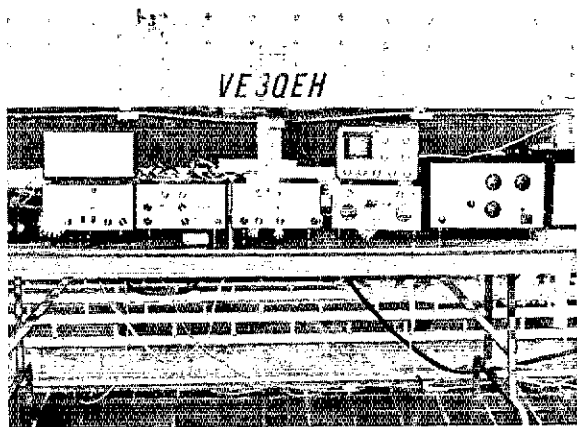
In the hospital between 20 and 45 years, these severely handicapped patients had learned such skills as painting with brushes between teeth, and typing with a mouth-held stick — but it was a big step to going on the air as full-fledged operators, especially when, as in Dorothy's case, you've never taken a test on anything in your life.

They did it, though, thanks to Len's simplified teaching and fund-raising efforts and to the equipment modifications by Ray Hunter, VE3UR, the Drake agent in Toronto.

The shack is a beauty — with a fine layout in the hospital's sixth floor solarium. The station equipment includes a complete Drake-line and the antenna farm is a Hy-gain TH6DXX beam, Ham-m rotor, and dipoles for 80 and 40 meters 160 feet above ground level.

But the secret is in the series of plexiglass disks fitted to the dials so that fine tuning can be done with a stick held in the mouth or by other adaptive devices. VE3UR cut the disks as the training program went along so they fitted everyone's needs exactly.

James Jarvie, the Federal Department of Communications Inspector who administered the license tests, was really impressed. "It was quite an operation," he said afterwards. Regulations were bent a little so that the six could go on voice straightaway, though they have passed the Morse code requirements. All the other tests were oral.



"We completely re-wrote all the usual ideas about training," Sumner said. "The usual two sessions a week with a lot of private study and delving into manuals was obviously of no use at all. We did everything orally with six one-hour sessions a week, about as much as the patients could handle without getting overtired."

The therapeutic effects have been startling in some cases. Bessie, 66 years old and 23 years in a wheel chair with multiple sclerosis, has started throwing her voice in a way she never managed before without the incentive of being on the air.

Lear Warner, a youngster from Barbados, paralyzed with a viral disease, could hardly make himself heard at first because of a throat operation for insertion of sustenance tubes during 14 months he spent in a coma. "Now he operates like a pro," Mr. Jarvie said.

VE3DOR was himself a late starter. He took up ham radio as a hobby after retiring from the insurance and computer software business. Just recently (long after the patients he trained) he passed his Advanced Amateur exam and can finally go home and talk to VE3QEH — over the airwaves.

Norman Hartley



With stick in mouth and a little practice, the operator can manipulate the slotted-disk tuning controls of the station.

Putting Up Wire Antennas — the Easy Way

BY GARY L. FOSKETT,* W1ECH

HAVE YOU EVER looked up wistfully at a big tree in your yard and wished you could get a wire antenna up there? If you have, maybe you gave up because (a) you weren't young or agile enough to climb the tree, or (b) you weren't strong enough to toss over a rock with a string on it. Here's an easy way to do the job in just a few minutes, with no climbing or throwing.

As a young Novice, I used to spend *hours* heaving pliers, rocks, sticks and other things tied with a string at backyard trees. All too often, the line went over a branch (rarely the one I wanted), got hung up, and, after a lot of angry tugging on my part, finally broke — leaving a rock or a pair of pliers dangling from the branch! In fact, one big old maple resembled an oddly-decorated Christmas tree, with a couple of small transformers, a pair of pliers, several glass insulators and other assorted objects hanging on strings of various kinds from its branches. The neighbors must have thought I was crazy, or at least a bit simple. Maybe they were right, because there was and still is an easier way.

A few years ago, a fellow ham demonstrated the use of bow and arrow to shoot a line over a tree. I thought it was a great idea, so I bought a cheap plastic bow, some target arrows and a spool of nylon string. Of course, the concept of using the bow and arrow to put up antennas isn't new — the ARRL *Antenna Book* has carried mention of it for many years. Basically, the idea is to tie a thin string to the feathered end of an arrow, shoot it over a tree and use the string to pull up successively heavier lines until the antenna rope is up. Sounds easy, doesn't it? It should be, but there are still little problems. For example, no matter how neatly you coil the string on the ground, small twigs and things tend to catch the stuff. So, when the arrow flies upward, the string snags and your shot just doesn't make it. Furthermore, if, by divine intervention, the arrow gets over the tree, it may not be heavy enough to pull the string over and back down again. And then you can add a dangling arrow to the pliers, transformers and so on. These problems can be overcome, however. Nowadays, with the same old plastic bow, I can usually get a wire up in just a few minutes. You can, too — here's how.

* David Road, Durham, CT 06422.



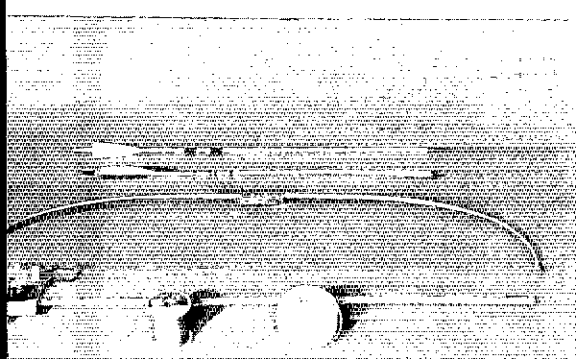
The "Antenna Kit"

Since many of the things you'll need can be used over and over again, you might consider the total conglomeration a kit — an antenna kit. Your kit will include a bow; some target arrows; a spool of 8- or 10-pound test nylon monofilament fishline; a spinning reel; a wooden dowel; and about 300 feet of 150-pound test nylon string, heavy fishline or even mason's line. You'll also need rope or whatever to actually haul up the antenna, but that's not really a reusable "kit" item, unless you plan to take the antenna down and put it up again repeatedly! Except for the rope, some careful shopping should provide everything you'll need for about ten dollars. My bow and reel cost only about four dollars apiece, and they're still in use after three years. An expensive hunting bow would have much more power, but my plastic one enables me to clear the top of a 100-foot tree. If you have giant redwoods out in back, hire a helicopter!

Preparation

Some minor equipment alterations will be necessary before you head off into the brush. First, drill a small hole through the shaft of each arrow, in between the feathers. This will provide the tie

QST for



point for the monofilament line. To make sure the arrow comes down the other side of the tree, add some weight to the tip. Don't add too much, of course, or you'll severely limit the distance you can shoot the arrow. Two four-inch steel nails, or a few small finishing nails, neatly taped around the tip, should work fine. Now wind enough 8- or 10-pound test monofilament line onto the spinning reel to just fill it. I've tried stronger line, but anything much heavier than 12-pound test is simply too stiff and kinky for this application. Mount the reel alongside one end of the wood dowel. Mine is secured with tape. Sharpen the other end of the dowel so it will stick into the ground. Pass the end of the line from the reel through the hole in one of the arrows and tie it. Use good knots, or plenty of not-so-good knots. This line is slippery; if the knots let go, you may lose your arrow.

Shooting the Line Over

Now you're ready to shoot up the line. If the neighbors looked amused at your climbing and throwing efforts, wait 'til they see you shooting arrows at trees! Having decided which way your antenna is to go away from the tree, stand on that side of the tree, just out far enough from the base so you can see the top. Obviously, this is easier when the foliage is gone, but don't let the leaves scare you off; they aren't really a problem. Next, stick the pointed end of the dowel into the ground between you and the tree, with the front or open part of the reel aimed skyward. Having tied the fishline securely, position the arrow in firing position against the bowstring so the fishline runs up, across the front of the bow above your hand and back to the tiepoint in the feathers. This will reduce chances of snagging the line when you shoot. Now flip open the spinning reel, so the line can pay off freely. Aim carefully for the top of the tree and let 'er fly. With any luck at all, the arrow will clear the tree nicely and come zipping down the other side. If you're careful, you can halt the arrow's upward progress with a quick tug on the line just as the arrow crosses the top. It will then come down hugging the trunk on the other side, rather than laying line way out beyond all the branches. This little trick will ensure that your eventual antenna rope is up against the tree trunk, too, and it looks neater this way.

If It Didn't Make It

Let me pause here to reassure anyone whose first shot misses the tree completely (!) or fails to cross the desired branch. If the arrow is through any of those branches, don't try to pull it back out. The feathers or nails will probably catch on something. Simply let the arrow fall to earth. Cut off the line (it's quicker than untying it), and reel it back in, re-tie the arrow and shoot again.

Success

Happiness is watching your arrow as it sails over the tree, comes down just on the other side and lands where there isn't any poison ivy! If you're satisfied with the shot, close the reel so no more line will pay off. Carry your roll of nylon string to the arrow. Cut the fishline - but don't let go of it - and securely tie it to the string. Check this knot or series of knots carefully. You certainly don't want the thing to come unglued while you're pulling it over the tree! Now walk back to your

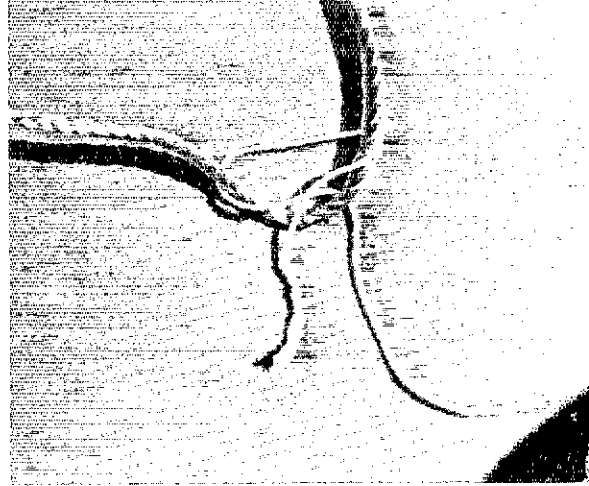


Fig. 1

reel, unraveling string as you go. Set the roll down on the ground, but hold the string loosely in your hand. Reel in the fishline, just as if you had a fish on the other end. Pick up the reel and dowel and use a series of smooth tugging motions as you crank, while paying out the string with your other hand. Keep plenty of slack on the string. Keep tugging and cranking until the string comes over and down to your hot little hands.

If the String Catches on Something

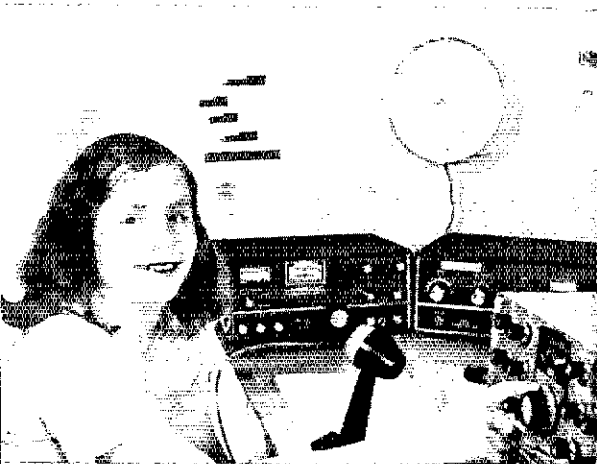
Sometimes the knot between the line and the string catches on fine little branches. If gentle tugs on the line don't free it up, let a little line back out of the reel. Holding the line in one hand and the string in the other, apply tension by gently pulling both at the same time. Then, in a single quick motion, simultaneously release the string and yank on the fishline. This will usually pop the knot through after a few tries. Of course, you'll break the fishline if you tug too hard, but even 8-pound test line is surprisingly strong. When the string is over the branches and in your hands, cut off the fishline. Tie this end of the string securely to your antenna rope. Be sure to streamline this connection as much as possible, because it can snag even worse than the smaller stuff. I suggest a "sheet bend" knot. See Fig. 1. This knot is quick, neat and won't slip, if you tie it correctly. Use the string to pull the rope over the tree, winding the string back on the roll as you do. If the rope knot hangs up, use the technique described earlier to pop it through. Your present materials are stronger, so you can tug harder if necessary. When the rope is in hand on the other side of the tree, secure it and untie the string.

That's all there is to it. You can now use that rope to pull up the wire antenna, a pulley or whatever you want. I might mention that polypropylene is wonderful antenna rope. It's strong, inexpensive, stretches less than nylon, weathers nicely and even comes in assorted colors - every color, unfortunately, except "tree-trunk brown," which would provide excellent camouflage. Of course, if your trees are blue and orange, you're all set!

(Continued on page 77)



Strays

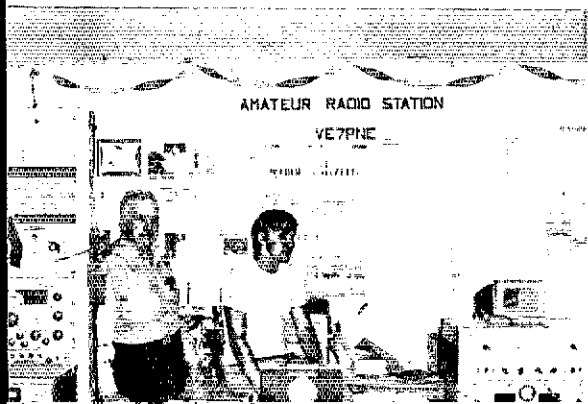


The Burlington Amateur Radio Club (VE3RAB) is celebrating the centennial of the Town of Burlington, Ontario, by operating a centennial station for the duration of 1973. The special call sign of VA3RAB will be used and acknowledgement of contacts will be with a colorful 3-section folding QSL card. Operation during all major contests will be part of VA3RAB activity.

W7WQ informs us that Bainbridge Island amateurs have placed in the public library a copy of the centenary commemoration volume of the International Telecommunication Union, *From Semaphore to Satellite*. A monumental volume, beautifully bound and profusely illustrated, it covers the history and development of telecommunication in all its branches.

Semaphore to Satellite is available for \$2.60 from ITU Publications, ITU, Place des Nations, 1211 Geneva, Switzerland.

On March 4, the Canadian Amateur Radio Teletype Group inaugurated an RTTY trans-Canada net on 14080, Sundays at 1930 GMT (170 kHz shift). A highlight of the transmissions is public service and informational bulletins.



Here's one of our new Life Members, Chuck Morrison, WA4BXR. Chuck is the eleven-year-old holder of an Advanced Class license, and is studying hard for a commercial ticket. The proud father is K4IBB.

E. V. Dorsey, Regional Postmaster General, has unveiled the designs of four postage stamps that point to Progress in Electronics. They will be issued in New York City, July 10. The four stamps, in as many denominations, span development of electronics from Marconi's turn of the century spark coil to the transistor which set the stage for the space age. Various electronic elements appear on the stamps above a panel containing the words "Progress in Electronics."

An 8-cent stamp for first class mail commemorates the transistors and a printed circuit board. A 6-cent stamp, intended for post cards, shows Guglielmo Marconi's spark coil and spark gap.

The 11-cent airmail stamp shows Lee De Forest's contributions - the Audion and the Audion tube. With these, in 1915, he transmitted the human voice from Arlington, Virginia to Paris. De Forest also later developed the talking motion picture, facsimile transmission and television.

In a 15-cent stamp for international surface mail, three nostalgic electronic elements - an early microphone, a goosenecked speaker and a vacuum tube - are combined with a TV camera tube.

Collectors desiring first day cancellations may make requests to Electronics Stamps, Postmaster, New York, NY 10001, enclosing the proper remittance and with request postmarked no later than July 10. Price for the set of four stamps is 40¢. A specific stamp or stamps may be ordered.

WB4OBZ recently sent a radiogram to his mother. Somewhere between South Carolina and California an operator heard \overline{AE} N and wrote ANN. CHUCK ANN didn't make sense so it became CHUCK AND ANN. So Chuck had to reply to his mother's return radiogram that he is still single, a monk, a priest, a bachelor, and has no plans to change!

During the recent Pacific National Exhibition in Vancouver, British Columbia, members of the Burnaby Amateur Radio Club set up and manned special station VE7PNE. In addition to regular operation on the hf bands and 2 meter fm, there were receiving demonstrations of SSTV and RTTY. Shown here (with friend) is VE7BFW who, at age 75, was a mainstay of the busy two-week operation.

Results, 1973 ARRL VHF Sweepstakes



Reported by Rick Niswander*, WA1PID

W9MHL/Ø IS SHOWN DOING what many must have done during the January VHF SS — watching the TV. Mike says, "As you may note, the TV was more in use during the VHF SS than the rigs. Things were pretty slow during the whole contest." Don't feel too badly Mike — things were pretty slow throughout the entire U.S. during the January 6-7 running of this annual event. Ground wave was the only reliable means of communications. E_s and aurora openings were scant, cutting down on section totals. Face it, the ole' ionosphere didn't cooperate this time around. Scanty conditions = scanty log returns, 648 for this year's bash.

The only bright spot, for some, in the dreary affair was the opportunity to include Oscar 6 QSOs in contest scoring. Sections unavailable elsewhere could be obtained, with a little work, through Oscar. Calls of the 27 people that used Oscar during the VHF SS are listed elsewhere in this report. Oscar use seemed to be greater in the western reaches where sections are not easily obtained. About 25% of the sixes and 20% of the sevens used Oscar as compared to about 5% of the ones and 1.5% of the twos. The sixth call area had

*Asst. Communications Manager, ARRL

6 persons who indicated Oscar use, more than any other call area.

Club totals were 23 in 1973. Mt. Airy took the gavel again for the 13th time in succession. (Who said 13 was an unlucky number!) Did your club complete?

If you watch your TV set next year (to break up the monotony of the hiss from your speaker) keep one hand on the tuning dial. Chances are better than even money that an opening will occur in the midst of your favorite show.

Soapbox

My 600 watts on 6 did my apartment dwelling neighbors no particular good. — (WB2LA1/4) Rotator for 144 and 220 MHz yagis broke with antennas pointed northeast. CQ Europe. CQ

AFFILIATED CLUB SCORES

Club Score-Entries-Winner

Mt. Airy V.H.F. RC (Pa.)	561,528	60	K3IPM
Rochester V.H.F. Group (N.Y.)	300,515	118	W2CNS
South Jersey RA	154,632	34	W2BV
Mobile Sixers RC (Pa.)	120,445	32	K1JDY/3
Potomac Area V.H.F. Soc. (Va.)	45,082	8	K3DUA
Suburban ARC (Pa.)	39,756	9	WA3NVO
1200 Radio Club (Mass.)	31,936	5	K1MUC
Dayton ARA (Ohio)	29,237	15	WBKPY
Warminster ARC (Pa.)	20,193	10	K3ZIG
Murphy's Marauders (Ct.)	18,674	4	WA1IQJ/1
Rock Creek ARA (Md.)	17,001	12	W3LUL
Scioto Valley ARC (Ohio)	15,894	8	K8SUL
York Radio Club (Ill.)	15,828	14	WA9QPM
So. Calif. V.H.F. RC	14,989	5	K6YNB/6
Whitman ARC (Mass.)	14,284	12	WA1MGC
Norwood ARC (Mass.)	12,435	16	K1CHY
Six Meter Club of Chicago	10,684	12	WA9FIH
M.I.T. Radio Soc. (Mass.)	9030	4	WA1CGW
Greater Pittsburgh V.H.F. Soc.	8784	6	W3BWS
Albany ARA (N.Y.)	7428	4	WA2DTE
Gloucester Co. ARC (N.J.)	6864	3	WB2BZY
West Valley ARA (Cal.)	5465	4	WA6UAM
Delta Radio Club (Tenn.)	1600	3	WA4IAX

Oscar Users

VE2DFO	W3BWU	W7VE*
K1HTV	W3LUL	WA7KYZ/7
K1ZND	W3TMZ	K8BBN*
W1JSM	K6YNB/6	WBKPY
WA1RDN*	W6YKM/6*	WB8BGY
K2RTH	WB6KBZ/6	K9HMB
W2UTH	WB6NKO	W9QQG
WB2DNN	WB6WLE*	DJ6RD/W9
K2QBW/3	KH6IJ	WØEOZ

*Multiop.



The six meter beam going up at WB2KKO/2. The 5 element twirly was placed on the 80 foot tower that provided the vantage point for this picture.

DIVISION LEADERS

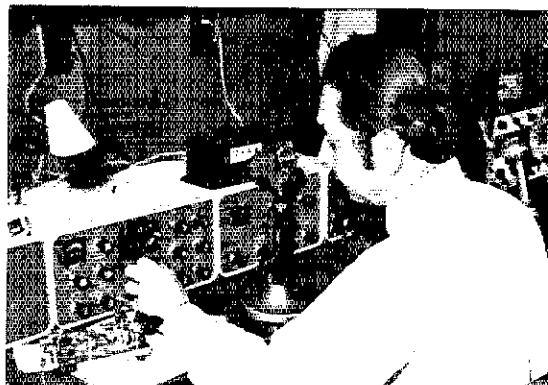
Single Op.	Division	Multiop.
K3IPM	Atlantic	WB2LZD/3
K9HMB	Central	WA9TMC/9
WA0FWR	Dakota	
WB4JGG/4	Delta	WB4HEL/4
K8MMM	Gr. Lakes	W8CCI
K2RTH	Hudson	K2OWR
W0MOQ	Midwest	
WA1NGR	New Engl.	W1DC
WA7KYZ/7	Northwestern	W7VE
WB6KBZ/6	Pacific	W6YKM/6
K2UOP/4	Roanoke	W4ZZ/4
W9MHL/0	Rocky Mt.	
W4GDS	Southeastern	
K6YNB/6	Southwestern	WA6EHL/6
WA5VHN	West Gulf	W5QDB
VE2DFO	Canadian	VE3OW/3

Europe. . . - (W1MX) This was the lowest activity level I've seen. - (K6YNB/6) What weather! Winds were 45 MPH with temperature of 7 degrees Sunday morning. It froze over the entire bay we were near in one night. - (W1QYY/1) After great thought, preparation and worry the final blow comes. The band closes for my area and I make 3 confirmed SS QSOs. Me thinks the Red Baron had something to do with this. - (WB4NBK) The inclusion of Oscar 6 contacts made what could have been a routine contest a very interesting one. - (W3BWU) The pileup on Oscar 6 was 30 deep and 100kHz wide. - (WB6KBZ/6) Conditions were such that no one seemed to work the contest with any consistency, particularly in this area. - (W3LUL) Didn't have much luck with Oscar equipment but we tried. (W7VE/7) Too bad the MUF and aurora didn't cooperate with contest. Must include them in our planning for summer. (WB8NYA) Nothing earth-shattering to report, really. The weather was quite clear but very cold. No unusual band conditions noticed except some skip on 6 to Florida on Sunday morning. - (WA2KHL/2) Worked more sections thru Oscar 6 than in last 3 VHF tests put together. - (WB6WLE)

TOP TEN

Single		Multi	
K3IPM	39,812	K2OWR	50,427
K8MMM	30,140	WB2LZD/3	27,552
W3KKN	26,598	W8CCI	25,542
W4GDS	26,400	K8LEE	24,948
W2EIF	26,304	K8BBN	21,920
W3ZD	26,288	WB2KKO/2	20,429
K2RTH	25,488	W1DC	16,626
WA3AXV	25,140	WB2ZVS	15,138
K3ZSG	23,405	WA2KHL/2	14,675
W2BV	21,516	WA1RDN	10,923

K8LEE nabbed second spot in Ohio (multiop) and fourth spot nationwide using this antenna farm. At the top of the tower is a pair of 11 element 2 meter beams at 100 feet. The lower antenna is a 13 element 6 meter beam on a 50 foot boom.



New Hampshire was represented to the tune of 167 QSOs by the W1JJO multiop setup. W1KGZ is shown operating in this shot.

VE
Quebec
VE2DFO 7224 84-33-ABF
Ontario
VE3ASO 6780-113-20-B
VE3OW/3 (VE3s FAH GJN)
792-33-2-B

U.S.A.
I

Connecticut
WA1NGR 19,812-254-29-AB
WA1FFO 8961-155-19-B
WA1QJ/I 7263-135-17-AB
WA1COW 3304-59-18-A
WIHDQ 2760-61-13-AB
K1HTV 2170-33-25-ABF
W1QJL 1840-58-6-B
W1WHL 1428-42-7-AB
W1WEL 840-30-4-B
W1LKKM 384-16-2-B
W1JAX 264-11-2-B
K1ZND* 104-4-3-6F
WA1GOI 88-4-1-B
WA1RDN (K1ZND W1ARR
WA1COW) 10,923-167-23-ABF
WA1GIP (+K1VYU) 6272-114-18-AB
K1MUJ/I (K1DNW W1ALYN)
1680-60-4-A

Eastern Massachusetts
K1AGB 12,960-203-22-ABCD
K1MUC 9170-131-25-ABCD
WA1OLS 5800-102-19-A
K1CHY 5292-147-8-ABCD
K1VTE 4528-143-6-B
WA1FCD 3636-101-8-AB
WA1MGC 3300-75-12-A
WA1MTI 3276-78-11-AB
WA1HON 2982-71-11-AB
W1RDC 2304-64-8-A
K1OJQ 2288-52-12-BC
WA1OWF 2080-52-10-A
WA1DUZ 2070-69-5-AB
WA1MKE 2020-51-10-A
K9AQT/I 1520-40-9-ABCD
K1YBS 1350-45-5-A
K1LUMP 1140-38-5-A
WA1NOV 1024-32-6-A
WA1FSD 900-30-5-A
WA1HTZ 840-35-2-AB
WA1HHH 832-32-3-A
W1FXR 812-29-4-AB
WA2ZPD/I 780-30-3-AB
W1DKD 704-22-6-A
WA1OMM/L 696-29-2-AB
K1HTN 650-25-3-A
WA1NCV 650-25-3-B
WA1POQ 616-28-1-A
K1CQC 546-21-3-AC
WA1NQG/I 546-21-4-BC
K1HRH 528-24-1-AB
480-20-2-B
WA1EOT/I 468-18-3-A
WA1NEL 462-21-1-AB
W1GNK 444-19-2-A
WA1PDM/I 432-18-2-A
WA1OLV 408-17-2-AB
WA1JHO 360-15-2-AB
WA1AKX 308-14-1-A
WA1MJJ/I 288-12-2-A
K1NZO 260-10-3-ABD
DL2AA/W1 187-9-1-A
WA1JH 110-5-1-A
WA1MHJ 88-4-1-A
W1DC (K1TWF W1BXI WA1s GVH
PHR) 16,626-248-74-AB
WA1OAM (+WA1s MSK MWN ONB
OZI PBU) 7714-203-9-AB
W1OXX (+WA1DRO K4GGI)
5334-127-11-ABCD
W1MX (WA1s IZC NQG QCI
WAJMEV) 3160-79-10-ABC
K1UJE (K1s OGR TBX W1LFB
WA1s AZA LEO OOF PYZ)
2048-64-6-AB

Maine
K1MTJ 1558-41-9-B
New Hampshire
WA1OUB 6322-109-19-A

W1EUI 6110-118-16-AB
W1JSM 2800-51-18-B
WA1FSZ 1140-30-9-AB
W1JJO (K1VOF W1s KGZ WUR)
7260-167-12-AB

Rhode Island
K1IKN 11,900-172-25-AB
WA1NTF 1496-44-7-AB
W1CPC 840-28-5-A
W1FEO 338-13-3-AB
W1OY/I (+K1GNW W1GGM
WA1MJD) 4050-81-15-AB

Vermont
K1GYT 7216-88-31-AB
WA1JEX (+WA1s MAG NBU)
5300-107-15-AB

Western Massachusetts
W1JFM 3638-107-7-ABD
K1LZG 3432-72-14-AB
WA1OEY 1184-37-6-A
WA1RIA 960-30-6-AB

2

Eastern New York
K2BGU 6720-112-20-A
K2CBA (WB2DNE, opr.)
5472-114-14-AB
WA2DTE 4212-78-17-AB
K2G5F 2144-67-6-B
WA2WSY 1680-40-11-AB
W2AWX 1116-31-8-B
WB2MRX 780-26-5-A
WB2TDN 756-27-4-AB
WA2QON 616-22-4-B
W2KBB 364-14-3-AB
K2JYL 66-3-1-A
W2SZ (WB2s BXP HYP DUS OEU)
W2S2 (+WA2PIL) 6525-131-15-ABC
WB2EMU (+WA2PIL) 4061-66-21-A
WA2JWS (K2ZEL WA2RUW
WB2UZE) 3800-76-15-AB
WA2MWZ (WB2s JNJ UTY ZCM)
644-23-4-AB

N.Y.C.-L.L.
K2RTH 25,488-236-44-ABF
WA2SLY 3434-101-7-B
WA2MZB 3042-85-8-AB
W2RTH 2244-66-7-AB
K2OVS 2000-50-10-B
W2TNI 1120-40-4-B
WB2VXD 935-28-7-A
WA2KJX (+WA2NFR) 4410-105-11-AB
WA2KUX (W2NKC WA2s QAL SRI
WR2GQW) 2790-93-5-AB

Northern New Jersey
WA2UDT 4720-118-10-B
WB2NUL 3040-95-6-B
WA2TWS 2670-89-5-AB
WB2HX 2464-77-6-B
W2CVW 1748-47-9-AB
WA2NPP (WA2NLP, opr.)
1248-39-6-AB
K2YNT (WA2RKL, opr.)
1120-40-4-B
W2FWM 1056-24-12-B
K4BNC/2 1054-31-7-AB
WA2QND 700-25-4-B
WB2TKZ 480-16-5-B
K2OWR (+WA2JVO WB2s CST
ISO WIK) 50,427-648-29-AB
WB2KKO/2 (+WA2s BGX UPK
WB2s BLA LPX OOO) 20,429-330-21-AB
WB2ZVS (WA2s KWP OAF)
15,138-261-19-AB
WB2KHL/2 (+WB2s LDE LYP)
14,675-294-15-AB
K2DFL/2 (K2KDO WA2s BSU CRF
CXS JIM NKL WB2VLC WND2FP)
6512-148-12-AB
K2BDX (K2YFF WA2s HSO SLR
WB2s F-W GFU) 6084-169-8-AB
WN2EMR/WB2CUM (multiop)
736-27-4-B

Southern New Jersey
W2EJF 26,304-411-22-ABCD
W2BV 21,516-326-23-AB

W2PAU 18,306-341-17-ABC
WA2EMB 15,626-302-16-ABCD
WB2MTU 12,958-341-9-AB
WA2KJF 12,750-188-24-A
W2JAV 8496-236-8-ABCD
W2ZQ 7182-171-11-AB
W2AXU 6784-106-22-ABC
W2FYS 6072-132-13-AB
WB2WRP 5082-121-11-AB
W2EA 5080-127-10-B
WA2HVD 5000-125-10-AB
K2ZGH 4368-104-11-AB
W2BRZY 4320-144-5-AB
WB2UVB 4050-135-5-AB
W2K1 3738-91-11-B
WB2YXP 3696-132-4-AB
W2FV 3502-103-7-AB
W2OSD 3232-101-6-AB
W2EKB 3192-114-4-AB
W2FGY 2626-101-3-B
W2BLV 2600-50-16-B
WA2EJY 2550-75-7-AB
WB2SZK/2 2548-98-3-ABD
W2ITG 2080-80-13-B
W2EPA 1938-57-7-B
WA7UJW/2 1742-67-3-AB
WB2VLD 1584-66-2-AB
WB2SPJ 1508-58-3-AB
WA2SFA 1320-55-2-A
WA2MEM 1224-51-2-A
WB2EFL 1120-40-4-A
K2MZP 988-38-3-B
W2G6B 984-41-2-B
WB2LCC/2 960-40-2-AB
WB2TLQ 672-38-2-A
W2BAY 572-22-3-AB
W2HBE 504-21-2-B
W1GRR/2 384-16-2-B
W2SDB 264-11-2-B
WB2GPH 264-11-2-B
WB2BNE (+WA2KRX)
12,048-251-14-ABC

Western New York
W2CNS 15,444-286-17-AB
W2UTH 11,600-200-19-ABF
K2YCO 10,944-228-14-AB
K2CEE 10,472-188-18-AB
WA2ZNC 8094-213-9-AB
WB2JFL 7676-202-9-AB
K2LDU 6171-182-7-ABD
WA2TFY 5436-151-8-AB
WA2KND 5190-173-5-AB
K2RZI 5100-170-5-AB
K2FLS 5040-140-8-AB
K2WV 4880-153-6-AB
K2RHS 3948-141-4-AB
WA2YEK 3900-140-4-AB
WB2ZFS 3900-150-3-AB
WA2YTK 3874-149-3-AB
WB2MCP 3640-140-3-AB
WA2EKR 3624-151-2-AB
WA2ALW 3586-163-1-AB
WA2FVG 3410-115-1-AB
W2DUC 3220-115-4-AB
W2LCH 3216-101-6-AB
WB2SUA 3216-134-2-AB
WB2NLY 3192-84-9-A
W2QY 3168-132-2-AB
WA2OAU 3014-137-1-AB
WA2SSU 2904-132-1-AB
WA2THS 2856-102-4-AB
WA2CER 2838-129-1-AB
WB2VPK 2834-109-3-B
K2JIA 2808-117-2-AB
WA2YPT 2808-117-2-AB
WB2NSD 2760-115-2-AB
W2EQW 2706-123-1-AB
WB2KUY 2664-111-2-AB
WA2TJS 2640-110-1-AB
W2RBT 2632-94-4-A
W2QWF 2604-93-4-AB
K2YMM 2596-118-1-AB
K2LQI 2520-105-2-B
WA2JXX/2 2520-90-3-B
WB2LAD 2392-92-4-AB
K2SQI 2376-108-1-AB
WA2UGE 2376-108-1-AB
W2FDI 2354-107-1-AB
K2LZG 2340-90-3-B
W2VVG 2332-106-1-AB
W2RIS 2296-82-4-AB
WB2NOJ 2189-100-1-ABD
WA2BKV 2184-84-3-AB
WB2QXB 2178-99-1-AB
K2YAH 2160-90-2-B
K2JD/2 (WA2EJY, opr.)
2134-97-1-AB
WB2KWZ 2088-87-2-AB
WA2MJB 2068-94-1-AB

3
Delaware
WA3QPX 7942-181-12-ABD
W3CJV 3444-82-11-ABCD
W3BDP 2541-62-11-AB
WA3OYA 918-27-7-B
K3QMK/3 336-14-2-A
Eastern Pennsylvania
K3PM 39,812-538-27-ABCD
W3KKK 26,596-403-23-ABCD
W3ZD 26,288-424-21-ABCD
WA3JAX 25,140-419-20-ABCD
K3S2G 23,405-379-23-ABCD
K3JUV 19,740-353-18-ABCD
K1JYD/3 19,684-353-18-AB
WA3LNE/3 18,210-304-20-ABCE
K3KMN 15,960-285-18-ABC
WA3DNC/3 15,704-302-16-AB
WA3PLR 14,040-270-16-AB
W3CJ 13,986-333-11-ABC
K3EOD 13,150-263-15-ABC
WA3NGK 13,062-311-11-ABC

July 'Open' CD Parties

APPOINTEES—OFFICIALS—LEAGUE MEMBERS

JOIN THE FUN!

JOIN THE FUN!

JOIN THE FUN!

IN MAY OF 1969, the ARRL Board of Directors voted to expand one of the quarterly ARRL CD Parties to include all league members.

What, you may ask, is this CQ CD all about, anyway? CD in this case designates the ARRL Communications Department. CQ CD is, in effect, a call for all ARRL appointees (and elected officials, too) to get together, work each other and enjoy a brisk test of operator and equipment. The object is to work as many of the eligibles as possible in as many different ARRL sections (p.6) as possible. The same station may be worked on each of the bands, but a section may be worked just once for credit. Thus, the maximum multiplier will be 75. Now, how come that, when there are only 74 sections? Well, for many years Yukon and the Northwest Territories were grouped together to form the VE8 section. Because of the small number of hams therein, this section (as such) was dropped quite a few years back. However, the VE8 multiplier was retained in ARRL contests — just for fun!

The exchange is brief and to the point. Appointees/officials transmit a short designation of their "status" plus ARRL section. Non-appointees-officials may transmit: member (MBR), life member (LM) or charter life member (CLM) — whichever is applicable; plus ARRL section.

The appointees and officials you'll run into, with some "probable" cw abbreviations of their designations, are shown below:

President	.....	PRES
Vice President	.....	VP
Past President	.....	PASTPRES
Director	.....	DIR
Vice Director	.....	VDIR
Assistant Director	.....	ADIR
General Counsel	.....	GC
Associate Counsel	.....	ASSTGC
QSL Manager	.....	QSLMGR
Section Communications Manager	.....	SCM
Asst. Section Communications Manager	.....	ASCM
NTS Official	.....	NTSMGR
Contest Advisory Committee	.....	CAC
DX Advisory Committee	.....	DXAC
Repeater Advisory Committee	.....	REPAC
Intruder Watch	.....	IW
Section Emergency Coordinator	.....	SEC
Emergency Coordinator	.....	EC

CW

Starts 2300 GMT July 14
Ends 0500 GMT July 16

PHONE

Starts 2300 GMT July 21
Ends 0500 GMT July 23

You may operate any 20 hours out of the 30-hour periods. Times out must be 15 minutes or more to count as off-time.

Route Manager	.....	RM
Phone Activities Manager	.....	PAM
Headquarters Staffer	.....	HQ
Official Relay Station	.....	ORS
Official VHF Station	.....	OVS
Official Observer	.....	OO
Official Bulletin Station	.....	OBS
Official Phone Station	.....	OPS

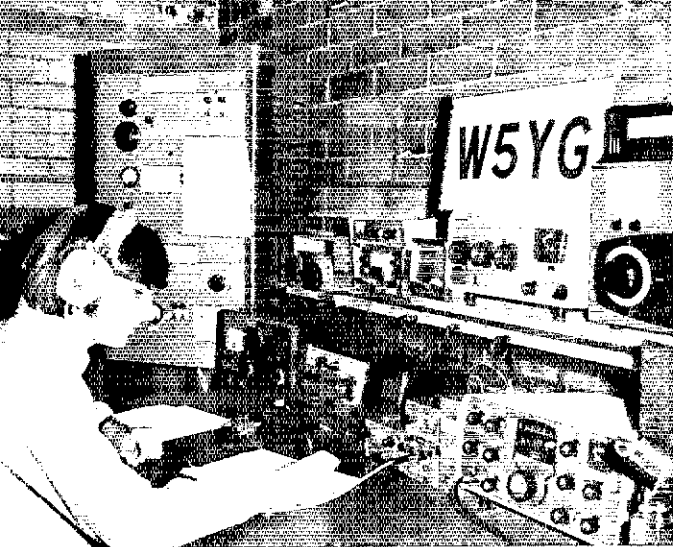
Scoring is simple. Count 5 points per QSO (remember now, you can work the same station, for example, on 160, 80, 40, 20, 15 and 10 meters — vhf too!). To this figure add your ARRL code proficiency credit (you must have the certificate at that time). Multiply this new sum by the section multiplier.

Suggested frequencies in past parties have sort of "shaken down" to the following pattern: CW, up from 3535 7035 14035 21035 28035; PHONE, up from 3905 7265 14280 21355 28600. (Try 160 meters at 0530 GMT and keep checking periodically for 10 and 15 meter activity.) Activity on 6 and 2 meters is welcomed!

Reporting should be done on ARRL CD Party report forms. An addressed stamped envelope sent now should get the logs to you in time for use in mid-July! The cut-off date for receipt of entries at Hq. is August 10. All participants reporting activity will receive a copy of the appropriate CD Bulletin containing final results. High-claimed CD scores will, as usual, appear in QST.

Remember now, CQ CD CQ CD CQ CD de
- W1YL K

MULTIPLIER CHECK-OFF LIST										
1	2	3	4	5	6	7	8	9	0	VE
Conn	NY	Del	Ala	Ack	E.Bay	Ariz	Mich	Ill	Calo	Mar
EMass	NH	Fla	Cal	La	LA	Ida	Ohio	Ind	Iowa	Ione
Me	NI	MDC	Ky	Miss	Org	Mont	WVa	Wisc	Kans	Ont
NH	SNI	WPa	NC	NMex	SBar	Nev			Minn	Man
RI	WNY		NFla	NTex	SCV	Oreg			Mo	Sask
Va			Sc	Okla	SDgo	Utah			Nebr	Alta
WMass			SFla	STex	SE	Wash			NDak	BC
			Tenn	CZ	NJV	Wyo			SDak	VE8
			Va		SV	KL?				
			WI		KH6					



WA5RXT, one of the ops at W5YG.

Reported by Rick Niswander*, WA1PID

EVEN THOUGH THE 160-METER contest has passed through the "terrible twos" and is now in its "traumatic threes" the growing pains common to most growing babies and contests have not yet appeared. In fact, this "baby" is shrinking. The third annual 160-meter contest, held December 8-10, showed a drop in entries from 272 in 1971 to 248 in 1972. Conditions alone cannot be cited for this decrease. W9PNE garnered 46 sections using less than 5 watts and W7DOL/6 worked a European. Participation does not seem to be the culprit either. Over 1000 different calls were listed by entrants. Where is the problem? Is it a lack of log-mailing initiative on the part of those with smaller scores? Since no logs are required, is this contest considered more "fun" than competition with the resultant lack of enthusiasm to put your log in the mails? Probably these and many other hypotheses are, in part, correct. Next year, send in your log, large or small. If you don't want your score to be entered in the listings, just label it a check log. If we can get half as many entries as we have participants we can really have a humdinger of an entry total.

Almost without exception, the pictures submitted this year were of extremely good quality.

*Asst. Communications Manager, ARRL

Results, 3rd ARRL 160-Meter Contest

The choice of which ones to pick was particularly difficult. However, if yours did not show up please try again next year.

The most prevalent comment concerned frequency usage. Some deplored the crowding of 1800-1825 kHz while 1830-1850 was practically vacant. Anyone who can operate in the lower band segment can operate from 1830-1850 kHz with slightly less power. It's a great way to get away from the QRM on the bottom end. The other frequency usage comment concerned the use of 1825-1830 by W/VE stations. For those of you unfamiliar with this segment it is known as the "DX Window." For many years this segment has been voluntarily "reserved" for use by DX stations so they can be heard more readily by those of us on this end. Usually the DX station transmits from 1825-1830 and listens in the bottom 10 kHz of the band. The presence of a W/VE station between 1825 and 1830 can destroy the segment for those straining to hear a DX station. Keeping these frequencies clear not only will help others trying to work DX but it might allow you to hear some too.

Awards are scheduled for a June 15 mailing.

Soapbox

Worked first European in almost 40 years of trying. G3ZEM. WOW! After that I wasn't much good the second night. - (W7DOL/6) G3ZEM was so loud (589) that I could hardly believe he was in England. Such beautiful skip! - (W0AHD) Grand

K5PFL operated up a storm at W5SZ using a Drake-Line and 3 (count 'em, three!) bobtail curtain antennas. The big antennas helped Richard snag 74 multipliers, including 3 Europeans (all G3s), and take 4th spot nationwide. This is the first time a five has broken into the Top 10.

QST for



For the second year in a row K2GNC keyed his way to the NLI section leader certificate. He was aided in his quest by an excellent antenna system consisting of two 90 foot verticals spaced 130 feet apart and phased to squirt a big signal NE or SW. The verticals are of homebrew construction, using an irrigation pipe at the bottom and fiberglass quad arms on top. The ground system consists of over 3 miles of wire. Bill doesn't do too bad on the "high bands" either judging from his assortment of QSLs on the wall (how many of you have cards from the likes of MD1D, C1MG or ZD2RGY?).



show. Made 32 DX QSOs in 14 countries. Enjoyed every minute. - (W1BB) Half-DXCC now on 160 with OE5KE and OA8V as numbers 49 and 50. - (W4YWX) Many stations said they had worked me before. Turns out that W2FJ/2 was the busy one. And both of us portable! - (K2FJ/2) Worked more stations on 160 the one evening I was on for the contest than I had since I operated loop modulated phone on 160 in 1930. - (W5KL) Worked more JAs than W1, 2 and 3 combined. Heard VS6DO and OA8V but no luck. - (WA6PGB) Wind chill factor here was 52 degrees below zero! At 2300 GMT I discovered my folded dipole (only antenna) was 16 feet too long. In the dark and cold the XYL and I fixed it. That's devotion. - (KØIJP) Surprised what a Ranger and a long wire will do on the top band. - (K4PJ) Both DL9KR and HB9NL were heard ½ hour before local sunrise though at the time they were in QSO with Europeans. - (W2BP) My first 160 meter contest. Great fun. - (WB4RUA) Very good conditions. Remarkably similar to last year but with better DX participation. (W3IN) Surely a lot of signals packed into 25 kHz at times. Interesting to note the proportion of hand keys and bugs being used in comparison with Sweepstakes and CD Parties. Can't remember working so many WVA stations in a contest for years - three! - (W8JWX) Just moved into new house - no antennas. Put up my loaded dipole Saturday afternoon. Center was 14 feet off ground, ends about 4 feet up. My congratulations to those who heard me. - (W4YOK) It is a great contest. Keep it like it is. - (K4FU) My first try at 160 meters. Very challenging and a lot of fun. - (K1CSJ/1)

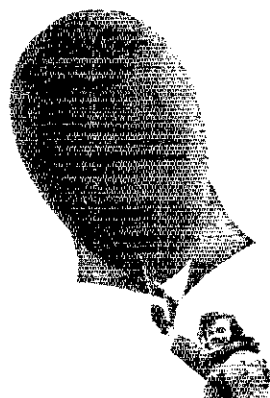
DIVISION LEADERS

Single Op.	Division	Multiop.
W3IN	Atlantic	WA2WLN/2
WA9MCC	Central	W9YB
WØAIH	Dakota	.....
W5SUS	Delta	.....
K8CCV	Gr. Lakes	W8LT
WA2UOO	Hudson	WA2SPL
WØNFL	Midwest	.....
K1PBW/1	New Engl.	W1KVI/1
K7IDX	Northwestern	.....
WA6DKF	Pacific	.....
K4CIA	Roanoke	WA4DUS
WAØCVS	Rocky Mt.	WØMS
W4YWX	Southeastern	.....
W7DQL/6	Southwestern	W6YRA
W5SZ	West Gulf	W5YG
VE3BMV	Canadian	VE1MX

TOP TEN

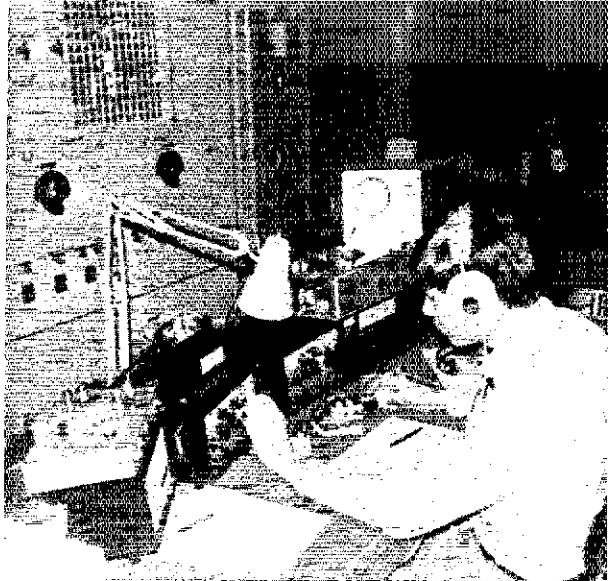
Single		Multi	
WA9MCC/9	76,923	WA2WLN/2	56,800
W3IN	75,208	WA4DUS	43,554
K1PBW/1	67,002	W8LT	39,650
W5SZ	64,528	WA2SPL	38,880
VE3BMV	60,336	W9YB	38,316
K8CCV	58,032	W9MAF	26,790
W9DL	56,587	WØMS	25,144
WØAIH	54,040	WA8ZDR	24,698
K4GSU	52,570	K8BYI	24,000
K4CIA	51,191	W1KVI/1	23,550

The object being held by WA1LKU/8 (one of the ops at the multi setup of W8LT) is a kitoon. For the uninitiated a kitoon (pronounced "kite-oon" with accent on the first syllable) is a cross between a kite and a balloon. The idea was developed in the fertile mind of W8ERD (who has conjured up other schemes such as a 20 meter corner reflector for FD) in order to cope with the swirling winds around the Ohio State University stadium, home of Woody Hayes and W8LT. The inflated kitoon supported the top of a quarter-wave ground plane antenna which helped the group to a fine third place national finish.




VF	W2UKA	750-25-15-3	W5GWD	728-26-14-15	W7IMP	84-7-6
Maritime		3	New Mexico		Utah	
VEIASJ 9120-120-38-			WSNGJ 1512-36-21-11		WA7OAU 6536-86-38-	
VEIMX (+Vels EK OM 15,540-179-42 27	Eastern Pennsylvania		WR5RHN 1152-36-16-		W7CYH 9640-94-30-	
	W3BUR 24,804-231-53-16		WSRE 728-26-14-			
	W3HUS 22,736-232-49-14		K5FIQ (WB5s DCC BYY) 5808-88-33-		Washington	
Ontario	W3AJS 12,600-180-35-20				K7IDX 18,036-164-54-4	
VE3BMV 60,336-410-72-	W3CNS 11,934-153-39-10		Northern Texas		W1BVP/7 7488-104-36-	
VE3BFK 9450-135-35-22	W3QOR 8844-134-33-7		W5SZ (K5PFL, opr.) 64,528-424-74-24		W7IU 5760-96-30-	
	W3ADE 8580-130-33-15				W7FSF 1897-43-22-	
British Columbia		Delaware		Oklahoma	W7HIM 990-33-15-	
VE7HQ 10,496-128-41-20		W3GL 19,008-216-44-12		K5JVE 11,832-116-51-20	K7UWT 6-3-1-	
U.S.A.		WA3GSM 160-10-8-1		WASVAP 1748-46-19-11		8
1		Maryland-D.C.		K5QNM/5 (+WB5GYU) 2-1-1-2		Michigan
Connecticut		W3IN 75,208-443-79-30			K8VOP 32,034-281-57-	
K1PBW/1 67,002-374-78-29		W3VAN 24,158-257-47-22		Southern Texas	WA8JUN 30,683-247-61-	
W1SG 12,046-154-38-9		W3GN 23,490-261-45-		W5SBX 46,434-321-71-28	W8OOR 16,380-182-45-	
K1ZND* 8192-128-32-5		W3IRE 12,236-161-38-21		WSRYO 40,120-289-68-24	W8IBZ 16,138-168-48-	
WA1OIX 7874-127-31-16		WA3JEL 7656-116-35-		WASZNY 43,351-151-47-10	K8LIQ 12,560-157-40-	
W1GNC* 6912-108-32-6		W3FA 5304-78-34-4		WSYG (WA5s FTP RRL KXT) 22,951-193-59-24	W8IBX 8214-111-37-	
W1BHF 5600-100-28-9		W3AXW 2750-55-25-3		K5DFG (+WB5CKM) 22,736-196-58-26	W8BDNG 2156-49-22-	
W1OY 3618-67-27-		W3KE 1054-31-17-		K5LZJ (+K5SSOR) 5032-74-34-22	WA8ZDR (+WA8SJK) 24,698-233-53-	
WA1GFH 900-25-18-	Western Pennsylvania				K8BYI (WB8AZ WA8WCZ) 24,000-240-50-	
W1YNC/1 234-13-9-3	W3UHP 15,088-184-41-20					Ohio
W4WFL/1* 24-4-3-1	W3HDI 6464-101-32-7				K8CCV 58,032-394-72-	
Eastern Massachusetts	W3SN 4686-71-33-7				K8HKB 46,308-333-68-	
W1PL 25,755-242-51-29	W3BZN 3172-61-26-23				W8DB 43,996-322-68-	
WA1CTT 7232-113-32-					W8OK 31,992-258-62-	
W1AX 4050-75-27-4	4				W8OH/W8 20,384-179-56-	
WA1LD 3264-68-24-7	Alabama				W8AO 8736-112-39-	
W1BB/1 2720-38-17-14	W4AUP 660-22-15-3				W8PCS 4672-73-52-	
W1DDC 1156-34-17-9	Eastern Florida				W8FAZ 2256-47-24-	
	W4BRB 28,768-217-62-24				W8VZE 1020-30-17-	
Maine	W7UXP/4 17,649-156-53-17				W8LTI WA1LKU W8ERD WB (CLF DEA) 39,650-325-61-	
K1VBL 6510-105-31-	W4OZF 8772-102-43-10				W8RYWX (+W8IDM) 20,000-200-50-	
WA1NMB 1840-46-20-10						West Virginia
W1KVI/1 (K1s GAX MTJ OYB RQE WA1KVY) 23,550-225-50-	Georgia				W8BAPH 18,238-186-49-	
	W4YWX 31,936-230-64-21				K8UOL 8896-139-32-	
	W4BRUA 12,048-124-48-13				W8JWX 3974-101-29-	
	K4BAL 7416-103-36-7					9
	W4DXI 3567-60-29-7					Illinois
New Hampshire		Kentucky				W9DL 56,587-394-71-
W1FZ 6156-114-27-		K4GSU 52,570-368-70-18				W9YYG 39,468-293-66-
K1CSJ/1 4000-80-25-		K4FU 41,478-333-62-20				W9ABA 19,200-192-50-
		K4QW 24,416-215-56-13				W9MTT 13,254-141-47-
		W4YOK 1656-36-23-				W9DVG 13,104-156-42-
						W9PNE 13,064-142-46-
						W9BMY 12,080-151-40-
						W9GVI 5280-88-30-
						W9HTV 2024-44-23-
						W9REC 288-16-9-
						W9MAE (+W9MTD) 26,790-235-57-
						Indiana
						W9BRN 32,940-270-61-
						W9AUM 18,666-183-51-
						W9SFR 7040-88-40-
						W9UC 1864-34-23-
						W9YB (WA2TGL W82R) 38,316-309-62-
						Wisconsin
						W9MCC/9 26,924-489-77-
						W9AVN 18,860-205-46-
						E9OXY 9506-97-50-
						E9REF 8288-112-37-
						0
						Colorado
						W40CVS 40,950-312-65-
						W0MS (+W0CMM) 25,144-223-56-
						Iowa
						W0NFI 37,310-284-65-
						W40TVD 22,464-208-54-
						W40VDX 16,000-160-50-
						W0II 9976-116-43-
						K0PUB 7776-108-36-
						W0RF-1 6864-104-33-

WA2WLN shown operating multiop WA2WLN/2 at the US Coast Guard EE Center in SNJ. The large grey box behind the Drake-Line is a LORAN-A transmitter that puts out 160 KW pulses. Behind the oscilloscope is an amplifier capable of one megawatt pulse power. The LORAN gear was not in use at the time of the contest (I suppose interference problem could have arisen). Doug was assisted by WA2SRQ and WA3FFR in racking up the highest multioperator score in the contest. Their antenna was a beach-mounted quarter-wave vertical (used for testing the LORAN equipment) with 120 radials, each 150 feet long. By the way, LORAN gear cannot be used on cw.



	Kansas		Nebraska
W0PSF	27,120-226-60-22	W0BDHR	8362-113-37-16
K0KU (W0PFGV, opr.)	19,344-186-52-9		North Dakota
W0DIT	12,500-125-50-22	W0SDN	8446-103-41-6
W0ECT	2808-54-26-8		
	Minnesota		South Dakota
W0AIH	54,040-383-70-21	W0IT	1560-39-20-3
W2TA/0	32,116-259-62-20		
K0LJP	18,706-199-47-		FOREIGN
W0HW	13,104-156-42-8		
W0YCR	6392-94-34-		Cuba
W0RHI	5632-88-32-	CO2QR	70-7-5-
W0BHA	5184-81-32-12		Bolivia
W0IH	4964-73-34-7	CP1EU	32-4-4-
	Missouri		Ireland
W0OEX	26,040-210-62-	0191	660-22-15-
W0BV	960-30-16-4		

	Switzerland		Austria
HB9NL	112-8-7-	OE5KE	56-7-4-6
	Japan		Czechoslovakia
JA7MJ	126-9-7-	OK1ATP	216-12-9-
JA0DAF	84-7-6-	OL1A0H	120-10-6-
JA9BOH	18-3-3-	OK1MCW	8-2-2-
	Peru		Check Log
OARV	1584-36-22-		VF7XN 



June 1923

... Plans were announced for Dr. MacMillan to take an ARRL operator along with him on the *Bowdoin*, to operate WNP in the Arctic polar regions. That operator had not yet been selected, but plans had already been started to find the best available.

... In the receiving department, there were filters for reducing interference and a four-circuit tuner for better control of regeneration. For transmitting, there was a description of the Reinartz Modulascope, which enabled you to get a "picture" of how your output looked, dope on capacity coupling of antennas, and word on how to rewind a dc motor for use as a plate generator.

... Dr. Goldsmith, then the secretary of the IRE, discussed the relationship of wavelength and frequency.

... Editorial comment in *QST* fifty years ago dealt with amateur regulations - it seems that the Department of Commerce wanted to know what sort of subdivision of the bands amateurs would like, and asked the League to provide this information.

... A column on International Amateur Radio described 5WS, the station of the Radio Society of Great Britain, which had been constructed for and distinguished itself in the recent trans-Atlantic tests. It had received special authority from the British Post Office to use one kw. power for the purpose of reaching America.

... And, thumbing through the display ads, you could buy a variable grid leak for only \$1.10. Try to find one in 1973!



June 1948

... Single sideband was the technical topic of the day twenty-five years ago, and this issue had two articles on the subject. Villard and Thompson discussed a detector for single-sideband reception that eliminated the unwanted sideband by phase-shift networks; while Norgaard described a new approach to single sideband, generating the signal by the phasing method.

... If you were in tune with more conventional techniques, Don Mix covered amplifier stability in transmitters, and Bonner wrote about a transportable 10-meter beam. There were several pages of tips for those who had war surplus gear, and two articles for the vhf enthusiast (a coaxial-line receiver for 220 and tripling to 420).

... Results of the 14 SS were detailed, with W6MLY the national high on phone and W4KFC likewise on c.w. In second place on phone was W6AM, and on c.w. W2IOP (now W8AB).

... Major editorial emphasis by KBW was on Field Day and Emergency Preparedness, and how to behave in a real emergency. Like, listen first!

... Highlights of the May Board meeting indicated that the FCC was going to be asked to expand 75-meter phone to 3800-4000 kc., but to leave 20-meter phone as is. 40-meter phone was voted down.

... The League was participating in the preparatory meetings of the Bogota Inter-American Regional Radio Conference, to be held next March. - WIRU

OSCAR NEWS

"How is Oscar doing?" is a question asked more and more frequently as the age of the spacecraft advances. Satellite users are of course interested in knowing how much longer to expect good performance from Oscar.

Contrary to some rumors, Amsat says that Oscar 6 is *not* currently near end-of-life. There is evidence of some battery degradation — but this is not a necessary indicator of shortened life. It is felt that Oscar will achieve the one-year design lifetime, but the complete cooperation of users now becomes an increasingly vital factor.

In early May, the operating schedule was modified leaving the satellite ON for Thursday, Saturday and Monday GMT each week. This is to provide more frequent battery recharge periods. However, recharging can not take place if amateurs use the repeater during the OFF days. Thus, *your* cooperation by refraining from transmitting to the satellite on OFF days can materially aid in extending the useful lifetime of Oscar. If you find the repeater ON when it should be OFF it is due to (1) a spacecraft logic error, or (2) a command station taking telemetry data, or (3) an authorized special experiment. In any event, please do not transmit to Oscar! Observance of the 100 watts effective radiated power limitation is another positive step to insure continued good performance.

ARRL Field Day

This year's Field Day marks the first time an amateur satellite will be available for communication in this event. FD groups have a unique opportunity to gain publicity for their activity by highlighting Oscar 6 work in their press releases; what resourceful media editors will ignore the operation of "the first portable satellite ground terminal in the area" by local citizens? Also, portable stations will gain 50 bonus points for completing a cw contact by Oscar 6, and all cw satellite contacts will count toward the total score. See the complete Field Day rules on page 80 of last month's *QST*.

In order to make Oscar 6 available to the greatest number of Field Day stations, the operating schedule for the satellite will be altered that weekend. Oscar will operate normally on

OSCAR 6 TWO-WAYS

Stations	States Countries		
	worked		
F8DO	650*	—	31
F9FT	400	20	41
G3IOR	184	15	32
G6RH	424*	—	32
KL7MF	315*	26	16
PA0WLB	138	9	28
SM3BIU	400*	—	37
SM6PU	180	—	31
Z55CG	76	—	3
W1FTX	120	33	8
K1HTV	359	40	33
WB2DNN	58	27	4
WA2HKS	151	33	17
K2KNV	212	37	22
WB2VKZ	203	38	19
K2QBW/3	90	29	6
W3BWU	55	21	6
K3JTE	43	19	4
W3TMZ	316	43	24
WA4JID	229	42	12
W6OAL	500*	30	4
K7BBO	315	41	16
K7GWE	129	37	8
W7JQ	132	28	5
W7ZC	138	25	2
W9QQG	190	40	10
K0DDA	144	31	10
W0EOZ	850*	—	11
WA0TAQ	165	24	7

Thursday, June 21, and will be turned off on schedule at 2359 GMT. The satellite will not be turned on again until 2100 GMT Saturday, June 23; it will remain on for a 24-hour period, that is, for the balance of the Field Day activity. Battery condition permitting, the satellite will be available on the normal schedule on Monday.

W2GN WAS Expeditions

WAS through Oscar 6 is drawing ever closer to reality for several stations, thanks in part to the efforts of W2GN and his mobile station. On April 5, Fred gave twelve stations their first Vermont contacts. This trip proved so successful that he followed it with an expedition to Kentucky on April 29. Though it involved a much longer drive, the Kentucky trip was easier in one respect: it didn't snow!

At the suggestion of NASA headquarters, ARRL Public Relations Consultant Don Waters and *QST* Managing Editor WA2INB took part in a NASA Community Involvement program in Little Rock, Arkansas during March. Our role was to assist local amateurs in presenting demonstrations of live satellite communications via Oscar 6 to various educational and community groups. Shown assembling a portable quad antenna at Little Rock's Metropolitan High School are Ronald K. Oines, ex-KN0GJU (of Oklahoma State University); WA2INB; WA5TJB (designer of the antenna); and Dr. Kenneth Wiggins (of OSU). Oklahoma State University is a contractor to NASA for educational programs.



During an Oscar pass over Little Rock, WA2INB explains satellite orbits to a group of Metropolitan High School students. Operating with the call W3ZM/5, communication was established with several stations. Other demonstrations were presented at the Arkansas Enterprises for the Blind, University of Arkansas at Little Rock, North Little Rock JayCees, and the Little Rock Museum of Natural History and Science. The local amateurs who were responsible for the program are Elmo Knoch, K5YWL, director of training at the Arkansas Enterprises for the Blind, and Al Simpson, WA5TJB, a student at Arkansas Polytechnic College.



Other states are disappearing from the "rare" list as well. WA8UUY has activated West Virginia, and K0WLU has been reported active in South Dakota.

WVE Satellite Award

The disproportionate activity by Canadian Oscar users has been noted in this column previously. Nowhere is this enthusiasm more evident than in Alberta; VE6s are more common through Oscar than on 20 meters! As a further indication of this interest, the Northern Alberta Radio Club is sponsoring the WVE Satellite Award for working Canadian call areas by amateur satellite. U.S. and Canadian stations must work four call areas (VO1, VO2, VE0, VE1, 2, 3, 4, 5, 6, 7, 8); DX stations, including KH6 and KL7, must work two. Only contacts after January 1, 1973 will qualify for this award; any mode may be used.

To apply, send the necessary QSL cards with \$.25 (one IRC for DX) to Ray J. Nadeau, VE6SE, P.O. Box 52, Barrhead, Alberta, Canada. Include sufficient IRCs for return of the cards by registered mail if this is desired.

Operating Notes

One of the most interesting reception reports received by Amsat was submitted by WB4WPP, who is awaiting an MP4 call in Bahrain. From this location, Joe has heard dozens of Europeans, VU2UV, 4X4MH, and UG6AD. Needless to say, he is anxious to get on the air!

K7GWE qualified for the Satellite DX Achievement Award with 4 QSOs, 4 countries, 4 continents: JA8ARS, KH6JJ, LA1K, and W9RGH.

Rusty, XE1PY, was very active during Oscar's initial weeks of operation, and it is with deep regret that we note that he is now a Silent Key. XE1XA has Rusty's Oscar logs and will confirm contacts for anyone needing a card. - K1ZND and WA2INB

Recent Satellite DX Achievement Award Winners

W9TGB, W0PHD, W0NQQ, K9PKQ, W1FTX, PA0WLB, SM3BIU, G3IOR, OK3CDI, K7GWE, K9GSC, VE3TW, OK1BMW, W6OAL, W9RER, JA1NEZ, DL7QY, W9QQG, W9HTF, W8DX, WB0CQJ, K3RYL, JA1VDV, W0EOZ, GW3MFY.

Certificates have been issued to 75 stations in 13 countries and 3 continents.

Oscar 6 Equator Crossings

Orbit	Date	Time (GMT)	Longitude (degrees W)
2872	June 2	0054	60.9
2897	June 4	0049	59.6
2935	June 7	0139	72.1
2960	June 9	0133	70.8
2985	June 11	0128	69.5
3022	June 14	0023	53.2
3047	June 16	0018	51.9
3072	June 18	0013	50.6
3110	June 21	0103	63.1
3135	June 23	0057	61.8
3160	June 25	0052	60.5
3198	June 28	0142	73.0
3223	June 30	0137	71.7
3248	July 2	0132	70.4
3285	July 5	0027	54.1
3310	July 7	0022	52.8
3335	July 9	0016	51.5
3373	July 12	0106	64.0
3398	July 14	0101	62.7
3423	July 16	0056	61.4
3461	July 19	0146	73.8
3486	July 21	0141	72.5
3511	July 23	0135	71.3
3548	July 26	0030	55.0
3573	July 28	0025	53.7
3598	July 30	0020	52.4
3636	Aug 2	0110	64.8
3661	Aug 4	0105	63.6
3686	Aug 6	0059	62.3
3724	Aug 9	0149	74.7
3749	Aug 11	0144	73.4
3774	Aug 13	0139	72.1
3811	Aug 16	0034	55.8
3836	Aug 18	0029	54.6
3861	Aug 20	0023	53.3
3899	Aug 23	0113	65.7
3924	Aug 25	0108	64.4
3949	Aug 27	0103	63.2
3987	Aug 30	0153	75.6
4012	Sept 1	0148	74.3
4037	Sept 3	0142	73.0
4074	Sept 6	0037	56.7
4099	Sept 8	0032	55.4
4124	Sept 10	0027	54.2
4162	Sept 13	0117	66.6
4187	Sept 15	0112	65.3
4212	Sept 17	0106	64.0
4249	Sept 20	0001	47.7
4275	Sept 22	0151	75.2
4300	Sept 24	0146	73.9
4337	Sept 27	0041	57.6
4362	Sept 29	0036	56.3

AMATEUR RADIO PUBLIC SERVICE

NTS RACES AREC

In the Public Interest, Convenience, Necessity

CONDUCTED BY GEORGE HART,* WINJM

THE BAD AND THE GOOD

ACCENTUATE THE POSITIVE, eliminate the negative. Ever hear that before? Believe there was a song with that title. For many years, your League has been expounding the virtues of amateur radio emergency operations in the up-front pages of *QST*, and condemning their shortcomings in non-feature material. This isn't exactly eliminating the negative, but it's at least de-emphasizing it. Including it is quite necessary, because every emergency operation, regardless of how expertly it is conducted, has shortcomings. Regardless of the emergency services perpetrated, more could have been rendered if the operation had followed all the rules.

A correspondent recently told us that "you have a responsibility to spread the word to every radio amateur on what to do in an emergency." But we all know that it is impossible to spread the word to amateurs who will not read and will not listen, and that there are thousands of them who show up out of nowhere when an emergency occurs. Are they "had"? Not really. Most of them merely want to help. A few have personal but unselfish motives. A still smaller minority are motivated solely by the desire to be individual heroes. None of them knows how to do what he is trying to do, however, so all three of these categories added together in an emergency situation can cause a whale of a mess in a net trying to handle emergency traffic, because all three are thoughtless and insensitive. They should know better.

WB6IXC states it well in an article in *World-radio/News* - an article well worth reading, by the way - when he says that these people "are the same ones who leave the shopping carts in the middle of the parking lot, the same ones who drive down the fast lane of the freeway at 35 mph, the same ones who force their way past a blocklong line at the post office or bank because they really

can't see any reason why they should wait their turn."

"How many times," Dennis continues, "can a net control call 'emergency or urgent traffic, no check-ins please, no incoming H & W traffic from the states, only emergency or urgent traffic... please!' and have ten stations come back with 'Any traffic for East McKeesport?' or 'Can you tell me what happened to my girl friend Maria? She has been down here for three years and I haven't heard from her since - think she works in a pharmacy somewhere?' How many times? About 30,000 times, that's how many!"

Another quote from WB6IXC's article: "We have more good guys than we have competent operators, that is fact. A guy who can't run an efficient phone patch or a guy who can't copy the name of his own town without asking for repeats, a guy who has no experience with message handling whether from AREC, RACES, traffic nets, MARS or what have you has NO BUSINESS getting involved in an international disaster. And a guy who can't keep his mouth shut and listen has even less business in an emergency net."

We recall a line which appeared frequently in an emergency bulletin some years ago, also emanating from the west coast: "Emergency Instructions: Shut up and listen!" A good procedure to follow for anyone without experience in emergency operating. If your assistance is needed, it will become obvious - both as to whether it is needed and whether you are equipped to perform it. Meanwhile, *shut up and listen!* Let the people who know how do the job.

Of course the biggest problem is that there are so many people who don't realize their own shortcomings in operating procedures. People who are technical wizards especially are prone to feel that operating procedures are easily and quickly picked up on the spur of the moment. They aren't. They must be practiced regularly.

*Communications Manager, A.R.R.L.



On Mar. 21, Lt. Alan B. Caplan, K4AVQ, Commanding Officer of the Lancaster (PA) Naval Reserve Center presented 16 Lancaster Co. area amateurs with commendation letters honoring them for their services during tropical storm Agnes. Six of the recipients are pictured. Left to right: K3HQ, W3FEY, WA3OWD, W3DWS, K4AVQ, K3VAX and WA3PTE.

When heavy rains caused flooding near Monroe, LA on March 24, amateurs were requested to provide communications in an effort to coordinate delivery of sandbags and pumps in the affected area. WASTRW is shown here at one of the flood sites. Details appear in the Public Service Diary.



Regarding our (Headquarters CD) responsibility to teach every radio amateur how to operate in an emergency net, this we have been trying to do for decades — but of course it's impossible without barging into their homes and hitting them over the head with it, figuratively or literally. We invite, nay urge, you all to take a look at the December *QST* indexes under "Operating" and "Public Service" headings, and dare you to point out one facet or aspect of public service operating that has not been treated during the past decade. While you are at it, look up some of the references and read up on the subject. You'll find them a revelation. Some of them are heavy, some light, some serious, some semi-facetious. None of them is without a message. We don't write this stuff "just for fun," just to entertain the reader, although if this is a side effect, fine. It's written for a purpose, and that purpose is to instruct amateurs in public service operating.

We particularly invite your attention to the "up front" series of articles in the 1964-67 issues, including a 1964 three-part series explaining the newly-formed Amateur Radio Public Service Corps (ARPS) and its two principal divisions, the Emergency Corps (AREC) and the National Traffic System (NTS), followed by an article about "Amateur Radio and Civil Defense," which described the place of the Radio Amateur Civil Emergency Service (RACES). Later that same year there was a three-part article on "Some Fine Points on Message Handling," and an article on "Organizing your Local Emergency Corps." In 1965 we blossomed forth with "Keeping Up Interest in Your AREC Group," "Public Service Through Civil Defense Communications," and a four-installment article on "The Anatomy of Public Service Communications," followed by "Some Random Thoughts on Public Service." In '66 there were "You and Emergency Communication," "How to Join the AREC," "Emergency Preparedness in Non-Metropolitan Areas," and in '67 "How to Deliver a Message" and "How to Originate Messages."

While all these feature articles were being printed, the Public Service column continued to harp on emergency-preparedness subjects, one or more each month. We recommend to your particular attention "No Formal Procedure Was Used..." (Feb. '66, p. 42); "The Angry Amateur" (May '66, p. 58); "Where Are We Headed?" (Aug. '66, p. 54); "Why Be an EC?" (Nov. '66, p. 79); "The Great Experience" (Nov. '67, p. 72); "The Case for Belonging" (Dec. '68, p. 72); "The Case for Preparing" (Jan. '69, p. 58); "The Frequency Squeeze" (Aug. '69, p. 61); "Keeping It Simple"

(Nov. '70, p. 72); "Infiltration" (Feb. '71, p. 69); "Now Is the Time" (Oct. '72, p. 89); "Twixt Duty and Privilege" (May '73, p. 86). But the list of references alone is nearly endless. The Dec. index titles under "Public Service" are fairly descriptive of content.

And we haven't even mentioned the *Public Service Communications Manual* (free on request), the *Radio Amateur's Operating Manual*, the *Handbook* and the many operating aids, all of which contain "how to do it" information, most of it along public service lines.

So read, brother, read! You can't learn much without it; the person who doesn't read, no matter how acute his faculties physically, is partially blind and deaf — not to mention *dumb*.

As for the headquarters not executing its responsibility to teach and train — well, maybe not. It's really a matter of opinion. All we can do is try, and keep trying. If nothing has been accomplished, then we've wasted years of man-hours. — *WINJM*.

Traffic Talk

Spurred by a published statement that only a trickle of traffic goes over NTS, that most traffic goes by ssb and that the amount of traffic handled by NTS is "meager indeed," W8IBX undertook a statistical analysis of net traffic reports in *QST*, including cw nets, ssb nets, NTS nets, Post Office nets, Slow nets and other Independent Nets. The findings amazed him and perhaps will be enlightening to you. The total traffic count for the month analyzed was 49,707 (i.e., all nets). Of this total, 71.9% was cw and 28.1% ssb. Section net traffic was 54.9% ssb, 45.1% cw. However, at the interstate and inter-section level, again including both NTS and non-NTS nets, cw was again way out in front, 85.1% to 14.9%. Forgetting the question of mode and considering NTS vs. non-NTS, the percentages showed 62.7% NTS, 37.7% non-NTS.

The person making the above statements was provided with these data. He replied to the effect that *QST* figures are not a good indication, that there are many other channels handling traffic not reflected in *QST* reports. Well, maybe so. Nevertheless, fifty thousand message handlings in a month is a pretty good "trickle," and some of the biggest independent nets do report in *QST*. W8IBX

BRASS POUNDERS LEAGUE

Winners of BPL Certificates for March Traffic

Call	Orig.	Recd.	Rel.	Del.	Total
W3CUL/4	232	905	830	56	2023
WA0VAS	122	481	47	434	1084
W0WYX	52	563	112	401	1068
W1PTX	134	435	344	37	950
K0ZSQ	4	398		398	801
K0ONK	57	281	269	9	616
W3VR/4	166	231	209	6	612
W0H-MN	29	290	288	2	609
WA30GM	56	282	206	50	594
K5LEY	3	283	281		567
W4MCR	68	236	182	54	540
WB2WFJ	28	363	188	51	530
WB4AIW	16	252	212	40	520
W0WYX(Feb.)	50	442	106	344	942

BPL for 100 or more origins-plus-deliveries

K6UYK	171	WN0HTR	128	WA4JQS	105
WA0AUX	164	WN0GVR	127	W9N9HH	105
WA0VYT	155	WA3RCI	124	WB4BEQ	104
WB4ZMK	148	WN0SL	117	WB2ADW	102
W3TN	144	WN0GQL	111	W0LYP	101
WB0HOX	140	WA0TFC	110	WA0MLE	101
WB5EIN	135	W5T	109	W9N9HH(Feb. 11-20)	
		WN3SZD	106		

More-Than-One Operator Station

KRLM1 (94) - KRCR 133
WALKZF(Dec.) 265 - VEJUN(Feb.) 105

BPL Medallions (see July, 1968 QST, p. 99) have been awarded to the following amateurs since last month's listing: WB2NRK.

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 300 or a sum of origins 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.

is skeptical that the tremendous amount of traffic claimed to be handled by ash nets is as tremendous as it's cracked up to be. The claims seem to be nothing more than opinion. In any case, it seems pretty obvious that cw is still a reliable traffic-handling mode and figures to be around for some time to come. Don't knock it. — WINJM.

National Traffic System

There is some misconception that the Daylight National Traffic System is a new breed, distinctly different from the present evening setup. Not so! The same principles apply. Traffic is passed from the national Continental Traffic Net (analogous to the three area nets) to region nets (each established with the same boundaries as the evening region nets) and on to section nets. The sequence corresponds to the "last half" of the evening schedule where traffic is passed from area to region to section (assuming a late section net meeting).

Liaison stations and net control stations are appointed in similar fashion to the method used in evening nets. The CTN manager (with his assistants) appoints the CTN NCS and assistant NCSs. The region net manager selects region NCSs and region liaison stations to CTN. Section net managers appoint liaisons to the region nets, as well as select net NCSs.

What happens if a section has more than one section net? No problem. It seems most likely that the cw section net manager would appoint liaisons for the evening region nets, while the phone section net manager would appoint liaisons to the daytime region nets.

What if there is no phone section net from which representatives can be drawn? That's a bit

more of a problem. Perhaps some interest can be sparked in starting an NTS phone section net. Otherwise the burden probably falls on the cw section net manager. A most important facet is that your section is represented.

March reports. Several DNIS net reports were received for March. Most indicate that during the month activities were just beginning. K7IFG indicates that many stations are eager to participate in CTN, but more organization is needed in the Central Area. D2RN is off the ground with WA2RYD reporting good representation from NJ sections and hopes for improved representation from NY sections. Representation on 1RN reached a new high and 2RN completes another month with 100% representation. W2FR issued initial 2RN certificates to WA2s (CNE RYD), WB2UFG and a second annual award to W2CU. W5TNT is subbing for RN5 Mgr. K0BAD/4 for most of April. Since conditions have improved, KN7 has resumed normal 0330 and 0530Z sessions. W9HRY submits his final report, thanking all who helped during his administration as 9RN Mgr. Annual 9RN certificates went to W9s CXY DND NXG QLW, with an initial certificate to WB9KVN. VE3AWK sez conditions are largely to blame for drop in representation and rate on ECN. W0LRN is off to a fine start as TWN Mgr. and putting out a monthly TWN bulletin.

Net	Sessions	Traffic	Rate	Avg.	% Rep.
EAN	31	1626	1235	52.4	99.5
CAN	31	1058	948	34.1	99.5
PAN	31	1034	926	33.4	100.0
CTN	9	71	116	7.9	71.4
1RN	62	477	364	7.7	97.8
2RN	62	687	395	11.1	100.0
D2RN	20	33	162	1.7	79.0
3RN	62	413	448	6.7	97.9
D3RN	19	89	284	4.7	90.0
4RN	47	516	445	10.9	74.2
RN5	61	619	358	10.2	96.5
RN6	62	757	537	12.2	100.0
DRN6	17	8	-	-	-
RN7	56	270	307	4.8	39.4
DRN7	9	8	058	0.9	14.3
SRN	60	527	400	8.8	76.9
D8RN	31	63	146	2.0	73.1
9RN	61	313	488	8.4	94.8
TIN	62	523	485	8.4	89.6
ECN	62	215	254	3.5	91.5
TWN	62	412	262	6.6	79.0
TCC Eastern	1231	695			
TCC Central	931	568			
TCC Pacific	1241	771			
Sections ²	3325	13896		4.2	
Summary	4242	25849	EAN	6.1	
Record	3219	33737	1.510	18.1	

¹TCC functions not counted as net sessions.

²Section and local nets reporting (99): APSN (AB); MTN (MB); Champlain-Minnet GBN ODTN OPN OQN (ON) WQ-VJURE (PQ); AENB AEND AENM AENO (AL); ATEN (AZ); OZK (AR); 1RN NCN NEN SEN (CA); CCN (CO); CN CPN Nutmeg-VHF (UT); EAST EMTN EPTN GN QFN QFFN 1PTN VEN (EL); GASSHN GSN GIN (GA); IMN (ID.MT); ILN (IL); OLN (IN); QKS QKS-SS (KS); KNTN MKPN (KY); MDCTN MDD MFPN (MD-DC); EMIN EMPN EMZMN WMN WMPN (MA); MNN QMN QWN (MD); MSP PAV (MN); MTN (MS); IC2AN MCN MSN WEN (MO); MTP (MT); WNN (NE); NHVTN (NH,VT); NJN NJPN NJSN PYTEN (NJ); NLI NLS NYCLL-VHF NYS (NY); CN (NE) (NC,SC); COAREC-10 COAREC-6 COAREC-2 OSSBN (OH) OJZ OCPN (OK); OSN (OR); EPA GERN PTTN WPA (PA) SPN (SD); TN TNN (TN); TEX TTN (TX); BUN UCN (UT) VRN VSN VSN (VA); NSN WSN (WA); WVPN QVV; BEP BWN WBSN WSSN (WI).

Transcontinental Corps.

Area	Functions	% Successful	Out-of-Net Traffic	
			Traffic	Traffic
Eastern	123	93.6	1837	695
Central	93	92.4	1144	568
Pacific	124	88.7	1618	771
Summary	340	91.8	4599	2034

The TCC roster (Mar.): Eastern Area (W3EML, Dir.) - W1s EJH NJM QYY YNF, W2s FR GKZ, WA2s CNE ICU UWA, W3s CB EML, K3MVO, WA3OGM, W4s UQ ZM, K4s FAC KNP, WB4s OMG SGV, W8s IBX PMJ VDA/4, K8KMQ, WA8PIM, Central Area (K0AEM, Dir.) - W4OGG, WB4s KPE YCV, W5s MI QU SBM TNT, WBSFDP, W9s CXY DND, W0HH INH ZHN, K0DDA, Pacific Area (K5MAT, Dir.) - KITMK/7, WSRE, K5MAJ, W6s BGF EOT IPW MII RSY VNO VZT, WA6DFI, WB6s AKR VKV, W7s BQ DZX EM GHT KZ PI, K7NHL, W0LO, K0OTH, W0BAXW.

Independent Net Reports (March)

Net	Sessions	Traffic	Check-ins
North American Traffic	27	214	523
20 Meter ISSB	24	1903	679
Early Eighty Free	31	95	197
YL	5	63	27
IMRA	49	565	1651
7290 Traffic	44	507	2249
Ohio Valley Teenage	34	125	358
Ohio Valley Teenage (Jan.)	29	100	254
Mike Farad	28	48	209
75 Meter ISSB	31	347	1641
Clearing House	26	254	396
Hit & Bounce Slow	18	72	113
NY Region RTTY	31	46	198

Public Service Diary

Several public service activities were reported which involved the use of the WA5VKZ repeater in San Antonio, TX. On January 28 WB5GJM/5 reported a brush fire near Highway 30 with the help of WASUAM. WBSGJM/5 reported a burglar alarm siren at a lumber company on Feb. 3 to WASQJH who autopatched the report to police. On Feb. 11, WASRFW/5 reported an accident via WASUAM which occurred on Highway 90. March 8-9 K5PWX/5 reported two automobile accidents and one stranded car via the autopatch repeater. (WB5CIT)

A tornado struck Hubbard, TX about 0620 local time on March 10, taking out all electric power and telephones. Shortly thereafter Hill Co. EC W5KRZ was on the air using emergency power. Securing the aid of K5QVI, they opened an emergency net on 3930 kHz at 0706 with W5KRZ as NCS and K5QVI as alternate NCS. This was the only means of communications available out of Hubbard for several hours. Approximately 50 priority messages were handled by local amateurs on both 2 and 75 meters. K5CIL directed 2-meter operations using his base station in conjunction with mobiles dispatched into the disaster area upon the request of W5KRZ. The net operated on emergency power for approximately 30 hours, continuing another 12 hours after commercial power was restored. About 125 amateurs in 9 states were logged. - (K5QKM, SEC NTex)

At 0645 (Mar. 10) Austin ARC Pres. W7WAH/5 was notified of the tornado in the Burnet-Hubbard area and that Red Cross needed communications facilities. Travis Co. EC WA5MUM was advised of the situation and he in turn alerted approximately 35 local AREC members. K5GDH and W5OVW left immediately for the disaster stricken area,

setting up stations at the local high school. Both stations were instrumental in providing communications for the Dept. of Public Safety, Army and Air Force MARS as well as the Red Cross. Approximately 60 other amateurs contributed their services. W5FIT set up at the local radio station operating on 2 and 40 meters. WB5EAT was very busy on a hilltop as a 2-meter relay station. The 7290 Traffic Net handled 72 formal messages and much traffic was passed on 7240 kHz. - (WA5MUM, EC Travis Co., TX)

WA5QQY, Coryell Co. EC, arrived in Burnet at 1115 (Mar. 10) with his emergency communications van. Once set up, W5NHB was contacted and acted as liaison with city officials, Red Cross and REACT units. As conditions permitted, incoming health and welfare inquiries were handled. Assisting WA5QQY from his location at a church were W5s HFF JLY, WA5NQL, W5PCN assisted Red Cross while operating from the high school. WA5MTI coordinated the whole effort. W5NHB acted as NCS. WA5QQY handled 9 formal messages and 60 H&W inquiries. Operation ceased at 1430 on Mar. 11 after fifteen hours operating time. - (WA5QQY, EC Coryell Co., TX)

Upon being notified of a tornado striking Newkirk, OK on Mar. 13, the Western Division ARC (in Oklahoma City) called Oklahoma Co. EC WA5JGU for back-up communications to the disaster area. A team was dispatched from Stillwater to assist with property and casualty survey and relay info back to Oklahoma City Hq. A considerable amount of inquiry traffic was handled. Operation lasted about 5 hours. (WA5FSN, SEC OK)

While deputies were transporting three prisoners on Mar. 14, an attempt was made by the prisoners to overpower the two deputies near Menomonee Falls, WI. K9ZYS was nearby in his car and reported the incident to W9PAS via 2 meters. W9PAS notified authorities. The three prisoners were quickly rounded up. - (K9ZYS)

Beginning on March 15, heavy rainfall in Morgan Co., AL caused a rise in the Wheeler Lake water level to 4 feet above flood level endangering approximately 350 homes in Decatur. Several homes were evacuated because of flooding. Seventeen members of the Decatur ARC (also AREC and RACES members) provided all communications services for the Morgan Co. c.d. at the courthouse for 64 consecutive hours. - (WB4NLM, EC Morgan Co., AL)

On Mar. 17 a heavy snow storm buried western Oakland Co., MI. A snow emergency was called by K8SWW. The Milford ARC station W8YDK at the police department was manned and all snow removal equipment had an amateur riding along as a link via the Milford repeater. Nine amateurs participated. - (K8SWW)

Heavy rains and winds caused flooding conditions in the Houston and Baytown area (TX) on Mar. 24-25. Amateurs read tidal gauges and passed information to the Emergency Operations Center, WASWGW, in Baytown. Participants included K5s MJA MWH, WA5s OPK PEV RSU and W5EKP of Houston c.d. The state guard was assisted in their

Public Service Honor Roll March 1973

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

Category	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
Max. Pts	10	10	12	12	12	20	3			Totals
WARI TX	10	10	12	12	12	10				5 71
WB4SVH	10	10	12	12	12	9				5 70
WB3AMN	10	10	9	12	20					5 66
WB8JAD	10	10	12	12	12	3				5 64
WAZRYD	10	10	12	12	12	1				5 62
WAIMSK	10	10	12	12	12					5 61
WA3JGM	10	10	12	12	12	2	5			5 61
WA3RCJ	10	10	12	12	6	3	3			5 61
W7OCX	10	10	12	12	12					5 61
K9BAD/4	10	10	12	12	12					5 61
K0PIV/4	10	10	12	12	12					5 61
WB5ELN	10	10	12	12	12		3			5 59
WA7JQS			12	12	20					5 59
W4OGG	10	10	12	12	14					5 58
WB0AXW	10	10	12	12	12	2				5 58
WA0MLE	10	10	12	6	12		2			5 58
WB8HUP	10	10	12	12	12	1				5 57
WB2ALH	10	10	12	12	12					5 56
WA3DUM	10	10	12	12	12					5 56
E3KAJ	10	10	12	12	12					5 56
WB4WCM	10	10	12	12	12					5 56
WA5VEA	10	10	12	12	12					5 56
WB9AHJ	10	10	12	12	12					5 56
WA2EUG	10	10	12	9	12					5 53
W4TJN	10	10	12	12	9					5 53
WB4UNV	10	10	12	9	12					5 53
WA3PLC	10	9	12	9	12					5 52
WA2AYC	10	10	6	12	12					5 50
W2RQJ	10	10	12	12						5 49
W3ICS	3	0	12	9		15				49
WB4VZQ	10	10	12	12	5					49
E4YZU	1	10	6	12		20				49
W7AXT	10	10	12	12						5 49
W7BO	10	10	12	12						5 49
W7GHT	10	10	12	12						5 49
E7OUF	10	10	12	12						5 49
W7VAH/5	10	3	12	12				8		49
WB8CSH	10	10	9	12		8				49
WB8CUI	10	10	12	12						5 49
WA8UPI	10	10	12	12						5 49
WB9KVN	10	10	12	12						5 49
K0BLX	10	10	12	12						5 49
K0MRL	10	10	12	12						5 49
VE3FOZ	10	10	12	12						5 49
VE3GFN	10	10	12	12						5 49

WA2CNE	10	10	12	3	12					47
WA6BEI	10	10	12	3	12					47
WA9FDZ	10	8	12		12				5	47
WB0HSZ	10	10	12	3	12					47
WA6TVA	10	10		12	9					5 46
WB2UVB	3	10	3	12	17					5 45
WA3JQR	10	10	9	12	4					5 45
W6LRU	10	6	12	12						5 45
WB8FFZ	10	10	3	12					5	45
WB0HBM	10	10		12	12	1				45
W3NEM						39			WA3QIA	34
WA3SWS						39			W3DU	34
WB6AW						39			W3TN	34
WB6WD						39			W3YA	34
WB8X						39			K4KNP	34
W8NKO*						39			WB5FML	34
W9NXG						39			WB6AKR	34
W0HH						39			WB6VKV	34
VE1AWE						39			W6YBV	34
VE1DPO						39			WA7BDD	34
VE1FWD						39			WB8ALU	34
WA2LCC						38			WB8FBG	34
WB4FDT						38			WB8KKI	34
W6DEF						38			W9FWH	34
WA7TXV						38			W9HDP	34
K3MVO						37			W9QLW	34
WB6KH						37			VE3LHF	34
W7DAN						37			WB8CLF	33
WB8KXV						37			WA2UOO	32
K9KSA						37			WA3SCR	32
WB9LH						37			K4TXJ	32
WA0SIG						37			W6AUC	32
VE3GT						37			W7PI	32
W6LYY						36			WB8IM	32
WB6RF						36			WB8JW	32
WB2NOM						35			VE3FRG	32
W3BRN						35			W2MTA	31
W8ETW						35			W3ABT	31
WB8JCK						35			WB4PNG	31
W1MYK						34			WB8UP*	31
W2CU						34			WA3ATO	30
WA3HV						34			WB5DBK	30
W3OKN						34			WN0ESL	30
W3LOS						29			WN0GQL	30

*Denotes multioperator station.

Category Key: (1) Checking into cw nets, 1 point each; (2) Checking into phone/RTTY nets, 1 point each; (3) NCS cw nets, 3 points each; (4) NCS phone/RTTY nets, 3 points each; (5) Performing assigned liaison, 3 points each; (6) Legal phone patches, 1 point each; (7) Making BPL, 3 points regardless of traffic total; (8) Handling emergency traffic directly with a disaster area, 1 point each message; (9) Serving as net manager for entire month, 5 points.

evacuation of 80 families from the flooded area. The WA5YUX repeater was used throughout the emergency for communication. - (WA5FJN, Ass't. EC Harris Co., TX)

At 1600 on Mar. 24, WA5QVN received a call from the local Red Cross requesting communications assistance in a subdivision near Monroe, LA which was experiencing flooding. By 1800, Twin City Hams members had set up on 6 and 2 meters in the school being used as a command post. Four mobiles coordinated the delivery of sand, sandbags and pumps in the affected area. Various governmental agencies were provided with communications. Operations resumed the following day. A total of 14 amateurs participated. - (WA5QVN, EC Ouachita Parish, LA)

Upon activation of the Florida Midday Traffic Net on Mar. 30, an emergency call for help was received from K4PGY/mobile north of Gainesville, FL. With K4PGY, was the father of a medevac patient who was being airlifted from Albany, GA to the University of Florida Medical Center in

Gainesville. The father requested W4GDK to immediately arrange for a completely equipped ambulance to meet the plane on the runway at the airport. This was accomplished in about 15 minutes by W4DFP through the efforts of the local FAA and Medical Center. W4LSR acted as relay between NCS and the mobile. - (W4SDR, Mgr. FMN)

While in QSO with WB0CGJ, VE8CD/mobile 30 miles from Whitehorse, YT on Mar. 31, witnessed a car off the road which had overturned and was on fire. WB0CGJ received the information and alerted the Royal Canadian Mounted Police. - (WB0CGJ)

On the afternoon of Apr. 2, WB4JSE (New Smyrna Beach, FL) answered an emergency call from K8CBT/mobile on I-95 at the scene of an automobile accident which severely injured the driver. While K8CBT's XYL, a nurse, was administering first aid, WB4JSE contacted police and the Highway Patrol. Police and an ambulance were

(Continued on page 106)

Happenings of the Month

New Exam Questions Races Inquiry Advisory Committees

RACES INQUIRY BEGUN; OLD REQUEST DENIED

The Federal Communications Commission has issued a Notice of Inquiry in Docket 19723, asking for comments on the future of the Radio Amateur Civil Emergency Service (RACES), under which amateurs officially provide communications services for Civil Defense organizations, in accordance with Subpart F of the amateur rules.

The Commission seeks information on whether RACES is effective; whether the licensing system is adequate; on whether a different call sign system is necessary; whether there are abuses needing solutions; whether additional or different operating privileges are necessary; and whether there should be safeguards for the non-RACES portion of amateur radio.

At the same time, FCC terminated a rulemaking proceeding, Docket 17315, under which it had proposed, on March 22, 1967, to allow RACES stations to use F4 emission in segments of the 160 and 80-meter bands (where this mode is not available for other amateur purposes). The texts of the two documents appear below:

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

In the Matter of
Amendment of Part 97
Subpart F, regulations
for the Radio Amateur
Civil Emergency Service
(RACES).

Docket No. 17315
RM-964

REPORT AND ORDER

Adopted: April 18, 1973; Released: April 20, 1973
By the Commission: Commissioners Robert E. Lee
and H. Rex Lee absent.

1. On March 22, 1967, the Commission adopted a Notice of Proposed Rule Making in Docket 17315. The Notice proposed amendments

to Subpart F, Radio Amateur Civil Emergency Service (RACES), of the Rules and Regulations for the Amateur Radio Service, Part 97. RM-964 was filed by the New York Civil Defense Commission, and requests that Sections 97.193 (a) (1) and 97.195 (a) be amended to provide for the use of facsimile, F4 emission, in the 1800-2000 kHz and 3500-4000 kHz amateur frequency bands. Although the time for filing comments was subsequently extended from April 28, 1967, to May 26, 1967, by Order adopted on April 27, 1967, only three comments were timely filed. Two comments oppose the proposal and the other one takes exception to the petitioner's basis for the petition. No comments were filed in support of the proposal.

2. The Notice was in response to RM-964, in which the petitioner stated a desire for a RACES radio link as a back-up capability to the primary wireline link in a system used to facilitate the collection, interpolation and dissemination of radiological fallout data gathered at approximately 3,000 monitoring stations throughout New York State. The data is transmitted by facsimile over the wireline circuits. Petitioner justified the need for the radio back-up link with the following statement:

"Since this portion of our civil defense communications system is essential to the survival of the State's eighteen (18) million populace, and since the post-attack wireline survival capability is an unknown, un-predictable link in this vital system, it is evident that a radio back-up link is necessary to ensure full post-attack radiological defense communications reliability."

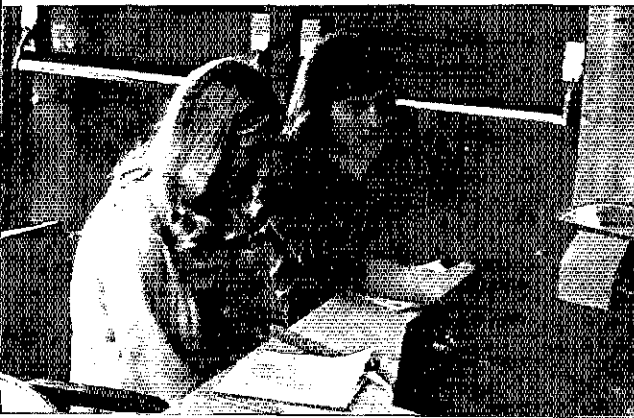
3. Due to the radio coverage desired, petitioner requested amendments which would authorize facsimile emissions in the 1800-2000 kHz and 3500-4000 kHz amateur radio bands. Accordingly, our Notice proposed to amend Sections 97.193 (a) (1) and 97.195 (a) to provide for the use of 3A4 emission in the 1800-1825 kHz, 1975-2000 kHz, and 3990-4000 kHz frequency bands and incorporate other related amendments. These frequencies are available on a non-exclusive basis for RACES stations which are operated under the direct supervision of civil defense officials.

4. Comments filed by the New York Telephone Company state no objection to the proposed rule making, but they request that the record be set straight with respect to paragraph 4 of the Notice which stated:

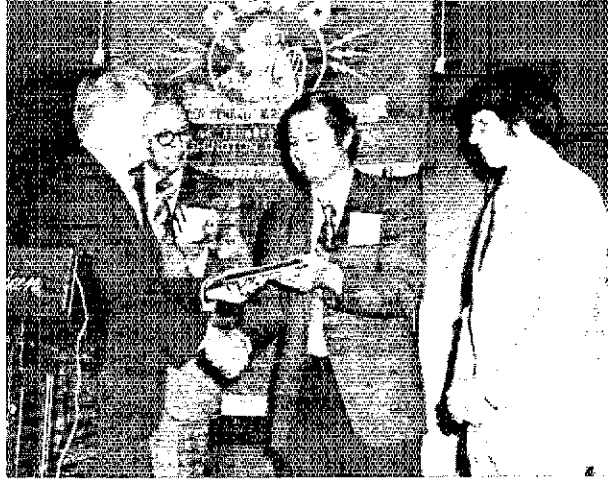
"Since the post attack wireline survival capability in New York State is an unknown, petitioner asserts it is evident that a radio back-up link is necessary to insure full post attack radiological defense communication reliability."

The New York Telephone Company believes this statement misleading and contrary to fact. They

Here is W0LJF/0 operating from the science fair at Denver Lutheran High School. George Schultz, WB0DJY is the control operator on watch; Terry Nicol, awaiting her Novice, is at the mike. (Photo thanks to WB0AMJ)



The 1972 ARRL Technical Merit Award was presented to the Radio Amateur Satellite Corporation, Amsat, in recognition of its work in coordinating the design, construction and launch of Oscar 6, currently-active amateur space satellite. ARRL President Harry J. Dannels, W2TUK, at left, makes the award to Perry Klein, K3JTE and Jan King, W3GEY; Roanoke Division Director Victor C. Clark, W4KFC applauding (left rear).



feel that the "... useful redundancy in the Common Carrier network in New York State gives this network a high degree of survivability."

5. Comments filed on behalf of the New York State Phone Traffic and Emergency Net stated opposition to the proposal to authorize A4 and F4 emissions in the 160 meter and 75 meter frequency bands. Respondant claims such operation would cause non-essential interference to the New York State group and other amateur traffic handling networks.

6. Comments filed by the American Radio Relay League (ARRL) stated they are unable to support the proposed amendments. ARRL requests adequate safeguards be applied so that RACES will not become a routine non-amateur communications activity. They express concern, "... over trends in RACES administration and operations which stray beyond the bounds of both the intent and the rules. These trends concern the use of non-amateur operators in some areas almost to the exclusion of licensed amateurs, often without the necessary authorization of the appropriate civil defense official, and use of RACES facilities for communications not authorized or contemplated by the rules."

7. The radio frequency bands proposed for facsimile emissions by RACES stations are also used extensively by non-RACES amateur radio stations. The 3990-4000 kHz segment is heavily used for radiotelephony. This is in the portion of the 75-meter band which was expanded on November 22, 1972, to help alleviate the severe overcrowded conditions. The other two segments are in the 160-meter band, which is shared on a secondary basis with the LORANA radio-navigation system. The State in which an amateur radio station is located determines the availability of these frequencies and the power limitations. As a consequence, the full potential of the 160-meter band to the Amateur Radio Service cannot be realized. Only a few stations can operate simultaneously in this frequency band.

8. Therefore in view of 1) the lack of support for the proposal, 2) the expressed opposition to the proposal, 3) the statement of the New York Telephone Company regarding the survivability

capabilities of the wireline system, and 4) the existing overcrowding and shortage of operating frequencies in the 160-meter and 75-meter bands, we are unable to find that adoption of the proposed amendments would be in the public interest convenience or necessity.

9. Accordingly, IT IS ORDERED, that the petition for rule making, RM-964, filed by the New York Civil Defense Commission, IS DENIED.

10. IT IS FURTHER ORDERED, that this proceeding IS TERMINATED.

FEDERAL COMMUNICATIONS COMMISSION

Ben F. Waple
Secretary

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

In the Matter of Docket No. 19723
Inquiry into the provisions RM-968, RM-1116,
of Subpart F, Radio Amateur RM-1478, RM-2032
Civil Emergency Service
(RACES), in Part 97.

NOTICE OF INQUIRY

Adopted: April 18, 1973; Released: April 20, 1973
By the Commission: Commissioners Robert E. Lee and H. Rex Lee absent.

1. In our Report and Order adopted today on Docket 17315, we denied a petition to expand the emission privileges for stations operating in the RACES program because of the expressed opposition to further expansion of privileges for RACES stations, among other reasons. Four other petitions for rule making have been filed requesting additional amendments to the provisions in Part 97, Subpart F, Radio Amateur Civil Emergency Service (RACES).

"Hams have more fun!" was the theme of this exhibit put on by Robert Zimmerman, WA2KTW and David Decsman, WA2DHG at a "CB Coffee Break" in Hamburg, NY. Strangely — and encouragingly — the CBers were very interested in the electronic keyer Dave brought along. In the photo: Dave at left, CB op Cliff Suggs, Bob at right. (Photo by Gierdowski)



2. RM-968 was filed by the County of San Diego, and requests amendments permitting RACES stations to be operated by radio remote control through a control link utilizing non-amateur frequencies. Petitioner desires to use the microwave facilities of the Government Emergency Operators Centers for this purpose.

3. RM-1116 was filed by the California Disaster Office. The petition requests extensive rule changes to Subpart F, including expansion and revision of frequency allocation for RACES.

4. RM-1478 was filed by the Area "D" Civil Defense and Disaster Board, Pomona, California, and requests Section 97.193 (a) (3) be amended to authorize 40F2 emission for radioteleprinter operation in the frequency bands 145.17-145.71 MHz, 146.79-147.33 MHz, and 220-225 MHz.

5. RM-2032 was filed by Murray Green, and requests amendments to rules to permit Technician Class licensees to operate in the 50.35-53.75 MHz, 145.17-145.71 MHz, and 220-225 MHz frequency bands in RACES. Petitioner also requests the frequencies 146-147 MHz be authorized for RACES with emissions 01A1, 11F1, 6A2, 6F2, 6A4, and 40F3.

6. As stated in Subpart F, RACES provides for amateur radio operation for civil defense purposes only, during periods of local, regional, or national civil emergencies. It is a radiocommunication service carried on by licensed amateur radio stations while operating on specifically designated segments of the regularly allocated amateur frequency bands, under the direction of authorized local, regional or federal civil defense officials pursuant to an approved civil defense communications plan. Persons holding amateur radio operator licenses, and persons holding certain grades of commercial radio operator licenses are eligible to operate RACES stations provided they are enrolled in the Civil Defense organization as a radio operator.

7. Stations operating in RACES share the allocated frequencies with other amateur radio stations conducting non-RACES amateur radio-communication. Inasmuch as the privileges of amateur radio operator classes (Section 97.7), do not apply to the operation of RACES stations, except for some limitations for holders of the Novice Class and Technician Class, and since non-amateur operators may operate RACES stations, appropriate safeguards are necessary to insure that non-essential RACES radio-communication is not conducted at the expense of regular amateur radiocommunications.

8. RM-968 is concerned with the control of RACES stations by radio remote control in one particular Emergency Operations Center, San Diego, California. Due to radio interference restrictions at that particular site, the frequencies 220-225 MHz available to RACES stations for

remote control cannot be used. Petitioner proposed amendments to the Rules to permit Local Government (Operational Fixed) microwave equipment to be used for the control link.

9. RM-1478 states that the authorization of 40F2 emission in the frequency bands 145.17-145.71 MHz, 146.79-147.33 MHz, and 220-225 MHz for audio frequency-shift keying in radioteleprinting will "... materially benefit the RACES service by allowing the use of the superior characteristics of this mode, e.g., sensitivity, noise interference and power ratios."

10. Petitions RM-1116 and RM-2032 request expanded and revised frequency allocations for RACES stations. RM-1116 does not offer any rationale for the extensive frequency and emission authorizations requested. Additionally, petitioner proposes rules changes relating to the organizational and operational phases of the RACES program. RM-2032 claims the potential value of Technician Class licensees to support the RACES program is lost by the prohibition against such licensees obtaining RACES station authorization for operation as members of RACES. Petitioner states that:

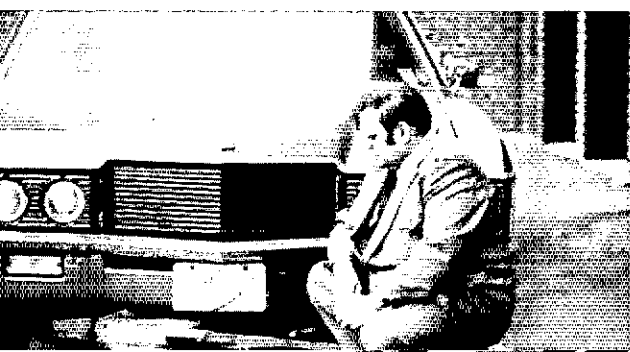
"... a large portion, if not the majority of today's fm repeater users, hold Technician Class licenses," and "... the utilization of fm vhf repeaters, together with mobile and portable communications equipment and dedicated amateur radio operators, provides an enormous reserve of emergency communications in support of local civil defense operations."

11. These petitions, like the petition denied in Docket 17315, would expand the privileges for stations and operators in the RACES program. Since the same frequencies and emissions are common both to RACES activities and to other amateur radio activities, the allocation of additional privileges to RACES could have an impact upon non-RACES activities. In light of the lack of any positive response to the proposed amendments in Docket 17315, and because of the lack of any other substantive information on the general need in the RACES program for the proposed amendments, this Notice of Inquiry is intended to elicit comments and suggestions from informed persons and organizations familiar with RACES and the amateur radio service.

12. In order to assist the Commission in making determinations in these areas, informed parties are requested to submit comments and suggestions relevant to the following:

I. Is RACES an effective means of providing needed communication services during periods of local regional, or national emergencies?

II. Is the present licensing system for RACES stations appropriate? Should stations



Ontario is one of the few places in North America where call letter license plates are not available. VE3CMM shows us his "underground" version!

George Batterson, W2BG, (left) receives Grand Old Man Award at the Old Timer Night of the Rochester Amateur Radio Association and the Antique Wireless Association. ARRL Atlantic Division Director Harry A. McConaghy, W3SW, made the presentation, while RARA President Ed Holdsworth, WA2EKR looks on.



authorized to be operated in RACES be assigned distinctive call signs which could only be used for RACES activities?

III. What abuses, if any, of the Rules by RACES stations are commonplace? What are possible solutions to ending these abuses?

IV. Should additional or different privileges, e.g. frequencies, emissions, operators, be authorized for RACES stations? What are the most needed additional privileges? What are the consequences, to both RACES and the amateur radio service in general, if RACES privileges are expanded? What are the consequences if RACES privileges are not expanded?

V. What additional safeguards, if any, are required to insure that non-essential RACES radiocommunication is not conducted to the detriment of non-RACES amateur radiocommunication?

13. This action is taken pursuant to Sections 4 (i), 303, and 403 of the Communications Act of 1934, as amended. Comments must be filed on or before July 1, 1973. All relevant and timely comments will be considered.

14. In accordance with provisions of Section 1.419 of the Rules, an original and fourteen (14) copies of all comments, suggestions, pleadings, briefs, or other documents shall be furnished the Commission. Responses will be available for public inspection during regular business hours in the Commission's Broadcast and Docket Reference Room at its Headquarters in Washington, D. C.

FEDERAL COMMUNICATIONS COMMISSION

Ben. F. Waple
Secretary

ADVISORY COMMITTEES

One of the many ways in which members help steer the course of the League is through advisory committees in specialized fields - contests, vhf repeaters, DX (and emergency communications soon to be established). The eleven members of each committee are nominated by three League members, and appointed by the president keeping geographic factors in mind, for terms ranging up to three years. A formal call for nominations will appear in the September issue of *QST*, but nominations can be submitted at any time to help the president in filling vacancies - and are especially solicited right now for the new Emergency Communications Advisory Committee. The full rules governing these groups appear in the pamphlet which contains the Articles of Association and bylaws of ARRL; it can be obtained upon request from any member - send a

stamped, self-addressed envelope and ask for AABL.

The committees earnestly desire your views on subjects within their areas: you may reach a committee through the nearest member in the addresses to follow:

Contest Advisory Committee

- Peter Chamalian, WIBGD, 52 Chestnut Ct., Cromwell, CT 06416
Joseph R. Kilgore, W2EIF, 5 Sunnybrook Ct., Stratford, NJ 08084
Eugene Zimmerman, W3BQV, 33 Brighton Dr., Gaithersburg, MD 20760
John T. Laney, III, K4BAI, Box 421, Columbia, GA 31902
William H. Parry, K5TSR, 4343 Birght Sun Dr., San Antonio, TX 78217
Philip J. Goetz, W6DQX, Box 5491, Los Angeles, CA 90055
Albert K. Francisco, K7NHV, Box 4412, Pocatello, ID 83201
James D. Cain, WA9AUM, 3418 Welch Dr., Indianapolis, IN 46224
Fred T. Deziet, W0HP, 2417 W. 112th St., Bloomington, MN 55431
Katashi Nose, KH6J1, 4207 Huanui St., Honolulu, HI 96816
Director Liaison - Larry Shima, W0PAN, 11417 Goodrich Rd., S. Bloomington, MN 55437
Hq. Liaison - Ellen White, W1YL

DX Advisory Committee

- John H. Thompson, W1BIH, P. O. Box 1, Torrington, CT 06791
Ted M. Marks, WA2FQG, 924A Village Dr. W., North Brunswick, NJ 08902
Layfield L. Lamb, W3BWZ, 5805 Alan Dr., Clinton, MD 20735
William F. Christian, K4IKR, 2800 Cave Ave. NW, Huntsville, AL 35810
Robert E. Shank, W5AO, 105 E. Porter St., Jackson, MS 39202
Robert B. Vallio, W6RGG, 18655 Sheffield Rd., Castro Valley, CA 94546
Norman G. Ray, W7LFA, 14005 - 132nd Ave. NE, Kirkland, WA 98033
J. O. Baumgardner, W8BF, 20470 Lorain Rd., Fairview Park, OH 44126

Robert F. Baird, W9NN, P. O. Box 498, Plover, WI 54467

Clyde F. Norton, W0ELA, 14 Westwood Cir., Minnetonka, MN 55343

Director Liaison - Robert York Chapman, W1QV, 28 South Rd., Groton, CT 06340

Hq. Liaison - Robert White, W1CW

VHF Repeater Advisory Committee

Richard G. Bromley, K1ABR, 12 High View Dr., RFD 5, Cranston, RI 02920

Howard L. Lester, W2ODC, 8 Bath St., Box 6, Alplaus, NY 12008

Raymond G. Hendrickson, W3DTN, 1419 Larch Rd., Severn, MD 21144

William C. Parris, K4GHR, RFD, 6, Box 605, Salisbury, NC 28144

George F. Munsch, W5VPO, 11314 Janet Lee Dr., San Antonio, TX 78230

Charles R. Flanagan, W6OLD, 6427 West 83rd St., Los Angeles, CA 90045

Jon Marcinko, W7FHZ, 26501 - 18th Pl. S. Kent, WA 98031

George R. Cryder, W8LGL, 15 N. Franklin St., Delaware, OH 43015

Gilbert J. Kowols, W9BUB, 216 Belle Plaine Ave., Park Ridge, IL 60068

Director Liaison - Roy L. Albright, W5EYB, 107 Rosemary, San Antonio, TX 78209

Hq. Liaison - Lewis G. McCoy, W1ICP

MORE PETITIONS FOR RULEMAKING

Last month we ran a list of petitions for rulemaking filed recently with FCC. Since then, some additional requests have been filed; a brief summary appears below.

At this point, the petitions only represent the ideas of those that filed them; they may be summarily rejected by FCC or they may be used as the basis of a "Notice of Proposed Rulemaking" by the Commission. If any of these ideas get that far, every interested person will have the opportunity

to file comments in favor or in opposition. Meanwhile, informal remarks may be filed with FCC on these ideas in the request stage, to give the Commission staff some indication of support or opposition.

RM-2105, filed in December by Paul Williams, W6WEO, requests "grandfathering" to Extra Class of any amateur licensed prior to December 7, 1941.

RM-2162, March 26, 1973, by Falmouth Amateur Radio Association, would allow Technicians to have Novice privileges after a no-exam application to FCC.

RM-2163, March 22, 1973, by Jerome C. Grokowsky, WA9HCZ, looks toward facsimile in the amateur bands, above 29.0 MHz.

RM-2165, March 26, 1973, by Lowell Wertz, WA9PCI, requests revision in the definition of "emergency communications," Section 97.3 (x).

RM-2166, March 26, 1973, by William Brady, WB6HDB, asks that Technician Class privileges include those available to Novices.

RM-2167, March 22, 1973, by the international Amateur Radio Journalistic Society (through its legal officer Clif Evans, K6BX) seeks new regulations to license and control net operations.

RM-2168, March 28, 1973, by Baltimore, Md., Office of Disaster Control, asks for RACES station privileges for Technicians and expansion of RACES frequencies to include those used for non-RACES repeaters in the 146 MHz band.

RM-2170, April 2, 1973, by Howard M. Krawetz, WA6WUI, looking toward facsimile operation in the hf bands.

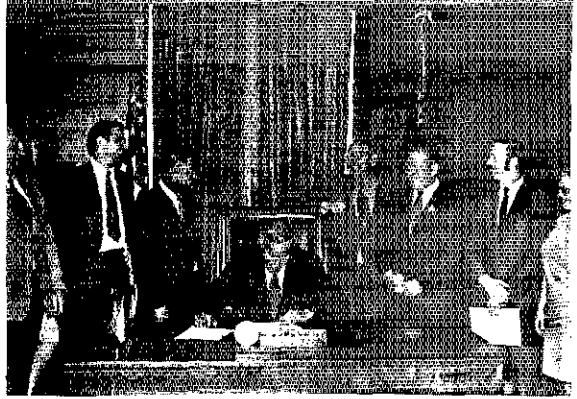
WASHINGTON AREA PR PROGRAM

WGTS/FM, at Columbia Union College in Takoma Park, Maryland, will present four programs dealing with amateur radio on Tuesday evenings during June, beginning at 6:30 P.M. at 91.9 MHz. June 5 features Ed Redington, W4ZM, introducing the public to amateur radio and covering some of its history. Members of the "Nights of the Roundtable" will discuss ragchewing, DX and contesting on June 12. Jan King, W3GEY, of Amsat, will discuss Oscar, RTTY, slow-scan TV and other less-common aspects of amateur radio on the June 19 show. The Maryland Section emergency coordinator, John

June 18-24 is Amateur Radio Week in Louisiana; Governor Edwin W. Edwards puts his signature on the proclamation which emphasizes disaster communications and international good will as strong points of the amateur service.



Amateur Radio Week in Oregon is June 17-23. The following, from left to right, were present for the signing of the proclamation: W7TMF, W7OBK, K7QYM, Governor Tom McCall, State Senator Debbs Potts, W7HLF, ARRL Vice Director K7WWR, WN7UMM. (Photo via K7YQM)



Munholland, K3LFD, on June 26 will tell the public about amateur communications during and after emergencies. If the series proves to be popular, it may be extended. Coordinating things at the station is Robb Mapou, WA3QDH.

AMATEUR RADIO WEEKS

Florida continues its string of Amateur Radio Weeks with the 1973 proclamation by Governor Reubin O'D Askew of June 17-23. Emergency work heads the list of "Whereases" together with training the handicapped; and spreading worldwide friendship.

Governor John J. Gilligan issued two proclamations for Amateur Radio Week in Ohio April 22-28, one saluting the Dayton Hamvention, the other commending the Apricot Message Network.

April 30 - May 6 was "Amateur Radio Hamfest Days" in Baton Rouge, Louisiana, as proclaimed by Mayor Woody Dumas, singling out the Baton Rouge Amateur Radio Club for mention.

The Hon. Marvin Mandel has proclaimed June 17-23 as Amateur Radio Week in Maryland. The governor marked out amateur service during disasters and emergencies as deserving of public attention.

FRANK M. CORLETT, PIONEER DIRECTOR

Frank M. Corlett, ex-W5ZC and ex-5BJ of Dallas, Texas, died in March at the age of 82. He was a member of the first formal Board of Directors of ARRL, taking office February 28, 1917. He served as a director-at-large until the democratic constitution of the League was adopted in 1924, when he was elected as the West Gulf Division's first director, and continued in that office through 1934. He had also served as Division Traffic Manager, and as a key station in the trunk line system. He was also involved in many of the transcontinental relays of the late 'teens and early 'twenties, and in the Transatlantic Tests.

Frank had been employed by Western Union for more than forty years, retiring in 1962. He was a veteran of World War I and helped found radio station WRR. He leaves a son, Frank Jr., WASBNK, and two grandsons (one of whom is WASQHN) of Bridgeport, Texas. An indication of the esteem in which he is held: the 1973 West Gulf Division Convention at Euless, Texas, April 27-29, was dedicated to his memory.

EXAM CHANGES AND ADDITIONS

FCC has adopted new study questions for the Novice and for Technician-Conditional-General. These may begin showing up on examinations any time during 1973, depending on which exam and which field office is involved.

The answers and references below, when used in conjunction with the 69th edition of the *License Manual*, should be adequate during the transition period, so that one can be reasonably well prepared for either test. In some cases, the references may not be a perfect match, but additional outside study material, such as *Understanding Amateur Radio* or the *Handbook* - which we recommend anyway - will bridge the gap.

The first section of each exam deals with rules and regulations; reference is made to the section number of part 97 where the answer may be found. A notation such as "Act 502" refers to the basic law, the Communications Act of 1934 as amended, extracts of which are in the first part of Chapter 10 of the *License Manual*. The notation "N30" means that the question is adequately answered, in our opinion, under old question 30 in the Novice chapter of the manual. Similarly, "G36" would refer to question 36 in the General Class chapter.

Questions for Novice Class Study

A. Rules and Regulations

- What is the Amateur Radio Service? [97.3a]
- What Part of the Federal Communications Commission's Rules govern the Amateur Radio Service? What are the maximum penalties for violating those rules? [Part 97; Act 502]
- The Rules encourage and improve the Amateur Radio Service by providing for advancing skills in what two phases of the radio art? [97.1c]
- What is the definition of an amateur radio operator? Of an amateur radio station? [97.3c,e]
- For how long is a Novice Class license valid? May it be renewed? [97.59a, 97.13a]
- May a transmitting station be operated in the Amateur Radio Service without being licensed by the Federal Communications Commission? [97.40a]
- Who may hold an amateur radio station license? [97.37]
- Where must an amateur radio operator license be retained? An amateur radio station license? [97.83, 97.85]
- Who is responsible for the proper operation of an amateur radio station? [97.79a, b]
- What is the definition of a control operator? Who may be the control operator of an amateur radio station? [97.3p, 97.79b]

What is the log of an amateur radio station? What information must it contain? How long should it be preserved? [97.103, 97.105]

What are the frequency privileges authorized to Novice Class licensees? [97.7d]

What are the emission privileges authorized to Novice Class licensees? [97.7d]

What is the maximum transmitter power privilege authorized to Novice Class licensees? [97.7d]

What are the Rules regarding the measurement of the frequency of emissions from an amateur radio station? [97.75]

B. Radio Phenomena

How fast do radio waves travel in free space (in meters per second)?

N30.

What is the relationship between the frequency and the wavelength of a radio wave? What are the approximate wavelengths for the frequency bands available to Novice Class licensees?

N30; 80, 40, 15 and 10 meters (see chart, page 52 of the *License Manual*).

How are radio signals transmitted across great distances? Which of the amateur radio frequency bands available to Novice Class licensees are most likely to result in long distance communication during the daylight hours? At night?

N34, G36.

C. Operating Procedures

When transmitted by telegraphy, what is the meaning of each of the following: CQ, DE, K, AR, SK?

CQ means "Calling any station"; DE is "from" or "this is..." (used before the call sign of the calling station); K means "Go ahead; your turn to transmit"; AR signals the end of a message or of a round of conversation; SK marks the end of a group of messages or of the contact (the line over the letters indicates that they are run together and sent as one character).

What is the RST reporting system? What is the meaning of "RST 579"?

RST means "readability, signal strength, tone." Readability is rated from 1 (unreadable) to 5 (perfectly readable). Signal strength is rated from 1 (barely perceptible) to 9 (extremely strong). Tone reports, mostly related to an earlier day at the low end of the scale, range from 1 (60-Hertz ac note, very rough and broad) to 9 (perfect tone, no trace of ripple or modulation of any kind). Thus, RST579 is, "perfectly readable, moderately strong, and with perfect tone."

What are "Q signals"? What is the meaning of QRM? The meaning of QRS? The meaning of QRU? The meaning of QRZ? The meaning of QTH? The meaning of QSL?

N45.

In what manner should a transmitting frequency be selected for an amateur radio station? What additional factors should be considered when selecting a transmitting frequency near one end of the authorized frequency band?

The band is chosen for the distance to be reached; see G36. The frequency within the band is picked by listening for a clear spot, and then setting the transmitter to that frequency. See also N38 and A10.

D. Emission Characteristics

What is an A1 emission?

N31.

What are the characteristics of a good quality A1 emission?

The A1 signal shall be a pure direct-current note,

constant in pitch so that it doesn't "chirp" as you key it, and without clicks as the key is opened or closed.

E. Electrical Principles

What is electromotive force? Current? Electrical power? What are their units of measurement?

Electromotive force, emf (or just E in Ohm's Law) is the electrical pressure applied to a device from a power source; it is also called potential or voltage and is most commonly measured in volts. Current is the rate of flow of electricity through a conductor or device; it is measured in amperes and milliamperes (thousandths of amperes); abbreviations are A or amp and mA, but the letter I is used in the Ohm's Law formulas. Power is the rate of doing work, expressed in watts and occasionally kilowatts, the abbreviations being W and kW (in Ohm's Law calculations, the symbol is P). It is the product of the voltage multiplied by the current. See also N.29.

What is direct current? Alternating current? How can alternating current be converted into direct current?

Direct current comprises electrons moving through a series of conductors in one direction only; it is the kind of electricity furnished by batteries. Alternating current results when the emf periodically changes from negative to positive and back; the current travels through the conductor first in one direction, and then in the opposite — often at the rate of millions of times per second for radio-frequency currents. Alternating current, at 60 Hertz (cycles) per second, is the form of electricity most commonly supplied by power companies for household and business use. It can be changed into dc with a rectifier, usually followed by filters to smooth it out.

What is a cycle? A kilocycle? A megacycle? A hertz? A kilohertz? A megahertz?

A cycle is one complete alternation of alternating current, as described earlier. See also N18 and N43. Sometimes, cycle, kilocycle and Megacycle are used by amateurs and other practical radiomen to mean cycles-per-second, etc., in reference to a radio frequency. ("Listening on 14.2 Megacycles.").

What is "r.f."?

The abbreviation "rf" means radio frequency. Often the term is used for energy at radio frequency; "the rf is getting into the speaker lines."

What is the relationship between a fundamental frequency and its second harmonic? Third harmonic?

N17.

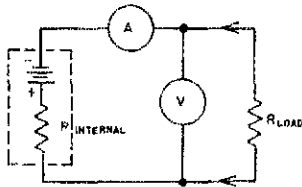
What is: Resistance? Inductance? Capacitance? What are the units of value for each?

Resistance is an obstacle to the flow of a current through a circuit, most often the means through which the circuit accomplishes its aims; the filament of an incandescent lightbulb is a resistor and power furnished to it is converted into heat and light. Inductance is energy stored in a magnetic field most commonly through a coil of wire. Capacitance is energy stored in an electric field, usually on two conductors close together but separated by an insulating substance. Resistance is measured in ohms, kilohms and megohms; capacitance in farads, but microfarad (millionth) and picofarad (millionth of a millionth) levels are more common in radio work; inductance in henrys, millihenrys (thousandths) and microhenrys (millionths).

F. Practical Circuits

Draw the schematic diagram of a circuit having the following components:

- (a) battery with internal resistance
- (b) resistive load
- (c) voltmeter
- (d) ammeter



From the values indicated by the meters in the circuit above, how can the value of the resistive load be determined? How can the power consumed by the load be determined?

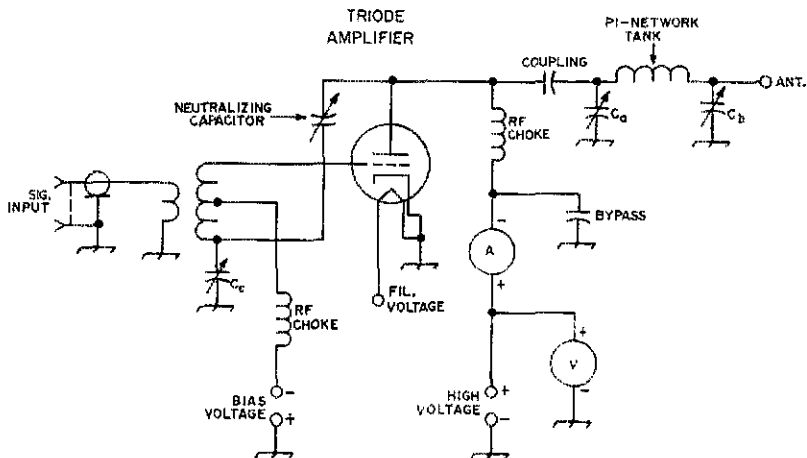
From Ohm's Law (N29) we know total resistance R_T equals voltage E divided by current I . R in this circuit will be the sum of the battery internal resistance R_I and the load resistance R_L ; thus, you'll need to subtract R_I from R_T to get the needed answer, R_L . Ohm's Law goes on to say that power equals voltage multiplied by current, or $P = EI$. P can also be expressed as the current times itself, times the resistance ($P = I^2R$) and as the voltage times itself divided by the resistance ($P = E^2/R$). The second of these power formulas is needed here: $P = I^2R_L$, power consumed by the load equals current times itself, times the load resistance.

In the above circuit, what must the value of the resistive load be in order for the maximum power to be delivered from the battery?

For maximum power to be drawn from the circuit, the internal resistance of the battery would theoretically be zero; since every battery in practice has some resistance, the practical answer would be minimum internal resistance in the battery.

Draw the schematic diagram of an rf power amplifier circuit having the following components:

- (a) triode vacuum tube
- (b) pi-network output tank
- (c) high voltage source
- (d) Plate current meter
- (e) plate voltage meter
- (f) rf chokes
- (g) bypass capacitors
- (h) coupling capacitor



What is the proper tune-up procedure for the above circuit?

With the proper amount of driving power being delivered at the signal input to the amplifier, tune C_a for a dip in the plate current, then tune C_b for a peak; repeat several times until the dc power input, (voltage times current) equals the desired wattage level; 75 watts maximum in the case of Novice operation. C_c is tuned for peak plate current consistent with proper drive to the amplifier.

G. Circuit Components

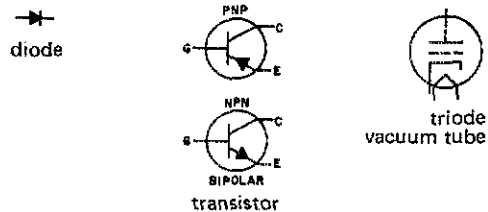
What is an insulator? A conductor? A semiconductor? Give an example of each.

An insulator is a substance which has extremely high resistance and accordingly, blocks the flow of electrical current at practical levels of voltage; some good ones are quartz, mica, glass and ceramics, and rubber. Conductors have very low resistance and thus allow the flow of electrical currents with minimum losses of power; gold and silver are best. Copper and aluminum, because of their much lower cost, are more frequently used. In between are some substances whose conductivity lie midway between these extremes - semiconductors such as silicon and germanium. These are the principal materials used in fashioning transistors and diodes which do much of the work of vacuum tubes in far less space and usually at lower cost and greater efficiency.

Draw the schematic symbol of a resistor, a capacitor, an inductor, a transformer, a choke.



Draw the schematic symbol of a diode, A transistor. A triode vacuum tube.



H. Antennas and Transmission Lines

What is a dipole antenna?

A dipole is a half-wave antenna to which the signal is applied at the midpoint. The dipole is generally used as a reference against which other antennas can be compared.

What is a half-wave antenna? What are the approximate lengths (in feet) for half-wave antennas for the frequency bands authorized for Novice Class licensees?

A half-wave antenna is one whose length is approximately one half wavelength long at the frequency for which it is designed. A practical formula for determining this length is at A68. Using that formula we get about 126 feet for the Novice portion of the 80-meter band; 66 feet for 40, 22 feet for 15 and 17 feet for 10 meters.

What is a transmission line? What are some commonly-used transmission lines?

A transmission line connects the antenna to the transmitter. Common types are coaxial line (with an insulated conductor encased in another "conductor" of tubing or wire braid); open-wire feed line (two wires joined by insulators of uniform size; "ladder line"); and Twin-Lead, two wires molded into a plastic insulated tube generally used in TV receiving installations; some types can be used with amateur transmitters of moderate power.

What are some advantages of a multiband antenna? The disadvantages?

Multiband antennas save space while providing flexibility in operations of an amateur station. However, such antennas readily accept energy at harmonics of the desired frequency, thus increasing the risk of interference to other communications. A multiband antenna, therefore, should be connected to the transmitter through a Transmatch which tends to reject signals at frequencies higher or lower than that to which it is tuned.

I. Radio Communication Practices

What precautions can be taken to reduce the possibility of shock hazard in amateur radio stations?

N40.

Draw a schematic block diagram of an amateur radio station having the following components:

- (a) receiver
- (b) speaker
- (c) transmitter
- (d) telegraphy key
- (e) transmission line

- (f) antenna
- (g) ground rod
- (h) transmit/receive antenna switch

What is the power input to a vacuum tube in the final amplifier stage of a transmitter, exclusive of power for heating the cathode, for the following operating conditions:

Driving power	0.5 watts
Plate voltage	600 volts
Plate current	140 milliamperes
Screen voltage	175 volts
Screen current	10 milliamperes
Filament voltage	6.3 volts
Filament current	0.8 amperes

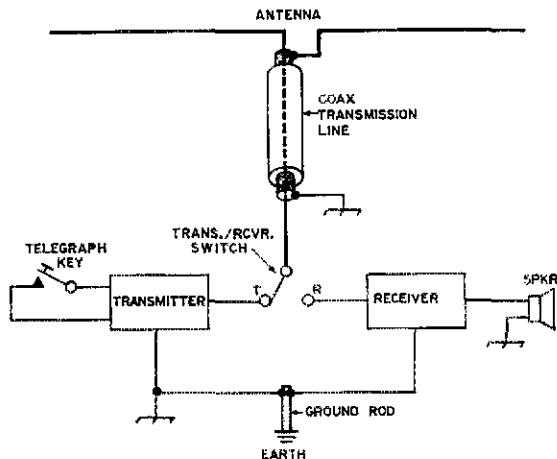
N23. In the example shown, 600 volts times 140 milliamperes equals 84 watts, too much for a Novice station.

What methods are most often used by amateur radio licensees for determining that an emission from a transmitter is within an authorized frequency band?

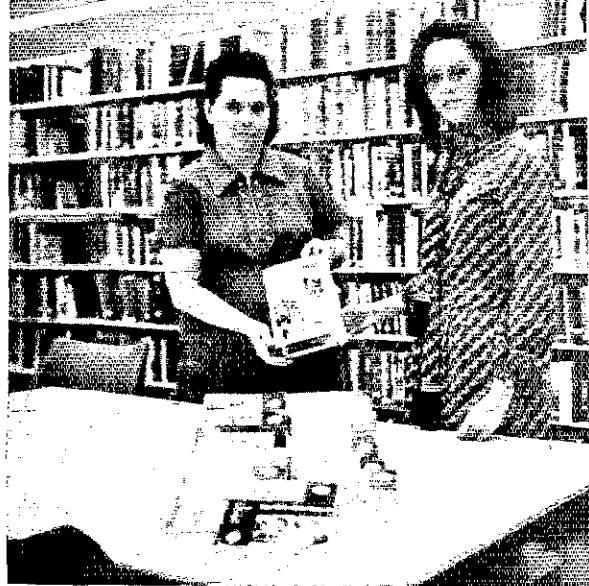
What is the purpose of each component in the above schematic block diagram?

The receiver accepts radio signals on the particular frequency to which it is tuned and converts them to audio-frequency signals which in turn are changed to sound waves by the speaker or headphones. The transmitter creates and amplifies a radio signal on the particular frequency to which it is set; the signal can be started and stopped rapidly by a special switch called a telegraph key which forms the dits and dahs of the International Morse Code. The transmission line carries this signal to the antenna, where it is radiated into the atmosphere and beyond. A ground rod is usually of copper and is driven into the ground; connected to enclosures by means of heavy wire or braid, it drains off unwanted electrical charges on the equipment reducing the dangers of electric shock. It is also connected to the antenna when the station is not in use, to reduce the dangers of the equipment being damaged by lightning strokes. Or a "lightning arrester" is connected permanently between the antenna and the ground rod; an insulator at amateur power levels, it easily breaks down under a heavy charge of atmospheric electricity, conducting it safely to ground. A transmit-receive switch simply connects the antenna to the transmitter during periods of sending and to the receiver during periods of reception; it can be as simple as a double-pole, double-throw knife switch.

N38.



The LERC Amateur Radio Club, W6LS, has donated a complete set of ARRL publications to the Burbank Public Library. Marie Welsh, W6JEP, at left, presents the books to Ania Gelblum of the library staff. (Photo courtesy of W6DDB)



What methods are most often used by amateur radio licensees to determine the quality of emissions from their stations?

An oscilloscope is very useful for this purpose. A simpler alternative — perhaps not quite as reliable — is to go to another amateur station a mile or so away and listen while another licensee puts your station on the air.

What is a transmatch? What are the advantages of using a transmatch?

A Transmatch features tunable circuits of coils and capacitors which can match the impedance of a transmitter output stage to that of an antenna transmission line. It insures maximum energy transfer to the feed line with minimum losses; at the same time, it attenuates energy at harmonic frequencies which could otherwise be radiated from the antenna and thus reduces the possibility of interference to other radio communications.

Questions for General Class Study

(Conditional and Technician Class also)

A. Rules and Regulations

What are the five principles expressing the fundamental purpose of the Amateur Radio Service? [97.1]

What is the definition of amateur radio-communication? [97.3b]

What is the definition of fixed operation? Of portable operation? Of mobile operation? [97.3m]

With what stations may an amateur radio station communicate? [97.89]

What types of transmissions may be made by United States amateur radio stations to amateur radio stations in foreign countries? [Art.41 (p.79)]

What is the definition of third-party traffic? What types of third-party traffic are prohibited? [97.3w, 97.114]

Under what limitations may a third party participate in an amateur radiocommunication? [97.79d]

What types of one-way transmissions by amateur radio stations are permitted? What types are prohibited? [97.89, 97.91]

May an amateur or radio station automatically retransmit programs or signals emanating from any class of station other than amateur? [97.113]

When there is a violation of the rules at an amateur radio station, how is the responsible person(s) determined? [97.3p, 97.79a,b]

What is the minimum information that must be recorded in a log for every amateur radio station? For how long must the log be preserved? [97.103, 97.105]

Who must retain possession of the log? [97.103]

What determines the operator privileges at an amateur radio station where the control operator is

other than the station licensee? How should the station be identified? [97.79]

What is the definition of a control point? Which types of amateur radio stations must have a control point? [97.3q, 97.79b]

In what manner and at what intervals, must an amateur radio station be identified by the transmission of its call sign? [97.87]

What are the rules regarding the transmission of interference? Music? Codes and ciphers? Obscenity? Indecency? Profanity? False signals? Unidentified radio communication or signals? [97.115 to 97.125]

When is a notice of operation away from the authorized location of an amateur radio station required? Where must the notice be sent? [97.95, 97.97]

What are the requirements in order to qualify for the special provisions in the Rules for stations used only for radio control of remote craft and vehicles? [97.99]

What are the consequences should the holder of an amateur radio operator license obtained by mail examination under the supervision of a volunteer examiner, be ordered to appear for a Commission supervised examination and fails to do so or fails to pass the examination? [97.35]

B. Radio Phenomena

What are the propagation characteristics of the hf and vhf amateur frequency bands?

N34, G36.

What are some propagation factors that influence radio transmission and reception of the amateur frequency bands? On the vhf amateur frequency bands?

A6, A36, A47.

C. Operating Procedures

What are some good operating procedures that can be employed to minimize interference and congestion of the amateur frequency bands?

G44.

In what manner should an amateur radio station be operated in all respects not specifically covered by the Rules?

97.77.

D. Emission Characteristics

What system is used in the Rules for classifying and designating emissions from amateur radio stations?

G6.

What are the characteristics and standards of good quality telephony emissions from amateur radio stations?

G40, G47, A25.

What range of audio frequencies is usually adequate for excellent voice intelligibility in communication systems?

500 to 2500 Hz.

How is voice information conveyed in frequency modulated emissions? In phase modulated emissions? In amplitude modulated emissions?

N21, G49, G50, A43, E18.

What is meant by the occupied bandwidth of an emission?

G39, E82.

What is wideband F3 emission? Narrowband F3 emission? On what amateur frequencies may each be used?

G6 [97.61]

What is the maximum percentage of modulation permitted by the Rules? What does the term mean?

G15, G19, G40, A59, E1, E2.

What is peak-envelope power (PEP) in an emission from an rf amplifier? How can it be determined? How can the PEP input to the final amplifying stage(s) supplying power to the antenna be determined?

G15, A44.

What is average power in an emission from an rf amplifier? How can it be determined? How can the average power input to the final amplifying stage(s) supplying power to the antenna be determined?

G15, G61.

In a single sideband, suppressed carrier A3 emission (ssb) transmitter what determines the PEP-to-average power ratio? What are typical values?

A8, A27.

What does the term "S/D ratio" in a ssb transmitter mean? How can the S/D ratio be determined?

The S/D (sideband distortion) ratio in an ssb transmitter is the ratio in dB between the peak carrier amplitude and the 3rd- and 5th-order IMD (intermodulation distortion) products. The ratio can be determined by subjecting the signal to spectral analysis while feeding a two-tone signal into the audio channel of the transmitter and observing the IMD level on the spectrum analyzer display tube. An alternative method might be to sample the transmitter output and supply the signal (under two-tone modulation) to the input of a highly selective receiver which has an S meter of accurate calibration. Tuning across the spectrum near the desired signal will provide responses at the 3rd and 5th order frequencies. The level of the responses can then be compared to the carrier frequency to establish the power ratio in dB.

What is "RFI"? What are some common RFI problems encountered by amateur radio stations? What are the solutions to the problems?

G9, A24, E8, E41, E54, E78

E. Electrical Principles

How do resistors combine in parallel and in series? Capacitors? Inductors?

G23, G27, G54.

How does voltage division occur across series-connected resistors? Capacitors? Inductors?

G59.

What is impedance? Inductive reactance? Capacitive reactance? How do like reactances combine in series? In parallel?

G35, E16.

What is Ohm's Law? How does it relate to resistive and reactive impedances?

N29, G8.

What is impedance matching and when is it important?

N49, G12, A2, E62.

What is a decibel? An "S" Unit?

An S unit is an arbitrary number of decibels used as a measurement reference. Signal-level meters on communications receivers often have S-unit divisions from 0 to 9. Above S 9 the meter divisions are generally rendered in decibels. Some manufacturers use 6 dB per S unit, while others have chosen the standard of 5 dB per S unit. See also E37.

What are the distinguishing features between series and parallel resonant circuits? How is the resonant frequency determined? What is the "Q" of a series resonant circuit? Of a parallel resonant circuit?

G4, G7, G24.

What is the operating principle of a transformer? How does a transformer provide a desired voltage? A desired impedance?

G2, A38, E32.

F. Practical Circuits

Why do circuits oscillate?

G55A17, A57, E28, E31.

What are some ways of minimizing harmonic generation in frequency doublers, vacuum tube amplifiers, transmission lines, and antennas?

N33, E78, E79. *Note:* Harmonic energy cannot be generated in a transmission line or an antenna. However, poor electrical connections in the antenna system can cause rectification, thus enhancing the possibility of harmonic radiation. Certain kinds of antennas are capable of radiating harmonics of the fundamental frequency supplied to them, thereby requiring that harmonic-suppression measures be taken at the transmitter end of the antenna system.

What are the main classes of vacuum tube amplifier operation and for what uses is each class best suited? What are the typical efficiencies associated with each?

G41, A19, E42.

What is neutralization and how does it contribute to proper amplifier operation? What procedure should be followed to properly neutralize an rf amplifier?

G51, G56, A18, A60, E53.

Compare the operating characteristics of grounded-grid, grounded-cathode and grounded-plate amplifiers.

G43, A66. The output signal from a grounded-grid or grounded-plate amplifier will be in the same phase as the input signal. A phase shift of 180 degrees exists between the input and output signals of a grounded-cathode amplifier.

Why are resonant circuits used in rf amplifiers?

Resonant circuits are used in rf amplifiers to effect impedance matching between grid and source, and between plate and load. Resonant circuits afford needed selectivity to reduce harmonic output from the amplifier stage, or, in the case of a receiver rf amplifier, to provide selectivity for rejection of unwanted out-of-band signals. Tuned circuits also serve to increase the effective gain of an rf amplifier by permitting it to function as a narrow-band device.

G. Circuit Components

What is the principle of a semi-conductor diode? A transistor? Compare the elements of a solid-state diode with those of a vacuum tube. Compare the elements of a transistor with those of a triode vacuum tube.

N46, N48, A46, E39.

What is the principle of an electrolytic capacitor? Why are they widely used in amateur radio equipment?

G21.

What is a toroidal inductor? What are its advantages and disadvantages compared to air-wound inductors?

A toroidal inductor is one that is wound in a doughnut shape, sometimes on powdered or tape-wound iron core material. Toroid cores are also made from ferrite material, but can be made from any material capable of serving as a coil form without shorting the turns of the completed inductor. Toroidal inductors have the advantages of being self-shielding, electrically, and are often more compact in format for a given Q and inductance value.

H. Antennas Transmission Lines

How is the approximate length of a half-wave dipole related to its resonant frequency? How is the approximate length of a quarter-wave antenna related to its resonant frequency?

G46, A68.

Compare the characteristics of a horizontal half-wave dipole with those of a quarter-wave ground plane antenna.

G13. Vertical ground-plane antennas radiate a vertically polarized signal at low angles of radiation. They require an image ground system (radials) in order to be effective. A vertical ground plane radiates in an omnidirectional manner. A horizontal dipole does not require an artificial ground system, and radiates a bidirectional, horizontally polarized signal if erected one half wavelength or more above ground. The closer it is to ground, the higher the angle of radiation and the less pronounced its directivity.

How may a center-fed, horizontal, non-resonant antenna be used on several hf bands?

E79. If tuned feeders are used with this antenna, a Transmatch (impedance-matching tuner) can be connected between the transmitter output (and receiver input) and the feed line to tune the system to resonance at the operating frequency. Transmatches also provide the necessary transformation from balanced to unbalanced line conditions and offer significant rejection to harmonic energy present in the transmitter output. The latter is an important consideration when operating a center-fed antenna on several amateur bands.

What is standing-wave ratio (SWR)? How can the

SWR on a transmission line be determined from the incident and reflected voltages?

G12, E44.

What are the major characteristics that determine the characteristic impedance of a parallel-conductor transmission line?

G12, G28.

What are the major factors that determine the characteristics of a coaxial transmission line?

The characteristics of a coaxial transmission line are determined by its velocity factor (electrical length), as determined by the dielectric material used in its manufacture. The characteristic impedance of air-dielectric coaxial line is determined by:

$$Z_0 = 138 \log b/a$$

where Z_0 = Characteristic impedance

b = Inside diameter of outer conductor

a = Outside diameter of inner conductor

If the line is filled with solid-dielectric material, the characteristic impedance as given by the formula should be multiplied by $1/K$, where K is the dielectric constant of the insulating material.

I. Radiocommunication Practices

What is the one instrument that will give more information accurately, for the proper adjustment of a radiotelephone transmitter, than will any other collection of instruments generally available to amateur operators? How is it used?

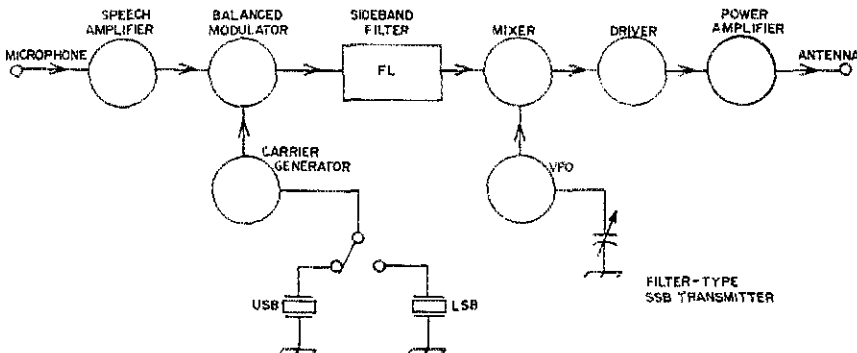
E12, E14.

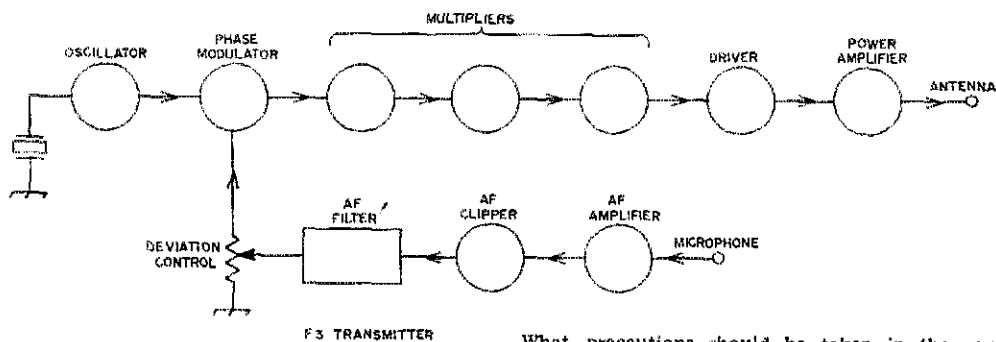
How is the input power to the plate circuit of the final amplifying stage of a ssb transmitter determined? If power to antenna is also supplied by the driver stage, how is the power determined?

The maximum authorized power is one kilowatt dc input, which is interpreted to be the product of the dc plate voltage by the dc plate current during the largest voice peaks registered on the plate-current meter. The meter must be one having a time constant of not over 0.25 second (practically all panel-type milliammeters and ammeters used in amateur equipment meet this requirement). The one-kilowatt power limitation is an inclusive one applying to all stages supplying power to the antenna; e.g., if the final amplifier is a grounded-grid stage, the sum of the inputs to the driver stage and final stage must be used in determining the power input, since the driver stage contributes some rf output power to the antenna.

What are basic stages of a filter system ssb transmitter? What is the purpose of each stage?

A3.





F3 TRANSMITTER

What are the basic stages of a transmitter for F3 emission? What is the purpose of each stage?

What precautions should be taken in the construction and operation of amateur radio equipment to avoid the danger of electric shock?
N40, G38

QST

Silent Keys

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

W1AI, Horace R. "Hod" Perty, Saco, ME
 W1ATQ, Nelson L. Abbott, Portland, ME
 W1BRK, Roderick Amidon, Petersham, MA
 W1DHG, Richard G. Wilder, Manchester, CT
 K1DZW, Edward D. O'Connell, Ludlow, MA
 W1FEG, Stanley V. Wilk, Jr., New Britain, CT
 W1HPE, Peter S. Gillis, Newport, RI
 K1UZZ, Alex Choronty, Bridgeport, CT
 K1YXQ, Bernard C. Kaler, Rockland, ME
 W2AKX, Albert J. Santmier, Jr., Dolgeville, NY
 WB2JZK, Mace N. Mason, Sunnyside, NY
 W2KAE/WA4BGX, Lloyd E. Brown, Jamesburg, NJ
 WA2MZR, Wayne H. Goldsmith, Glen Oaks, NY
 WB2THK, Sebastian W. Genovese, East Northport, NY
 W2VC, Louis J. Varson, Whiting, NJ
 W2VMZ, Milton Unger, Brooklyn, NY
 W3AJO, Kermit B. Crowell, Philadelphia, PA
 W3AWN, Clinton A. "Cap" Petry, Crofton, MD
 W3BIO, Wilbur W. Hiehle, Hagerstown, MD
 WA3GJL, Joseph R. Vogan, Pittsburgh, PA
 K3GWM, George W. MacCool, Philadelphia, PA
 W3NKS, William L. Simms, Timonium, MD
 WN3SYZ, Harold W. Reitz, Sunbury, PA
 WA3TLZ, Stephen L. Creasy, Mifflinville, PA
 K3UIK, William Barczynski, Erie, PA
 W3VC, Everard M. Williams, Pittsburgh, PA
 *W3ZF, John S. Marsh, Bethlehem, PA
 K4AW, Reeve O. Strock, Hendersonville, NC
 W4CML, Etheridge L. Carson, Savannah, GA
 K4DH, Robert J. Cassidy, Greenville, SC
 Ex-W4DHz, David Evans, Montecito, CA
 WB4EJF, Diane M. Falls, Sharpsburg, GA
 W4NGD, Ralph E. Potter, Arlington, VA
 WB4PTE, Patrick A. Fastabend, Bon Air, VA
 K4RCO, William T. Smith, Green Brier, TN
 W4RWM, Fred W. DeMotte, Daytona Beach, FL
 WB4SAC, Ted R. Yagle, Ft. Lauderdale, FL
 WA4VFI, J. Normand Hardy, Lehigh Acres, FL
 WA4WDP, Michael J. Ruskim, North Bay Village, FL
 W4ZKC, Paul B. Landen, Morrow, GA
 W5EMM, Samuel H. "Jack" Hairston, Jr., Lauderdale, MS
 W5KD/W5ZZ, Harold A. Schonwald, Oklahoma City, OK
 K5KSI, Aubin J. Myers, Houston, TX
 EA-W5ZC, Frank M. Corlett, Dallas, TX

W6ALV, Oscar Zimmerman, Alameda, CA
 W6AXL, Paul J. Schwartz, Inglewood, CA
 K6CFF, Hercul LeVaughn Shipley, Sacramento, CA
 W6CZ1, Raymond V. Rukke, Monterey, CA
 W6EGB, Donald G. Wright, San Luis Obispo, CA
 W6LQX, John R. Schick, Santa Ana, CA
 W6MRV, Louis A. Perasso, San Francisco, CA
 K6QHL, Edwin W. Walworth, Elk Grove, CA
 WB6TIV, Herbert A. Coffin, San Diego, CA
 W6TU, Harold W. Leighton, No. Hollywood, CA
 K6WC, Clifton H. Watson, San Diego, CA
 K7EKF, Allen L. Andersen, Portland, OR
 W7FLI, John I. Carter, Coalville, UT
 W7FP, Leland S. Wilson, Freeland, WA
 WN7NCH, Arthur L. Payne, Missoula, MT
 K7OXT, Joseph C. Jezulin, Salem, OR
 Ex-8AGZ, Claude J. Carter, E. Cleveland, OH
 K8DBC, Charles S. Getz, Hanoverton, OH
 W8LDZ, Edgar F. Killingbeck, Sr., Beattyville, KY
 W8LBT, James F. Short, Huntington, WV
 K8PGV, Ernest M. Mann, Pontiac, MI
 W8VA V, Glenn L. Brown, Cincinnati, OH
 W9CX, William P. Willing, Oak Park, IL
 W9EV, Ralph W. Ballard, Harvey, IL
 W9EXH, Albert F. Freybler, LaCrosse, WI
 W9FII, Fred Sawyer, Evansville, IN
 K9IAY, Bernard H. Appleby, Chicago, IL
 W9LJN, John J. Zeglin, Chicago, IL
 W9LSB, Carl Grunden, Alexandria, IN
 WA9PNR, Trevor K. Cramer, Crawfordsville, IN
 K0EJF, Gerald W. Smith, Rapid City, SD
 W0FJZ, Fred B. Williams, Rapid City, SD
 W0EXF, Joseph Jenny, Malmo, NE
 WA0IZG, Price E. Thomas, Kirksville, MO
 K0JAY, Clarence C. Jackson, Joplin, MO
 W0LCO, Herbert Williams, St. Joseph, MO
 W0MMN, Ralph R. Lewis, Harper, IA
 K0RME, August F. Eugas, Tyler, TX
 K0ZGM, Leonard E. Burns, St. Louis, MO
 K0ZNN, Paul S. McKinney, Dix, NE
 VE3DIF, Robert E. Robinson, Agincourt, ON
 VE3FMM, E. G. Mahoney, Ottawa, ON
 KL7HEG, James R. Fox, College, AK
 GCBMF, Tom DePutron, Guernsey, Channel Islands
 HB9IB, Roland Corfu, Bern Switzerland
 ON4QF, Paul Hiernaux, Brussels, Belgium
 * Life Member

Hamfest Calendar

California - The Mission Trail Net's 36th Annual Roundup is June 16, 17 at Calavenas B 19 Tree Park in Arnold. Host and hostess are Clint and Buelah Barrick, W6CP and W6NLM. Registration fee including a dinner is \$6.50. Hams and their families are welcomed to this family-styled affair. For details write W. C. Long, K6EVQ, Box 151, Buelto, CA 93427.

Pennsylvania - The Williamsport and Milton Clubs' Tenth Annual Penn-Central Hamfest is Sunday, June 3, at the Union Township Volunteer Firegrounds on Rt. 15 in Winfield. Indoor and outdoor facilities for contests, auction and flea market. Starts at noon. Gate registration is \$3, XYL and children free, free parking. Talk-in on 3940 and 146.52/146.94 MHz. More info from Clair Yeagle, WA3QXI, 714 N. Main, Watsonstown, PA or call (717) 538-9292.

Pennsylvania - The Harrisburg Radio Amateurs Club, Inc. Hamfest is Sunday, July 1 at the Indian Echo Caverns between Harrisburg and Hershey off Rt. 422-322. Entire pavilion reserved for ham activities 10 AM to 4 PM. Registration is \$2 at the door.

Illinois - The Egyptian Radio Club's Annual Ham Picnic is Sunday, June 24 at the club grounds, 700 Chouteau Slough Rd., Granite City. Something for everyone - games for the children, food at the club house, parking for swaps, etc.

Illinois - The Radio Expo '73 is at the Lake County Illinois Fair Grounds on July 7, 9. For more info write PO Box 1014, Arlington Hts. IL 60006.

Indiana - The M.R.A. 2nd Annual (Father's Day) Hamfest is June 17 at 8103 Austin Rd., Schererville, 8 AM to 4 PM, free coffee, plenty of parking. Call-in 146.94 fm. All sellers, buyers, swappers and browsers are invited.

Iowa - The Des Moines Radio Amateur Asso.'s Des Moines Hawkeye Hamfest is Sunday, June 17 from 8 AM to 6 PM in the Town Arena of the Iowa State Fair Grounds. Free parking, refreshments, flea market, dealer displays, XYL activities, auto racing and camping on Saturday Night, extra. Small charge for limited number of covered booths and extra tables. Free open area inside the arena. Registration \$1.50 advance, \$2 at gate. Write Des Moines Radio Amateur Asso., PO Box 88, Des Moines IA 50301.

Missouri - The Annual Hambutcher's Net picnic is July 28, 29 located at Shadow Rock Park in Forsyth, southeast of Springfield on Hwy. 160. Music and eyeball QSO Saturday night. Bring a covered dish and your eating gear for a big feed on Sunday. Activities in the shelter house at the park. For info contact Herbert M. Peery, WØGQR, Box 313, Trenton, MO 64683.

Montana - The Prairie Radio and Electronics Club of Wolf Point's 18th Annual Ham Picnic is June 18 at Bridge Park. Hams from Montana, North Dakota and Canada will attend. For details write Russell G. Hustad, WA7SQU, Box 305, Wolf Point, MT 59201.

Nebraska - The Pine Ridge Amateur Radio Club's Annual Hamfest Picnic is at Chadron State Park, 9 miles south of Chadron on Sunday, June 3. Free registration is at 9:30 AM. All amateurs and families welcome, bring a covered dish and eating utensils, the club will furnish soft drinks and coffee.

New York - The 7th Annual Meeting of the Medical Amateur Radio Council is Thursday, June 28 in conjunction with the Annual Meeting of the A.M.A. at the Hotel Plaza in New York City. The membership meeting is at 10 AM when election of officers and the presentation of 3 short papers will take place. In the afternoon a scientific session

includes presentation of papers, talks, tapes and films. The banquet begins at 7:15 PM. The meeting is open to all amateurs who hold doctorate degrees of any type in the medical field and to nurses and other medical technicians who may qualify for associate membership. For info write Joseph J. Boris, MARCO, PO Box 229, Manchester, CT 06040.

New York - The 1973 Hamburg International Hamfest is September 15 only 45 minutes from Niagara Falls. RV parking for the weekend only \$2.50 with hook-up. Write Valerie Orgera, K2KQC, 187 Main, Hamburg, NY 14075.

North Dakota - The 10th Annual International Hamfest is July 7, 8 at the American Lodge in the International Peace Garden between Dunesith, ND and Boissevain, Manitoba. Camping excellent, party, contests. For details write Mel McKnight, WAØSJB, 909 Main St., Bottineau ND 58318 or Ron Samchuk, VE4SR, 834-9th St., Brandon MB, Canada.

Ohio - The Goodyear Amateur Radio Club's 6th Annual Hamfest Picnic is June 17 at Goodyear Wingfoot Lake Park East of Akron, 1 mile west of Suffield on County Rd. 87 near 043. Come for fellowship, Swap n' Shop, refreshments, displays, and a huge flea market. Hours 10 AM to 6 PM. Family admission \$2.50 at gate, \$2 prepaid. For details, tickets, and map, write Floyd Gilbert, 1976 Newdale Ave., Akron OH 44320.

Texas - The 28th Annual Convention of the South Texas Emergency Net is June 8-10 at the Holiday Inn West on I 10W Houston. For info write WA5FVH, Sue 27221 Lana Lane, Conroe, TX 77301.

COMING ARRL CONVENTIONS

- June 2-3 - Florida State, Orlando.*
- June 9-10 - Georgia State, Atlanta.*
- June 30-July 1 - Rocky Mountain Division, Cheyenne, Wyoming.
- June 30-July 1 - West Virginia State, Jackson's Mill.
- September 14-16 - Roanoke Division, Reston, Virginia.
- September 29-30 - New England Division, Hyannis, Massachusetts.
- October 5-6-7 - Midwest Division, Lincoln, Nebraska.
- October 13-14 - Pacific Division, Santa Cruz, California.
- October 20-21 - Southwestern Division, Burbank, California.

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

* Description, page 93, May QST.

WEST VIRGINIA STATE CONVENTION

Jackson's Mill June 30-July 1, 1973

Jackson's Mill, 3 miles North of Weston, is the site for the 15th Annual ARRL West Virginia State Convention. In addition to the regular events and meetings, some special events are planned. Lewis G. McCoy, WIICP, will conduct a technical session

(Continued on page 99)

I A R U News

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

MANAGUA POSTSCRIPT

Through the courtesy of the *Liga Mexicana de Radio Experimentadores* and IARU Region II President XE1CCP, we are able to provide an additional perspective on the part played by radio amateurs in the Managua relief efforts (p. 67, April QST). The following is condensed and translated from reports in Spanish by Dr. Luis Raymundo Cervantes, XE1IJ, and the *Asociacion Mexicana de Rescate* (Civil Defense).

In the early hours of December 23, XE1IJ was tuning 20 meters when he heard his friend Emita, YN8EP. On making contact, he learned that a tremor had been felt in Esteli, a town 150 km from Managua. XE1IJ stayed on frequency in case he could be of assistance.

At 7 A.M. the President's office called and asked if there was any news from Managua. This call was followed by others from the Red Cross and news agencies, but it was the President's office as the coordinator of relief flights which was most in need of information, particularly about the condition of the airport at Managua. YN1AZ was located at the airport, but due to the heavy traffic it was impossible to make contact with him before his gasoline supply gave out that evening. On learning of this, the *Asociacion Mexicana de Rescate* decided to send its own station, XE1RES, to Managua and obtained permission to put the equipment and operators aboard the Presidential relief flight. Operators included XE1s IJ and MMD. The plane, a DC9, arrived at Managua in the early morning on the 24th. The station was first set up at the Red Cross building and traffic was handled with Red Cross organizations throughout the hemisphere. Later, the equipment was moved to the home of General Somoza and direct contact with Mexican President Luis Echeverria was provided through XE1AZ in Mexico City. Through this amateur radio link, aid shipments of food, antibiotics, and surgical instruments were arranged.

After 60 hours of continuous operation by XE1RES/YN, telephone service was restored and the operators returned to Mexico.

RSGB DIAMOND JUBILEE

Next month marks the sixtieth anniversary of the founding of the "London Wireless Club," later to become the *Radio Society of Great Britain*. ARRL joins all IARU societies in saluting the RSGB during its Diamond Jubilee Year, and thanks the Society for its continued close cooperation for the benefit of amateur radio worldwide.

SOLAR ECLIPSE PROPAGATION EXPERIMENT

On June 30, a total eclipse of the sun will take place over portions of South America and Africa. In conjunction with this event, a high-frequency propagation experiment will be carried out from an amateur station at Akjoujt, Mauretania (West Africa). The special call sign 5T5SOL will be used on 14.050 and 21.050 MHz from 0930 to 1130 GMT, beginning a half hour before the start of the eclipse at that location and continuing until a half hour after its end. Amateurs are requested to keep these frequencies clear for the duration of the experiment.

Operators at the experimental station will be 5T5AD and 5T5CJ. Reception reports are welcomed, and should be sent to S. Canivenc, F8SH, 6 rue de Pont Hele, 22700 Perros Guirec, France.

ANNIVERSARY NOTES

This year the City of Belfast YMCA Radio Club, G16YM, celebrates its golden jubilee. A high level of activity from the club station will be maintained in recognition of the event.

In addition, the Ballymena Amateur Radio Club will mark the 75th anniversary of the first use of radio in the public service by operating special station GB3MKB from Ballycastle, Northern Ireland during the period June 30 to July 7. The



OZ1LO was presented with the plaque for high European cw score in the 1972 ARRL DX Contest at a recent gathering of leading Danish DXers. Left to right are EDR president OZ3Y, OZ6MI, OZ2VO, OZ5GF, OZ1LO, OZ7HT, OZ5DX, and OZ3PO.

QST for

This edifice houses the headquarters of Radio Peking, a broadcast station well known to amateurs from its use of exclusive amateur 40-meter frequencies. (Photo by W8DWJ)



event being commemorated is the establishment in 1898 of a wireless link between Ballycastle and Rathlin Island off the North Irish coast to report ships passing the northeast corner of Ireland. This link was the result of tests by the early experimenters Marconi and Kemp.

A special award commemorating both events is being made available by the City of Belfast YMCA Radio Club, Wellington Place, Belfast 1, Northern Ireland.

QSL BUREAUS OF THE WORLD

For delivery of your QSLs to foreign amateurs, simply mail cards to the bureau of the proper country as listed below. Cards for territories and possessions not listed separately may be mailed to the bureau in the parent country; e.g., cards for VP8s go to RSGB in Great Britain. W, K, VE and VO stations only may send foreign cards for which no bureau is listed to ARRL. See "How's DX?" for QSL information on specific stations.

Algeria: ARA QSL Service, P. O. Box 2, Algier R.P.

Angola: LARA, P. O. Box 484, Luanda

Antarctica: Dave Porter, K2BPP, Mountainside Rd., Mendham, NJ 07945

Argentina: RCA, Carlos Calvo 1424, Buenos Aires, BA

Austral/French Antarctic Lands: via Malagasy Republic

Australia: VK1 QSL Officer, VK1ACA Canberra Radio Society, P.O. Box 1173, Canberra City, A.C.T. 2601; VK2 QSL Officer WIA Hunter Branch, P.O. Box 134, Charlestown, N.S.W. 2290; VK3 QSL Bureau, Mr. E. Trebilcock, 340 Gillies St., Thornbury, Vic. 3071; VK4 QSL Officer, P.O. Box 638, G.P.O. Brisbane, Qld. 4001; VK5 QSL Bureau, Mr. Geo. Luxon, VK5RX, 27 Belair Rd., Torrens Park, S. Aust. 5062; VK6 QSL Bureau, Mr. J. Rumble, VK6RU, Box F319, GPO Perth, W.A. 6001; VK7 QSL Bureau, P.O. Box 371D, G.P.O., Hobart, Tas. 7001; VK8, 9, Ø, Federal QSL Bureau, 23 Landale St., Box Hill, Victoria 3128.

Austria: OeVSV, Box 999, A-1014 Vienna

Azores: via Portugal

Bahama Islands: BARS, Box 6004, Nassau

Bahrain: (All MP4) Ian Cable, MP4BBW, P.O. Box 425, Awali

Barbados: ARSB, Box 814E, Bridgetown

Belgium: UBA, Postbox 634, 1000 Brussels

Bermuda: RSB, Box 275, Hamilton

Bolivia: RCB P.O. Box 2484, Cochabamba

Brazil: LABRE QSL Bureau, P.O. Box 070004, 7000 Brasilia DF

Bulgaria: CRCB, Box 830, Sofia

Burundi: via Zaire QSL Bureau

Canada: See ARRL QSL Bureau in this issue

Canal Zone: Lee DuPre, KZ5OD, Box 407, Balboa
Cape Verde Islands: RCCV, CR4AA, Praia, Sao Tiago

Ceylon: RSC, P.O. Box 907, Colombo

Chagos: via Seychelles

Chile: RCC, P.O. Box 13630, Santiago

Colombia: LCRA, P.O. Box 584, Bogota

Cook Island: ZK1 QSL Bureau, % Radio Station Rarotonga, Rarotonga

Costa Rica: RCCR, Box 2412, San Jose

Cuba: FRC, Apartado 1, Habana

Cyprus: CARS QSL Bureau, P.O. Box 216, Famagusta

Czechoslovakia: CRC, Box 69, Prague 1

Denmark: FDR QSL-Central, Harry Sorensen, OZ6HS, Ingstrup Hovdegaden 51, DK 9480-Lokken

Dominican Republic: RCD, P.O. Box 1157, Santo Domingo

Ecuador: GRC, P.O. Box 5757, Guayaquil

El Salvador: CRAES, P.O. Box 517, San Salvador

Ethiopia: Telcoms ARC, Box 1047, Addis Ababa

Faeroe Islands: OY-QSL Bureau, P.O. Box 184, 3800 Torshavn

Fiji Islands: QSL Bureau, P.O. Box 184, Suva

The International Amateur Radio Club in Geneva operates station 4U11TU, which has just been moved to new quarters on the third floor of the ITU headquarters building. Shown here are IARC secretary F8RU and president HB9AJ1/WØDW.



Finland: SRAL, Box 306, 00101 Helsinki 10
France: REF, Boite Postale 70, 75560 Paris Cedex 12
French Oceania: RCO, P.O. Box 374, Papeete, Tahiti
Germany: DARC Amateurfunk-Zentrum, P.O. Box 1155, D3501 Baunatal 1
Ghana: GARS QSL Bureau, P.O. Box 3773, Accra
Gibraltar: RAF Amateur Radio Club, RAF North Front, Gibraltar
Great Britain: (and British Commonwealth): RSGB QSL Bureau, G2MI, 29 Kechill Gardens Bromley, Kent BR2-7NH
Greece: RAAG, P.O. Box 564, Athens-107
Greece: (SVØ only): % Mars Station, APO NY 09223
Greenland: via Denmark
Greenland: (U.S. Personnel) OX5A-E via MARS Director, XPIAA, 1983 Comm. Sq., APO New York 09023. OX4F-H via MARS Director, XPIAB, 2004 Comm. Sq. APO NY 09121
Guam: MARC, Box 445, Agana, USPO 96910
Guantanamo Bay: GARC, Box 12, FPO, New York, NY 09593
Guatemala: CRAG, P.O. Box 115, Guatemala City
Haiti: RCH, Box 70-B, Port-au-Prince
Honduras: RCH, Apartado 273, San Pedro Sula
Hong Kong: HARTS, P.O. Box 541
Hungary: HSRL, P.O. Box 214, Budapest 5
Iceland: IRA, Box 1058, Reykjavik
India: ARSI, QSL Bureau, P.O. Box 534, New Delhi 1
Iran: ARSI, Box 1000, APO New York NY 09205
Ireland: IRTS, QSL Bureau, P.O. Box 462, Dublin 9
Israel: IARC QSL Bureau, P.O. Box 65, Herzliya
Italy: ARI, Via D. Scarlatti, 31, I-20124 Milan
Ivory Coast: ARAI, B.P. 20036, Abidjan
Jamaica: JARA, Red Cross Bldg., 76 Arnold Rd., Kingston 5
Japan: (JA): JARL, Box 377, Tokyo Central
Japan: (KA only): FEARL-M, HQ 5AF, Box 1414 APO, San Francisco, 96525
Japan: (KA6 only) KA6 QSL Bureau, ORC, Ft. Buckner, APO, San Francisco 96331
Johnston Island: KJ6BZ, % MARS Stn., Det. 1, 1957 Comm. Gp., APO, San Francisco 96305
Jordan: RJRAS, P.O. Box 2353, Amman
Kenya: RSEA QSL Bureau, P.O. Box 45681, Nairobi
Korea: KARL, Central Box 162, Seoul
Korea: (HL9) HL QSL Bureau, Signal Section, USFK/EUSA, APO, San Francisco 96301
Kuwait: Alhalf Nasir H. Khan, 9K2AN, P.O. Box 736, Kuwait, Persian Gulf
Laos: Houmphanh Saignasith, XW8AL, P.O.B. No. 115, Vientiane
Lebanon: RAL QSL Bureau, P.O. Box 8888, Beirut
Liberia: LRAA, Post Box 1477, Monrovia
Liechtenstein: via Switzerland
Luxembourg: R. Schott, 35 rue Batty Weber Esch-Alzette
Macao: via Hong Kong
Madeira Islands: via Portugal
Malagasy Republic (Madagascar): QSL Bureau, P.O. Box 587, Tananarive
Malawi: H.Y. Bvumbwe, 7Q7AE, P.O. Box 24, Blantyre
Malaysia: QSL Manager, MARTS, Box 777, Kuala Lumpur
Maldives: (8Q6) via Ceylon
Maldives: (VS9) via Great Britain
Malta: 9H QSL Bureau, P.O. Box 575, Valletta
Mariana Islands: see Guam
Marshall Islands: KX6 QSL Bureau, via KX6BU, Box 444, APO, San Francisco 96555
Mauritius: Paul Caboche, 3B8AD, Box 467, Port Louis
Mexico: LMRE, P.O. Box 907, Mexico, D.F.
Midway Islands: KM6BI, Box 14, FPO, San Francisco 96614
Monaco: ARM QSL Bureau, Pierre Anderhalt, 3A2CN, 41 Bd du Jardin Exotique
Mongolia: JT1KAA, Box 639, Ulan Bator
Morocco: AAEM, P.O. Box 299 Rabat
Mozambique: LREM QSL Bureau, P.O. Box 812, Laurengo Marques
Netherlands: VERON, Postbox 400, Rotterdam
Netherlands Antilles: VERONA, P.O. Box 383, Willemstad, Curacao
New Zealand: NZART, P.O. Box 489, Wellington
Nicaragua: CREN QSL Bureau, Apto. 925, Managua
Nigeria: NARS QSL Bureau P.O. Box 2873, Lagos
Northern Ireland: via Great Britain
Norway: NRRL, P.O. Box 21, Refstad, Oslo 5
Oman: ROARS, Box 981, Muscat
Pakistan: LARS, P.O. Box 65, Lahore
Panama, Republic of: LPRA, P.O. Box 9A-175, Panama 9-A
Papua: Via VK9 QSL Bureau
Paraguay: RCP, P.O. Box 512, Asuncion
Peru: RCP, Box 538, Lima
Philippine Islands: PARA QSL Bureau, P.O. Box 4083, Manila
Poland: PZK QSL Bureau, P.O. Box 320, Warsaw 1
Portugal: REP, Rua de D. Pedro V., 7-4, Lisbon
Puerto Rico: Alicia Rodriguez, P.O. Box 1061, San Juan 00902
Rhodesia: RSSR, P.O. Box 2377, Salisbury
Romania: CRC, P.O. Box 1395, Bucharest 5
Rwanda: Box 663, Kigali
Samoa (American): D. E. Earnest, KS6DY., P.O. Box 1618, Pago Pago 96799
Samoa (Western): Director of Post Office and Radio, Post Office, Apia
Scotland: via Great Britain
Senegal: Ch. Tenot, 6W8BF, P.O. Box 971, Dakar
Seychelles: QSL Bureau, Box 191, Victoria, Mahe
Singapore: SARTS, P.O. Box 2728, Singapore 1
South Africa: SARL, P.O. Box 3037, Cape Town
Spain: URE, P.O. Box 220, Madrid
St. Vincent: QSL Bureau, P.O. Box 142, St. Vincent, West Indies
Surinam: VRAS, P.O. Box 566, Paramaribo
Sweden: SSA, Fack, S-12207 Enskede 7
Switzerland: USKA, c/o Franz Acklin, Sonnenrain 188, CH 6233 Buernon/LU
Syria: TIR, P.O. Box 35, Damascus
Tanzania: via Kenya
Thailand: RAST, GPO Box 2008, Bangkok
Trinidad and Tobago: T&TARS, P.O. Box 1167, Port of Spain
Uganda: via Kenya
United States: See ARRL QSL Bureau in this issue
Uruguay: RCU, P.O. Box 37, Montevideo
U.S.S.R.: CRC, Box 88, Moscow
Vatican: HVICN, Domenico Petti, Radio Station, Vatican City
Venezuela: RCV, P.O. Box 2285, Caracas
Virgin Islands: Graciano Belardo, KV4CF, P.O. Box 572, Christiansted, St. Croix, V.I. 00820
Wales: via Great Britain
Yugoslavia: SRJ, Bulevar Revolucije 44/II, P.O. Box 48, 11001 Belgrade
Zaire: UZRA QSL Bureau, B.P. 1459, Kinshasa 1
Zambia: RSZ, P.O. Box 332, Kitwe





Correspondence From Members -

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

RESTRICTIVE REGULATION - PART II

● The Cedar Valley (Iowa) A. R. C. shares concern for the recent trend of the FCC towards unreasonable regulation of the amateur radio service. In its apparent abandonment of a minimal regulation policy, FCC is disregarding the high level of technical competence gained by a self-governing amateur radio. Although we appreciate the need for more restrictive regulations from time to time, recently adopted and proposed amateur regulations seem to be over-reactive. Should these trends in policy making continue, the principles upon which the amateur radio was founded will be in jeopardy. - *Al Groff, KØVQM, President*

● . . . Those rules which apply to vhf repeaters are justified amply in my opinion. The flagrant CB style tangle and operating habits are sufficient argument for a curb. The amateur brought this one on himself.

There are other areas which require restrictive attention. Among these are flagrant commercial use of the ham bands, intra-continental phone patching which is unnecessary, etc. In short, the amateur is failing to regulate himself. I think that the Board should lend its effort toward this end rather than to assault the federal agency which is forced to step in. - *Roger V. Williams, W7DY, Worley, ID*

● We all know that tighter government controls aren't necessarily just a problem for amateur radio members only. This problem involves all facets of our present-day existence.

We are indeed fortunate to have an organizational composition with reliable leadership to present our views to those that are anxious to impose unrealistic restrictions on our activities.

We are 100% in favor of your present program. If our privileges aren't jealously guarded, some day we'll all wake up to the realization that they have disappeared like a thief in the night. - *Larry D. Drake, WNØGFY, Secy., Three Rivers (No. Dakota) R. C.*

● The reaction was unanimous to support the League in its efforts to bring realistic regulation back in amateur matters, and it was probably significant that some non-ARRL members present at the meeting expressed their support of the petition. - *Tom Powell, WA7GBU, President, Clallam County (Washington) A. R. C.*

● For the last 20 years I have been either associated with or active in ham radio. I have never been an ARRL member. At times I have been in agreement with the League, at other times in disagreement. And much of the time undecided as to who was right about a given issue.

However, after reading "A Resolution with the Board of Directors," I feel that the time has come for me to support ARRL. Don't get me wrong - I do not agree with all of your policies. But I do feel that your heart is in the right place. I would very

much like to see ham radio remain a mostly self-governing entity. After all, isn't that what this democracy business is all about? - *W. C. "Bill" Dirk, WN3UIW, White Haven, PA.*

● Some U.S. amateurs are concerned with the ARRL position. ARRL is a self-proclaimed representative and does not necessarily support the majority of the U.S. radio amateurs, either by deed or appointment. It is a national magazine which bestows automatic membership upon its subscribers. *QST* does not, therefore, represent the amateur any more than *Time* magazine represents the majority of the people of the U.S.

We cannot accept the ARRL premise that the FCC should pursue only "minimal regulations." The advanced technology of amateur communications today bears little resemblance to that of 1934. In fact Section 97.1(c) virtually directs the Commission to enact rules which provide for advancing skills in both communication and technical phases of the art. Modern regulations are needed, just as they are in other communication services. If the ARRL premise were accepted, then it would follow that all radio, TV and communication services would have little need for a national regulatory and governing body such as the FCC. Many amateurs, including myself, support the recent FCC rulemakings as necessary actions to keep pace with modern requirements. I would hope therefore, that the FCC will lend credence only to logical, constructive and well-founded recommendations. - *Jack Quinn, W6MZ, Menlo Park, CA.*

● I wish to respond to the report that a member of the FCC has expressed doubt that the American Radio Relay League represents the viewpoint of its membership and that it does not enjoy the privilege of representing non-membership views

In my 27 years of formal membership in the ARRL and my 40 years of reading the ARRL viewpoint in *QST*, the official journal of the ARRL, I have found no significant occasion on which to disagree with the view they represented as that of the membership. To be more explicit, it has represented my views as a member and as a non-member.

I am as appalled at a suggestion to the contrary as I am at the disproportionate additional restrictions proposed for the amateur service. - *Eugene W. Furley, W7TE, Salt Lake City, UT.*

● Although I have been a licensed amateur for some years, I have never been a League member. However, your March editorial and the accompanying resolution have convinced me of your willingness to face up to the problems confronting amateur radio today, as well as the necessity for all concerned amateurs to stand with you in this time of crisis.

My disagreement with many League policies persists, and as a League member I shall not fail to

voice my dissent whenever necessary. I would nonetheless emphatically urge those of my colleagues, who like me have disagreed with the League over the years, to set aside their differences and work to make the ARRL as strong a voice as possible. Today our very survival is at stake, and we need every bit of unanimity possible. Surely, the difficulties before us far outweigh our past disagreements. Surely, our common interests surpass our differences! — *William M. Klykylo, WA8FOZ, Pinconning, MI.*

● While many hams in this country do not seem to support ARRL, there are a great many of us who do consider the League to be our voice in official matters such as the new rulings now being considered. While there is always dissatisfaction with the organization and operations of any group with as diverse a membership as ours, it should not be mistaken for a feeling that the League does not represent hams! . . .

New rules that require lawyers hours to figure out the meaning of — and even the FCC does not seem to understand — make the League's representation a must. Do not mistake controversy within the League or relative silence from the "silent majority" as non-support of the League. — *W. C. Hunter, WB0JEY, Loveland, CO.*

● The resolution that FCC must be stopped from increasingly restrictive amateur rulemakings has convinced me that at least some members of the Board are actually cognizant of the happenings of the radio world. As long as the League continues to show an interest in the future of our operations, I intend to support the League. — *Robert R. Hale, WB6APU, WA6GNN, WB6QHJ, WA6ZOP, Rancho Santa Fe, CA.*

● The Pikes Peak Radio Amateur Association, Inc. is extremely concerned by recent trends in FCC rulings which directly affect our operating privileges, and we are equally concerned with the apparent FCC position that the ARRL is not our official spokesman in Washington.

The PPRAA hereby expresses strong support for our elected ARRL Board of Directors, and affirms our position that we consider the League to be an official spokesman for amateur radio operators on matters under consideration by the FCC. We further urge the FCC to seriously review recent developments which led to the adoption of the Resolution by the Board of Directors of the ARRL. — *Wayne G. Brown, W2TPV/0, President.*

● To paraphrase a conversation which I heard on the Houston repeater within the last seven days:

Q. What have you guys been doing lately?

A. We have been working on CB rigs.

Q. Why?

A. Well, with the attitude that FCC has toward repeaters these days, we won't be here much longer.

Q. I know that, but why CB?

A. Well, on CB you don't need a license, you can run as much power as you want, and FCC won't bother you!

Q. Well, all that you say is true, but why move to 27 MHz, why don't we just do that here on two meters?

Friends, I don't know what to say, but I know that we must not succumb to this type of operation. — *Michael E. Watson, K3MUH, Baytown, UT.*

● Scofflaw activity is self defeating; we must fight this new FCC hostility by legal means. We

should go to Congress and the courts to overturn the new highly restrictive rules such as Docket 19555, the "environmental" rule that effectively outlaws towers.

Ham radio is not the only amateur technological activity being attacked by the bureaucracy. Sport aviation and amateur boat building are also being threatened by new very restrictive regulations. The operating philosophy in Washington is that the citizen doesn't know enough to manage his own affairs and that he should be regulated "for his own good." In addition there is a growing belief that consumption is bad and that personal ownership of things should be discouraged. We technical men and women will have to fight for our rights (legally) or we are going to be stuck in the straitjacket. — *Nick Leggett, WA1PCM, Chicago, IL.*

● As an amateur radio operator I consider that ARRL officially represents me in all matters relating to amateur radio presented to the Commission and other organizations. I fully support the policies, programs, procedures, and recommendations of the ARRL. — *Warren E. Smith, WB0GTL, Lt. Col. USAR (Ret), Colorado Springs, CO.* Many members of the Satellite Amateur Radio Club of Vandenberg AFB are gravely concerned with this restrictive FCC trend. — *Milton E. Bramer, W6DKQ, Secretary* Amateur radio has contributed greatly to the nation in both service and radio technology. Since in the past such accomplishments have been achieved with minimal FCC regulation, we feel a restrictive policy would eventually inhibit the growth and development of amateur radio. Therefore, the San Bernardino Microwave Society supports the ARRL Board of Directors in their resolution. — *Edward R. Cole, K8MWA/6, Corresponding Secretary* The Central Coast Amateur Relay Society, a group of concerned amateurs involved in building and maintaining our three-band vhf/uhf communication network along the rugged Central coast of California for the past nine years, are unanimously behind your actions to seek more reasonable regulation of the amateur radio service. — *Frank T. Crowe, WB6UNH, Secretary* We concur with the ARRL Board of Directors relative to the initiation of a vigorous program to see more reasonable regulation of the amateur radio service. — *Kam F. Lai, KH6HGD, Secretary, Honolulu Amateur Radio Club, Kaneohe, Hawaii.* As a personal observation let me add that the collective sentiment of the members present was that the club was not doing enough in supporting the League's stand. Doubtless further recommendations in this direction will be submitted in subsequent meetings. — *Emmett Goodman, WA2JFA, Secretary, Grumman Amateur Radio Club* I do join and support ARRL in stemming the apparent trend to overly restrictive regulation by the FCC for the radio amateurs of America. — *George Stillman, KH6AN, Honolulu, HI* The resolution by the Board was read and there was a unanimous agreement. — *Harry S. Eberly, K3JOEN, Secretary Lancaster Radio Transmitting Society, Ephrata, PA* The Radio Club of Tacoma, Inc. unanimously passed a motion supporting the resolution and your efforts to curb restrictive and unrealistic regulations for amateur radio. — *J. Chris Jensen, WA7MJK, Secretary* The members and officers of the North East Georgia Amateur Radio Club express to you our complete agreement with and support of the resolution. If our club, which is affiliated with the League, can be of any service in

fulfilling the terms of the resolution, please do not hesitate to call on us. — *L. B. Cebik, W4RNL, President* The Ohio Council of Amateur Radio Clubs, along with the clubs which we represent, would like to go on record as unanimously supporting the recent resolution in the matter of the restrictive FCC regulatory policy. — *James W. Benson, W8OUU, Secretary* What do amateurs expect? What with profanity commonplace, standard operating procedures absent and the emanation of splatter the 'in' thing, the FCC is only trying to clean up what we should have a long time ago. What we need is more practice and less preaching. — *Alan Applegate, WB0BHE, Shawnee Mission, KS* The Kern County (California) Radio Club, Inc. voted unanimously in favor of supporting the stronger position of the ARRL in regards to the FCC. — *Dale Mooney, WA6DLA, Secretary* Picoram Radio Club, Monticello, Ill., supports the Board of Directors wholeheartedly and urge you to do everything possible to bring about a reasonable change in the attitude of the Commission. — *Fay H. Root, K9KGS, Cisco, IL* Chapter No. 1 of the O.B.P. Amateur Radio Club, St. Louis, MO, is in support of the resolution. We hope you communicate to the FCC our opposition to increasingly restrictive regulation of amateur radio. — *Charles J. Minners, W0EWD, Secy-Treas.* The members of the Eastern Suffolk (N.Y.) Radio Club are concerned to see restrictions being imposed on the amateur service which in the past has been under a minimum of resolutions. It would appear that the bureaucracy which is so prevalent in the rest of our government is finally reaching into the amateur rules and regulations. — *Peter H. Lawrence, WA2SWL, Secretary* The proposed rules regarding transmitting antenna height are discriminatory as related to amateur radio operators. Nowhere in this docket is any reference made to the control of the height of television and/or radio receiving antennas where it is not necessary to file an application with the FCC. — *Andrew Reuter, President, Southeastern Mass. Amateur Radio Ass'n Inc.* At our regular February meeting, concern was voiced over the drastic changes of FCC is recent years, seemingly against the radio amateur. Occasionally there comes a welcome one, such as incentive licensing. FCC is definitely restricting the wrong service. — *Carl G. Peterson, WB4MTN, President of Eastern Shore (Va.) Amateur Radio Club* Keep up the fine work. I think FCC is treating we amateurs like a group of criminals just now. You might think WE were the culprits instead of the C Bers and others. — *Peter H. Shavney, Jr., WA3OVH, Glenside, PA* We of the Radio Amateur Mobile Society, Inc. of Sacramento, CA, believe that it is unrealistic to apply a restrictive and inhibitive philosophy to a service which has such a long history of technical contribution, public service, proficiency in the art, and self control. — *Everett R. Lee, W6QYS, Secretary* I strongly resent the statement that repeater operators or any other hams share Richard Nixon's views. — *Warren Ziegler, WA2QQR, Staten Island, NY* It would lend credibility to the sincerity of the League's efforts to convince the FCC that the Amateur is capable of policing his own activities if *QST* would omit from its pages advertisements extolling the virtues of "3 kW amplifiers that run cool" and similar come-ons for the irresponsible. . . . — *Kenneth Hahn, W3LC, Philadelphia, PA* I think that the resolution puts into words the thoughts of many amateurs after the recent decisions by the FCC. — *Patrick E. Brown, WA9FCG/1, Dover-Foxcroft, ME* The

members of the Beloit (Wisc.) Amateur Radio Club, Inc. are happy to see the ARRL take a stand on the issues which confront us, and seek more reasonable regulation of the Amateur Radio Service. You may count on our support. — *Gerald C. Wallen, WA9PKM, President* If we are to keep our privileges as amateurs, we must be united. — *Louis C. Winters, K8HXW, Secretary, Central Michigan Amateur Radio Club*

● We couldn't help but say to ourselves "right on" and "amen" when, in a recent *QST* article, it was pointed out that it is often our friends in the FCC, the ones who want to help the amateur service, that seem bent on making a lot of new regulations that responsible amateur groups have not asked for and do not want. These are particularly in the areas that have been self regulated by amateurs in the past.

We would like to encourage our friends to fight for us in international consultations over frequency allocations, reciprocal agreements on third party phone QSOs, enabling regulations for new modes of operation and things of that nature that require basic rules in order that amateurs may achieve the highest states of the art and most use of the amateur bands possible. As for making detailed regulations covering all facets of amateur radio operation, whether it be with repeater stations, satellite communications or slow-scan TV, we would like to see a policy of "benign neglect," if we can steal the phrase. Amateurs should jealously guard their freedom of movement within the parameters set by enabling law and regulations to develop the working arrangements that suit amateurs best.

The other side of the coin, of course, is that freedom means responsibility. The amateur organizations and the individual amateur needs to practice a high standard of conduct with particular emphasis on cooperation and courtesy. If we continue to demonstrate that we are responsible and have regard for the rights of others, we will be able to handle any new regulating problems that may come up without having the FCC do it for us. — *QSA5, Marin, (Calif.) A. R. C.*

COMPUTER WOES

● It works — at this address, anyway. April *QST* arrived yesterday, March 22, the earliest ever in more than 20 years. — *W200J, Delmar, NY 12054* As of April 10, I have not received *QST*. — *WA20IO, Newburgh, NY, 12550*. April 12 & still no *QST*!!! — *W4CPL, Winston-Salem, NC 27106*. April 12 & no *QST* as yet. What happened? — *W8BU, Cleveland, OH 44104*. Apparently the new computerized mailing system "goofed" on my April issue of *QST*. About four out of eight hams I have talked to here in Lubbock, Tx. have received their copies — over a week ago — and the others have not. — *W5VGR, Lubbock, TX 79410*. Your new computer is doing a beautiful job for the west coast. Received the April issue today (March 27th), the earliest ever. — *WA6JNY, Santa Rosa, CA 95401*.

● I read your editorial on the possible slip-ups during transition to computer addressing. I read it in someone else's copy 'cause mine hasn't come yet. Well, I'll show you guys — when my life membership runs out, I won't renew. So there. — *Thomas F. Carten, WA1DJC, No. Dartmouth, MA* [EDITOR'S NOTE: The computer hiccupped when it got to Life Members; their April *QST*s were placed in the mail a day or two late, on March

22 . . . And then the post office mislaid the whole LM shipment!!

QST MIS-ORIENTED!

● I wrote you on November 21 of last year advising you that I had not received the August issue of *QST*, and as I did not get an answer or the magazine I wrote you again on Jan. 19 of this year, which letter you returned to me advising that the magazine had been sent to me on Dec. 25, 1972.

This is to let you know that the magazine arrived today from Yokohama, Japan!!! Seems that something must be "rotten in Denmark" with the mail system up there.

I am glad that the magazine arrived finally as it was the only missing one since 1961. *J. B. Wilson White, Palmira, Valle, Colombia*

APRIL ARTICLE

● "Organic Reflective Elements for the Simple Dipole" in April *QST* calls to mind Professor H. F. Oidar, a self-educated Lithuanian who spent most of his life in scientific experimentation at his retreat in Bent Neck, South Dakota. One of his most successful projects was the liquid radio director, or LRD (he didn't quite make it to LSD). It was during this work that he propounded his famous Floating Molecule Theory. He experimented with various trough arrangements, various liquid types and different methods of tuning. By using a true isotropic radiator and a circular trough, he was able to produce a rotating array. His efforts to generate amplitude modulation by varying the liquid level were never successful, however, since he never understood the Slosh Principle.

One of the most effective liquids used was the gin martini. This not only provided the required anti-freeze capability, but was an excellent resource for passing the time while the band was closed. It was during an extended ionospheric disturbance in the Spring of 1915 that Professor Oidar, under the influence of most of his 40 meter director, decided he would visit his native Lithuania. With the pattern of bad luck that always seemed to plague him, he chose the Lusitania for his voyage. All his notes and records went with him to be shown to the homefolks. . . . *J. D. Wells, W4TJU, Orlando, FL 32809.*

● I dug a big ditch for a 160 meter reflector but the city has a law about open ditches full of water. Could I bury a wire in the ditch and get the same results? - *Robert A. Prehm, W7ZEV, Marysville, WA*

● I often wondered why my 20-meter dipole worked so well in only one direction. My 32-foot trench-type dry well fits perfectly in the formula. - *Russell Ronning, K8BGP, Muskegon, MI*

● . . . Not being a ditch-digger by trade, I hired a backhoe for a modest charge of \$50 an hour and instructed the operator to dig five trenches; two for 40 meters and three for 80 meters. Members of the Woodbridge Wireless Society provided large quantities of manpower to erect the towers (the beer bill was almost as much as the backhoe rental).

But this rather way-out antenna system has its drawbacks. First, the switching is slow because my pumps only perform at 100 gals. per min. Second, when it rains the pumps must be run all the time in "bailing" mode. Thirdly, my real estate resembles Venice, Italy. The neighbors complain that I have

constructed a safety hazard for their pets and children which forced me to contract for \$1,400 worth of fencing. Insect control for the county insists that when summer comes they will have to dump oil in the troughs to reduce the mosquito's breeding grounds. . . . - *Pete Shaw, K4LDR, Woodbridge, VA*

● This is my third very happy year with ARRL and also my third April. The first year I was really had, and the second year (1972) I nearly got caught again. This year, however, after reading just one paragraph, a light came on in my brain and something said to me, "It must be April." Sure enough, the issue was dated April. I'm still pretty green at this electronic stuff, and I don't say I can't be caught again, but I think it's fun, and a nice tradition. I hope *QST* will always keep a sense of humor. - *Jim Dayton, WAIMRT, Waterford, CT*

● Being only 14, I saw thru "Organic Reflective Elements for the Simple Dipole" the first time I read it . . . or is it really so?? - *Bill Levant, WA3RHP, Philadelphia, PA*

FOCUS ON REFLECTIONS

● Congratulations to M. Walter Maxwell, W2DU/W8KHK on his article "Another Look at Reflections" in April *QST*. I believe we have needed clarification on this subject for quite some time. Anyone who has written, or attempted to write a technical article of this complexity will appreciate the time and effort that has been expended. Notice particularly that the work has gone into an amateur radio publication when the same amount of energy expended on an article for a professional journal could be used to enhance the author's professional image. We are indeed fortunate to have the benefit of Maxwell's professional experience.

Now to the library to get the microfilms of those articles listed in the bibliography. - *James S. Collier, W2QBB, Williamsville, NY*

● The article in the April issue by W2DU is one that has been overdue for some time. For years the "old timers" have been screaming about the mania over SWR - stating that maximum signal does not always come with minimum "SWR" on the line (at the particular point at which the meter may be connected). Maybe the Mobile Manual was right after all!

My only complaint is that the author did not explain his points well enough for me. Perhaps we could see more material on conjugate matching, for instance. - *Gregory R. Combs, K4CRB, Danville, KY*

● Mr. Maxwell's article on VSWR is by far the most interesting, clear, concise and informative article that I have had the pleasure of reading over and over . . . and over. Authors and articles of the caliber contribute to the fact that *QST* leads the field in amateur publications. - *N. R. Farbman, W6SEM, San Francisco, CA*

STRIKING A BALANCE

● Each year I hesitate to renew my subscription to *QST* because I find it offers me little in the way of useful practical information . . .

I realize that the "state of the art" is important, but let's remember with whom you're dealing. I could not recommend *QST* to my students in electronics when I know they have difficulty comprehending basic laws of impedance or capa-

citive reactance. They would not enjoy most of the technical articles, contest news, etc.

I have faith in the ARRL and hope you will consider the average ham who wants to improve his TX-62 or learn to distinguish between junk electronic gear and worthwhile surplus "bargains." I feel that *QST* should be written in the style of *Understanding Amateur Radio* and leave engineering articles to engineers. — Myron Steir, W2EDY, Fair Lawn, NJ

● I am well pleased with *QST* because as a Novice I have used *QST* to help build my station, increase my knowledge of ham radio and keep abreast of what's going on. I like the articles written for the Novice because you don't have to be an electronic engineer to figure out what is being said. — James S. Ringley, WN4UYH, Lynchburg, VA

POSTPAID

● Recently I ordered a new *Handbook*, 2 log books and a License Manual. Total cost \$7.50. In due course I received the items in two separate packages, postpaid.

Postpaid — there hangs the tale. I bought \$7.50 worth of ARRL publications. You paid \$2.45 postage. I don't believe the League should have to pay this large amount for postage on such a small order, or on any order.

I strongly urge that the purchaser pay postage on all mail orders. Let's let the League make some money for the members. — Karl J. Adkins, WA6MAR, Richmond, CA

AN APPRECIATION

● On March 28 just past, we received a package from you which included a manual in English entitled, "A Course in Radio Fundamentals."

This kind gesture on your part toward the Radio Club of Chile is an example of your good will and has evoked much interest and appreciation

on the part of our members who will have the opportunity to use this reference book. — Jose Borbolla A., CE3ALD, President, Radio Club de Chile, Santiago, Chile

[EDITOR'S NOTE: League publications are sent regularly to IARU member-societies as one of our projects to assist development of amateur radio worldwide.]

CONTEST VIEWS

● Having read the letter of W2OHF in *QST* of February, under the heading "Contest Quandary," I have checked the latest list of contests dates in 1973 and find that between February 17 and November 11 there are only three weekends free from contests (excluding the SS contests). Several weekends have three or four different contests on the same dates, and many of the European contests are cw/phone, which means phone all over the bands. I am only interested in QRP (40 watts) cw work, but it is almost impossible for DX work at weekends nowadays. I can well understand the frustration of W2OHF as he only has 15 minutes each Saturday and Sunday in which to pursue his hobby! I am much luckier as I am able to do so during the week, and keep off the air during the many contest weekends. He asks in his letter "What is the answer?" How about doing away with all contests (except uhf ones) for a year, at weekends? This would give many amateurs, especially the really low-power stations, a fair deal. I know this is only a pipe dream! — Barbara M. Dunn, G6YL, Carlisle, Cumberland, England

● I think I learned more about smooth operating procedures in one week of NR than I could in a year of normal operation! I also owe the tripling of my code speed to the Novice Round-up after working 46 states and 533 contacts, including five countries (KP4, KL7, JA, ZM1, VK2, VE1-3-5). I'd also like to mention that outstanding courtesy and friendliness of my fellow Novices and the Generals whom I worked and the ones I heard while taking breaks. — David M. Clothier, WH6IBT, Maui, HI

Coming Conventions

(Continued from page 91)

with help from local experts. Flea market space is free and so is space for exhibitors inside air-conditioned buildings. Ladies: program includes a presentation by Miss Helen Monks, Monk's Studios, Simsbury, Conn; games and cards party, apple peeling contest and "Other Hobby" display. Ladies are requested to bring something which demonstrates their hobby if not ham radio. Children's program includes free swimming, kiddie carnival with a clown and contests, horseshoe pitching, basketball, volleyball and movies. For everyone there's the radio-controlled aircraft show, QSL display board (please bring your card), pizza party, group picture taking and a "celebrity auction," gifts from famous persons world-wide sent to this convention. Complete registration includes lodging and 4 meals and all activities of the convention — \$10. Registration tickets only — \$3 or 2/\$5. Requests for information should be sent to: Kay Anderson, W8DUV, 209 Childers Ct., Huntington, WV 25705. Descriptive brochure will

be sent promptly. Meals are family style (all you can eat) and lodging is dorm style. Other lodging available at Weston, Buckhannon and Clarksburg, W. Va.

ROCKY MOUNTAIN DIVISION CONVENTION Cheyenne, Wyoming June 30-July 1, 1973

The Shy-Wy Amateur Radio Club cordially invites you to spend two glorious summer days in the Old West attending the 1973 ARRL Rocky Mountain Division Convention to be held in Cheyenne, Wyoming, at the Hitching Post Inn on June 30 and July 1.

Featured in the program will be many technical talks by prominent individuals in their respective fields; a talk on DX by Gus Browning, W4BPD, editor of *DXers Magazine*; an fm forum, MARS forum, ARRL forum featuring President Harry J. Dannels, W2TUK, and other League officials. A Saturday night banquet is planned.

Registration will be \$5 until June 15 and \$6 thereafter. Send your registration fee and inquiries to the Shy-Wy Amateur Radio Club, P.O. Box 164, Cheyenne, Wyoming 82001.



YL news and views

CONDUCTED BY LOUISE RAMSEY MOREAU,* W3WRE

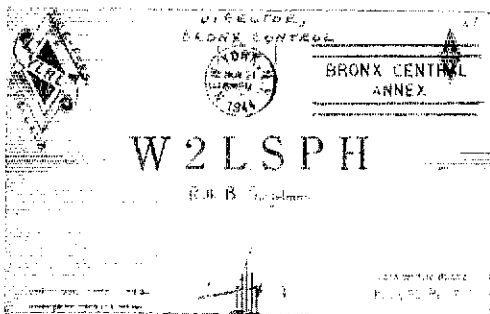
QRV - YL

EVERY TIME there is an emergency, the amateur radio operators go to work in extraordinary sessions handling communications out of, and into, the stricken area. The lists of those who are recipients of the ARRL public service awards for their work in this most publicized of all amateur activities includes many YL calls. Women operators have always been active in this service. In fact, so far as documented facts can be found, women have been there since the beginning of this vital service.

The story of the disaster in Johnstown, Pennsylvania, on May 31, 1889, is well known, but what is not so well known are the stories of six women, and the parts that they played. Emma Ehrenfeld, Pennsylvania R.R. operator at South Fork, who sent out the warning that the dam would break; the three Western Union telegraphers, Gracie Garman, Mary Jane Watkins, and Minnie Ogle operating from the second floor of the office after the water was waist deep on the first; and Mrs. Hettie Ogle, the office manager, who not only remained on the wire keeping in touch with the towns throughout the valley, but, in her capacity as representative of the Government Weather Service, was also sending out reports of conditions until her final dispatch "this is my last message." Of those YLs only the P.R.R. operator survived in a fast scramble to safety.

In Ebensburg, a Miss Lloyd was the Western Union operator, and was busy all night sending

*YL Editor, *QST*. Please send all news notes to W3WRE's home address: 305 N. Llanwellyn Ave., Glenolden, PA 19036.



W2LSPH, a "collector's item" in QSL cards, that were used by people who were active in communications in World War II. (Card courtesy of W8TAY)

information and survival messages over the wires until she was relieved the next day.

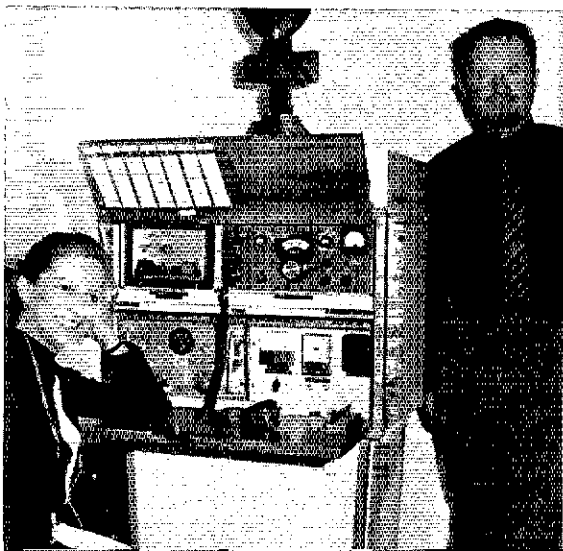
Many stories of the heroism and dedication of operators, OMs all, who remained on duty at the risk, and often the cost of their lives are a part of communications history. But until earlier documentation can be uncovered, May 31, 1889, is the beginning of that tradition.

The YLs in radio continued the heritage with their participation in both World Wars, with the example of Lena Michelson, the first and only YL marine operator to send an SOS from a ship in distress. There were the women in AEC, later AREC, and the old Trunk Lines of traffic that became NTS, and the many independent nets where they handled traffic by the ton in emergency. YLs in MARCO have given badly needed medical assistance on the air; gals have assisted a relay for vital medicine; women in Eyebank Nets have helped bring the priceless gift of sight; those in tornado, hurricane, and weather nets, and the ladies of MARS have given so much of their time, and themselves to keep members of our armed services all over the world in touch with their loved ones at home through phone patch and messages. All are carrying on the tradition.

The service that communications provides has so conquered space and time that the individual, or the community, need not struggle alone in an emergency, but can summon the world, if necessary to assist.

Want to work a truly rare DX family? Try Alban, and Josette Duffau, 5T5AD, and 5T5YL the only husband and wife team in that country.

QST for



XE1HHH, Marilu of Guadalajara, Mexico a licensed amateur for 12 years just passed her reexamination as required of all XEs in good standing. Her code speed is in the 18 to 20 wpm range and she welcomes all contacts. (photo courtesy K6IPJ)

The gals who participate in AREC or RACES drills or in actual emergencies, the YLs whose traffic totals are one or one thousand, the ladies in MARS with their world-wide links to the armed services, in women operators who assist the public service in amateur radio, are all carrying on a heritage that was begun by six women when that first warning went out from a railroad signal tower at South Fork, Pa., at noon, May 31, 1889.

1973 Powder Puff Derby

The annual Powder Puff Derby will start July 13, 1973 from Carlsbad, California, and end July 16, 1973 at Elmira, New York. Carolyn Currens, W3GTC, for the past 16 years the chairman of the communications link for this event, has announced the route and the chairman who will be in charge of radio contacts at each location. Carlsbad, Calif., W6YZV; Prescott, Ariz., W6LL; Albuquerque, N. Mex., K5CQH; Liberal Kans., KØEPE; Topeka, Kans., WAØSQN; Waterloo, Iowa, WAØLPA, (here the club call WØMG will be used); Champaign, Ill., WB9DPX; Flint, Mich., John A. Schneider; Niagara Falls, N.Y., W2OVP; Elmira, N.Y., W2PVG.

Assistance is always welcome and there is a need for operators at each of the stops. Those who are willing to assist in this service should get in touch with the chairman in the locality in which they live.

WA4BVD, YL Harmonics Editor

Carrie Lynch, WA4BVD, 1973 president of YLRL, has accepted the additional duties of managing editor of *YL Harmonics*, the official publication of the organization. The former editor, Mae Hipp, K7QGO, was the editor of the magazine during her term of office as YLRL president. "YL News and Views" congratulates Mae on a job well done, and wishes Carrie good luck as managing editor of *YL Harmonics*.

YLRL Membership

Again there have been a number of requests for information about membership in YLRL. The requirements are simple for YLRL membership is open to all licensed women amateur radio operators regardless of the class of license. For a membership application write to the membership chairman, In Western United States: Beth Taylor, W7NJS, 14367 S.E. Fair Oaks Avenue, Milwaukie, OR 97222. Eastern United States: Marge Campbell, K4RNS, 65 North Arbor Drive, Ormond Beach, AL 32074. The International Membership Correspondent who handles the DX YL memberships is Gretna Longware, WA2WHE, Box 426, New Russia Road, Elizabethtown, NY 12932.

WA3NGV, Edna Sutton, Third DC YLRL.



LSPH

Of the well known letter groups that designate long-time, or specialized interest in amateur radio such as QCWA, OOTC, SWP, and OTC, the designation LSPH is the most indefinable to us, and yet there are almost 100 YLs who can claim that particular status of "Licensed Since Pearl Harbor."

In 1943 there was a request for radio operators to assist in communications during World War II. In July 1943, *QST* requested that women enroll in training courses, and as a result there was a group who passed the tests, received amateur operator licenses, but were unable to be on-the-air except in government or military capacity.

These gals served as teachers, cryptographers, radio technicians, and radio researchers, as well as operators. Some were members of the armed services in the WAC, WAVE, WAF, and Marine Corps, while others worked in defense organizations, and a few became high speed press telegraphers. The records show 66 women with the LSPH call in the second call area, three each in the seventh and eighth call areas, one in the third, and one in the tenth call areas.

YLs who had held licenses prior to the war were also very busy in war work - they totalled 144 - plus one in Puerto Rico, one in Alaska, and four in Canada.

LSPH is not an active club as are most amateur organizations. Rather it is an organization of interested persons who, in time of national emergency, personified that well known definition that "amateur radio exists as a hobby because it qualifies as a service."

Edna Sutton, WA3NGV

For a number of years the 1973 YLRL District Chairman lived in an atmosphere of radio with both the OM and their son busily building equipment, and talking about contacts and contests. But the radio "bug" didn't bite Edna until 1969 when their son was preparing to go to school and

(Continued on page 106)



The World Above 50 Mc.

144-149 220-225 240-245
 150-155 2300-2450 5.345-5.350 5.650-5.925 10.000-10.500 21.000-22.000

CONDUCTED BY BILL SMITH,* W7JNK

Gone, But Not Forgotten

A PECULIAR THING has happened. The first 100 kHz of the six-meter band seems to have fallen into a category which defies description. Maybe it should be entitled, "Miscellaneous." Segments of the 80 through 15-meter bands provide incentive for up-grading of license class, some protect cw operators from undue interference from other modes and some just attract attention of many people, FCC included. The segment, 50.0 to 50.1 does none of these and perhaps has now become a resident of that never-heard-of, but nonetheless real category, "Miscellaneous."

Supposedly this segment serves two functions. It allows the cw operator freedom from phone interference and provides an incentive to the General and Technician Class licensees to up-grade their licenses. Neither function is being performed as intended by FCC.

The FCC has repeatedly stated its intention to review the effectiveness of its rule-making establishing an incentive licensing system for amateur radio. In a Report and Order released September 26, 1969, FCC quoted itself, "It is its intention . . . to make necessary changes if the effective utilization of the frequencies involved is threatened."

In denying an ARRL petition requesting reconsideration of the implementation of the Commission's incentive restrictions for the 50-MHz band, FCC stated, "Further, in Docket 15928 the Commission said it would stay in whole or in part, as appropriate, any reserved frequency assignments which do not appear to be sufficiently occupied. The Commission's intention to review the sub-allocation remains unchanged. However, until the initial phase of the implementation has been accomplished and time allowed for necessary transitions, there is no real basis for evaluating the effects of frequency reservations on the amateur

*Send reports and correspondence to Bill Smith, W7JNK, ARRL, 225 Main St., Newington CT 06111.

service in general and incentive licensing in particular."

After sufficient time for the transition and completion of the initial phases of incentive licensing, it becomes obvious that the 50.0 to 50.1 segment of the 6-meter band is used only by an extremely small percentage of 6-meter amateurs. With careful monitoring of this 100 kHz sub-allocation, one hears on an average fewer than a half-dozen amateurs. My observations have included times when the band was open on E from all parts of the country. It now becomes obvious that incentive licensing has not produced the desired results on the 50-MHz band.

Let us examine the reasons. Six meters is used by amateurs of all license classes except Novice, however the Technician dominates. As established by FCC, the Technician Class is intended to allow the experimenter frequency space. However, the typical Technician is also a communicator. As such, many Technicians view their license as a "stepping stone" to higher license grades while others are content to confine their operating to frequencies above 50 MHz. Those who do up-grade their license class often leave vhf to operate the hf bands. To them the incentive is the privilege of leaving six meters for the lower frequency bands, not operating in the 50.0 to 50.1 segment. Techs who do not seek to operate the hf bands see no reason to up-grade to use the six-meter sub-allocation. For these reasons, incentive licensing has held no incentive for the Technician Class licensee.

The General and higher class licensees desire to operate in the 50.0 MHz and above portion, as well, since that is where the bulk of the activity exists. In addition, most General and higher class licensees spend most of their operating time on hf bands and comparatively little on vhf.

Another reason for lack of occupancy of 50.0 to 50.1 is that most six-meter operation is on phone. Just as is the case on the hf bands, relatively few amateurs desire cw for the majority



Berlin vhfers met recently to present awards to two operators for satellite communications. The group's "Silver Transistor" award went to DC7DB (second from left) while DL7QY (third from left) received the "Golden Transistor" award. Both awards cited Oscar 6 contacts with North American stations. Participating in the program was DL7JR (left) and DL7IK. (Photo courtesy of DC7AS, VHF Manager in Berlin, and DK2ZF)

QST for

VK2ALU mans the controls at VK2AMW, Dapto, NSW, Australia. The transmitter, a pair of 4CX250Bs, delivers 400 watts to the 30-foot dish. Most controls shown are for antenna aiming at the moon.



of their operating. However, due to the Technician's limited code ability, there is an even greater percentage of phone to cw operators on six than on hf bands. Therefore, it is little wonder that 50.0 to 50.1 is not being used.

To correct this inefficient use of the six-meter sub-allocation, I propose FCC reconsider its decision under incentive licensing and once again allow Technician and General Class licensees use of the entire 50-MHz band. Additionally, I propose that the "A-1 emission only" portion of six be reduced by 50 kHz, to 50.0 to 50.05 MHz.

In so doing, activity in the 50.0 to 50.05 portion would increase, not only because of the previous reasons, but also because the vhf experimenter interested in studying propagation anomalies on six would be better able to communicate with foreign amateurs who are allowed full use of the 6-meter band.

Retention of 50.0 to 50.1 for cw only would prevent undue interference between phone and cw operations, as it was intended. A 50-kHz sub-band would be adequate for the limited number of amateurs using cw.

The foregoing comments were filed with FCC in conjunction with Docket 19162 in March, 1971. The Commission completely declined comment on the 50-MHz band in its Report and Order released October 2, 1972.

Gone, but not forgotten?

The preceding is the editorial viewpoint of Vince Varnas, K8REG. Any comments?

K2UYH to VK2AMW, 432 MHz!

The 432-MHz DX record stands at 10,000 miles. And that is going to be hard to beat, the distance being nearly halfway around the globe.

The record was established March 10 when K2UYH, near Trenton, New Jersey and operated by K2UYH, WA2LTM and WB2PKY completed a moonbounce contact with Australian station VK2AMW. The two stations had been scheduling since November and on several occasions had come very close to a contact. Because of the path distance and antenna aiming at the Australian end of the circuit, the two stations have only approximately one hour of common moon-window time.

As for station details, this is the information given by K2UYH. Al says his antenna is a 20-foot stress dish with a V766 1-dB preamp mounted at the feed antenna which is a pair of stacked dipoles in front of a one-wave square reflector. The K2UYH transmitter runs between 700 and 800 watts output from a 7650 amplifier. Receiving bandwidth is set at 3 kHz and K2UYH says he finds no advantage in narrow-band filters. VK2AMW's station is built around a 30-foot dish with crossed-dipole feed and 400-watt output transmitter.

K2UYH reports receiving up to S5 reports from VK2AMW and that the Australian's signals were consistent enough for a solid contact.

That contact, by the way, was repeated April 3, and perhaps since, as schedules are continuing. And K2UYH had another interesting comment, "It is ironic that I have tried to work VK2AMW a number of times on 15 and 20 meters with no success, yet now on 432, I can work him almost anytime."

Elsewhere on the moonbounce scene, K2UYH reports WØDRL, Kansas, at work on a 32-foot dish in hopes of being 432 EME-ready this summer. K2UYH, fresh from several repeat 432 EME contacts with W6FZJ and VE7BBG is involved in a joint moonbounce project with WA2LTM, WB2IRX and WB2HHH which will find a 28-foot dish on 144, 432, 1296, 2300 and 3300 MHz.

A recent receiving test by K2UYH and WA2LTM with W6YFK found the Californian's 2300-MHz moonbounce signal easily readable in New Jersey on an 8-foot dish and 4-dB preamp. K2UYH says he will have several hundred watts on 2300 this summer for EME schedules with W6YFK - to go along with that 28-foot dish!

OVS and Operating News

50-MHz DXers awaiting the return of summer E found several March and April auroral sessions to their liking. No question about it, the April Fools Day aurora was the best. In fact, several operators say it was the best aurora they ever worked. The opening was intense, so much so that WB4WMT in Atlanta, Georgia says, "VHFers in this area are convinced the opening was certainly a once-in-a-lifetime event." Bryan worked 23 stations from New England to Iowa between 2000 and 0020 GMT. WB4WMT says the signals were as strong as those normally associated with E, but had extreme auroral buzz. Bryan uses a homebrew 3-1000Z amplifier and a pair of 24-foot Yagis nearly 100 feet high.

W8HST, Ypsilanti, Michigan, logged nearly 60 stations, while being confined to listening only with a dipole taped to the ceiling of his shack. Between 2030 and 0045 GMT, Jeff heard signals from New Hampshire to Georgia to North Dakota. WA8KPN, Adena, Ohio said the band sounded like a 40-meter cw contest. Ralph said 15 states were workable between 2150 and 0030 GMT.



This man is missed by the vhf clan. "Rusty" Lanier, XE1PY, died February 6 at age 66. Rusty was first licensed as 4LB at Nashville, Tennessee in 1922 and moved to Mexico in the 1940s. ZE1PY was a well-known call on 50 MHz for years and was the first Mexican contact for many U.S. amateurs. More recently, and until his death, ZE1PY was active with the Oscar 6 project having made over 300 contacts. ZE1GE says he and ZE1XA have Rusty's log books and will confirm contacts which ZE1PY didn't get a chance to answer. ZE1PY was a member of numerous amateur organizations and last December had received his 50-year QCWA award. (Thanks to XE1GE)

WB9ETQ, Wallace, Ind., sat on one frequency and made 57 contacts spread across 18 states in two hours. Jack worked from Maine to Alabama to Minnesota.

And in Minnesota, WB0IWG at Northfield worked the aurora from 1630 to 0100 and then 45 minutes later the band reopened for another hour, until 0245 GMT, April 2. Jim worked 13 states as the buzz signals poured in from Texas to Vermont. W0QOR, St. Ann, Mo., first noted the aurora about 2130 lasting for two hours. He worked ten stations from W2 to W9.

The aurora and associated magnetic storm apparently caused the MUF to soar above 50 MHz for *F*-layer. WASIYX, San Antonio, reports backscatter around 2255 GMT, hearing WB5AHC in Irving, Texas. That was preceded by a solar noise burst at 2220. In Phoenix, WA7FPO worked WA6JRA in Southern California at 2331 and K2VDK/4, Miami, at 2346. WA6JRA was heard until about 0020 on a beam heading off the west coast of South America. And while this was taking place, in Hawaii KH6HRV, KH6HMD and KH6GRU were frantically trying to attract the attention of LU6BMW, Argentina, and CE4PY, Chile, both of whom were S9 on *F*₂. KH6HLK says the KH6EQI 24-hour beacon operates on 50.110 and may be broken by calling within plus or minus one kHz, which trips an alarm system at several 6-meter shacks in Hawaii.

In other six meter news, WB2LAI/4, Virginia, says activity is growing on a Tuesday night 8 PM local time net on 50.110. WA3SKT/4 is net control. And he writes of several March aurora and tropo openings, none of which were major. Buzz says he and WB2LAI/4 seek scatter schedules. Anyone interested write him at 143 East Evans, Norfolk, VA 23503. K5ZMS/5, San Antonio, says March was poor for DX, there being only three *E* openings, the 7th, 24th and 29th. WASIYX reports *E* through channel 5 television March 24 in the late morning and the following evening to Central America on channel 2. Somehow we must get more 6 meter activity in Central America! The evening

of March 28 produced strong *E* to nearly 90 MHz from Mexico City, and *E* backscatter on 6 meters. The following evening was a repeat but also included 50-MHz contacts with San Diego, Phoenix and Las Vegas. Pat says March *E* openings were not as frequent as in February, but the higher MUF indicates to him a promising summer season. April 10 say a near-repeat of March 29 doings, but in the late afternoon. April 13 Pat worked Southern California and K8REG/7, Phoenix, in the evening.

WB6NMT, near San Francisco, worked W7FN in the Seattle area on 50-MHz moonbounce April 12, between 2232 and 2309 GMT. Louis says W7FN's signal peaked 6 dB out of the noise in a 500 Hz filter. W7FN was using an array of eight 3-element Yagis and a 3-1000 amplifier. WB6NMT's array was his now-familiar stacked rhombics.

At Portland, K7ZCB is looking for scatter contacts into Southern California.

During a 10 meter contact, 8P6EN on Barbados, told W1HDQ that he will again this summer be very active on 6 meters with a 4-element quad. 8P6EN was widely worked last summer and has contacted 28 states. He will not operate his beacon this summer, telling Ed that the only result he could see last summer was TVI and that he always heard U.S. stations before anyone apparently noticed his beacon.

XE1GE, at this writing, had caught only one *TE* this spring, that being March 15 to LU7MBH and LU8MBL. Jeff says he'll be active looking for stateside *E* this summer.

144-MHz DXers found the April 1 aurora one of the best ever. Says K1AGB, "I don't get up steam enough to write regularly, but the April Fools Day aurora certainly deserves comment." Ed says it was the *best* he ever heard; no exceptions. He noticed building evidence of what was to come several days prior to the event when the hf bands were suppressed on long-haul DX paths. Ed spent the opening searching for long-haul aurora from Massachusetts while ignoring S9 W8s and 9s finding W0MJS, Minneapolis, and K0MQS, Iowa, paths in excess of 1100 miles. Ed did make some other contacts though, 37 in 14 states to be exact. WA2BLE worked 18 stations from New Jersey, adding three new states. WA2UDT listened to the aurora - with his kilowatt apart on the floor. And we understand that W8KPY, Dayton, took his 2-meter array down that morning while making room for a larger moonbounce array. Tsk Tsk! WB2WIK worked Missouri, Iowa and Illinois.

At Bethesda, Md., W3HB worked seven states, from New Hampshire to Indiana, but missed WA0CHK in Missouri, heard briefly S9. K3RYL, Pennsylvania, listened to the aurora on the 10-meter output of Oscar 6. Kevin said the aurora buzz was interesting and that he heard signals 22 minutes later than he would have expected during that particular pass of Oscar 6, apparently due to the aurora. Listening on the 2-meter Oscar uplink frequency, Kevin logged 20 states.

From Brandon, SD, K0WLU reports doing good two-meter work in two April aurora openings - on the 1st and 13th. Bill wonders if there is a significance to those dates. On the first, he contacted stations in the 2, 8, 9 and 0 call areas, and heard VE3ASO, K3QCC, and WA1FFO among others. The opening on the 13th started later, around 2330 CST, allowing Bill to work K2RTH, W3LNA, VE2DFO, and W9ERC.

WA1FFO reports working 20 stations in 12 states during the April 1 melee. Some of those

contacts were at 145 MHz, indicating that it pays to tune up there once in a while. Steve also heard many 8s, 9s, and 0s in the aurora that lasted until after midnight.

The aurora even extended into the Deep South. WB4NFA, Alabama, thrilled several, providing contacts with a somewhat rare 2-meter state. Steve worked 9s and 0s with 160 watts and 8-element Yagi. WB4NFA offers schedules for those seeking Alabama. Write him at 10010 Westleigh, Huntsville 35803. W8QOB, West Virginia, says he has observed quite a few auroras since 1965 but has never heard a buzz session the equal of that on April 1. Don worked stations from New England to Iowa. For those interested, he is also active on 432. He has 25 states worked on 144.

K9KQR, near Chicago, made 35 contacts in 16 states, including a 910-mile hop to K1AGB. K9UNM, Ft. Wayne, concentrated on WIs and came away with his state number 30, K1ABR, Rhode Island. W9OJI, Illinois, was one of the lucky ones to work WB4NFA in Alabama, and then added W0EYE, Colorado, for a wide geographical coverage on 144 aurora. Steve seeks meteor scatter schedules with Wyoming, Montana, Arizona and New Mexico.

W0OHU, Rochester, Minnesota, heard 7 states and VE2DFO. W0MJS, Minneapolis, says, "This was absolutely the best aurora I have ever heard." Ron worked K1AGB, Mass., 1118 miles for a fine bit of aurora DX on 144. Ron heard W1YTW, Maine, a few dB above the noise, but midwest QRM wiped out a possible contact. He has some interesting observations on signal paths. From Minneapolis, signals from the East Coast peaked on a beam heading of 80 to 85 degrees while Ohio signals peaked at 45 degrees. W0EYE, Colorado, was loudest at 315 degrees. Ron says he is convinced that had others experimented with beam headings they would have heard much further than they would have ever expected. CW signals from the East Coast had flutter that was not evident on midwest signals, lending value to the theory that two auroral reflection areas may be present on long-haul paths. W0MJS says also he is convinced his vertical stack of four 7-element Yagis outperforms any other stacking arrangement he has tried, on any mode.

W0CHK, Bowling Green, Missouri, worked W1YTW, Maine, over a 1000-mile path at 2036 GMT and then W1QYY, also Maine, about 45 minutes later. John's best DX to the west was Colorado's W0EYE, who seems to never miss an opening.

European amateurs also got in one on the aurora DX. The *VERON VHF Bulletin*, from the Netherlands, reports PA0JMV worked 12 countries in Northern Europe and the British Isles, including five Russian contacts. The contacts were made between 1600 and 2350 GMT. The same news source reports 432 aurora contacts between G3LTF, England, and DK1KO, Germany, and between DK1KO and GM3UAG, Scotland.

In other two meter news, Don Falle, VE2DFO, says his moonbounce project has enjoyed a good deal of recent success. Don has worked W6PO,

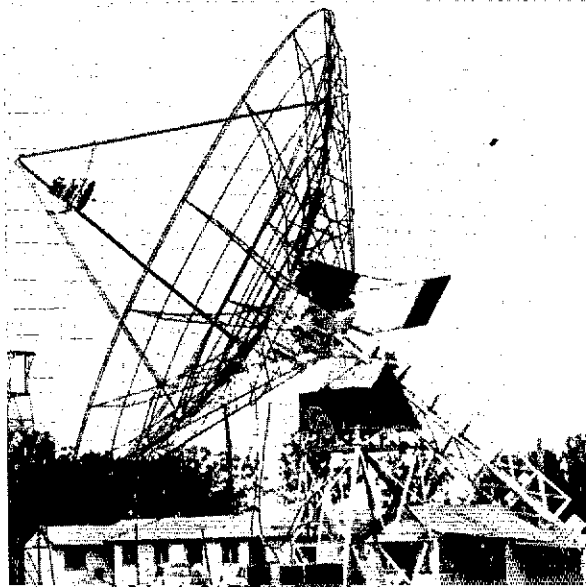
VE7BQH, SM6BAE and VK3ATN, all around early April, and had a near contact with VK5MC. Don was scheduling VK5MC and listening also for VK3ATN when he heard Ray calling. The contact, without a schedule, took six minutes to complete! VE2DFO's moonbounce system includes a 160-element collinear, pair of 4CX25QRs, and a solid-state converter. Don credits W6PO with keeping 2 meter EME fever at a high pitch. VE3EMS says he is still active, but has been rebuilding his shack in preparation for some 220 moonbounce work.

In France, F9FT nears 3000 Oscar 6 contacts including those with W0PSB, near Denver, and KL7MF, Anchorage. F9FT has heard K7BBO, Washington, and W5ORH, Oklahoma, both of whom are further from France than Alaska or Colorado. DK2ZF, Germany, tells us that European beacon transmitters heard through Oscar are SK1VHF and SK4MPI, Sweden; DL0PR, Germany; OZ7IGY, Denmark, and HB9HB, Switzerland.

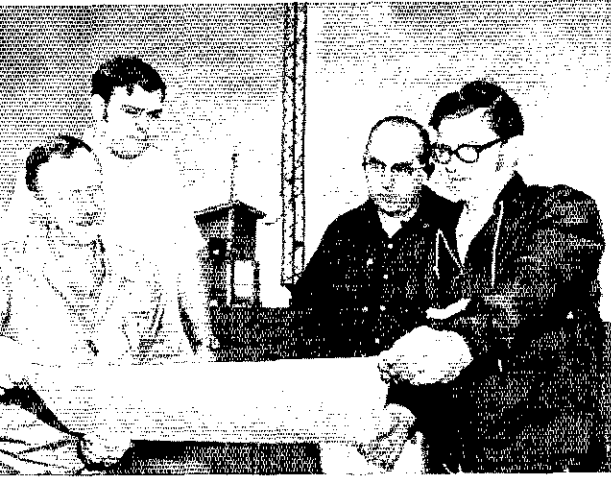
220 and Up receives aurora and moonbounce attention this month. During the April 1 aurora, W5ORH in Oklahoma City and W0EYE, Boulder, exchanged reports on both 220 and 432, giving both two new states on each band. W0EYE also worked W0YZS, Missouri, on 432 for a new state. These two contacts were the only reported on 432. On 220 moonbounce, WB6NMT and K9HMB, Illinois, worked one another at 0312 GMT April 9 giving each, obviously, a new state. K9HMB used a 160-element collinear array while Louis pointed sixteen 10-element Yagis skyward.

The equipment for the 220 and 432 tropo tests between Hawaii and the West Coast scheduled for this summer is now in Hawaii at KH6BZF, following an April trip there by WB6NMT and W6FZJ. The gear for 220 consists of a kilowatt and four 10-element Yagi operating on 221.993 MHz; 500 watts and a 20 dB array is aimed towards the mainland on 432, but I do not have the exact frequency. Full details are available from either WB6NMT or W6FZJ.

ZS6NM, South Africa, tells W1HDQ he'll be ready for 432 moonbounce sometime in August with an 80-element array. ZS6NM says about 70 stations are active on 2-meter fm in the Johannesburg area. QST



This is the 30-foot dish antenna used at VK2AMW March 10 during a contact on 432 MHz with K2UYH via the moon. The 10,000 mile distance is a new DX record for 432.



The Beaver Valley Amateur FM Association is the proud owner of WR3AAA. Their repeater operates 146.25/146.85 and is an open machine. The area covered by WR3AAA includes North Pittsburgh, Aliquippa and Ambridge counties in Western Pennsylvania. Looking over the circuit used in the repeater are the officers of the club, from left to right, Robert McClain, W3VRZ, President; Richard Hanna, K3VVY, Treasurer; Chester Calvin, WA3LJS, Secretary; and Ken Riggie, W3FCO, Chief Engineer.

FM REPEATER NEWS

At press time, word from FCC is that they have received about 400 repeater applications and the rejection rate is running over 80 percent! They have added additional staff people and their hope is that all applications will be processed by June 30th. FCC has prepared nine pages of material that is being sent to applicants whose repeater application is rejected. This bulletin is similar in content to the one on repeater licensing that was prepared by ARRL. The government bulletin contains information on what commercial antennas have been approved, sample control circuit and system outline diagrams, examples of how the operation of a control link is achieved, and other pertinent information. We have a supply of the

FCC bulletin and will send one on request to interested parties, s.a.s.e. please.

There is no doubt that since 18803 the FCC has by interpretation relaxed some repeater and remote base rules but on the other hand some of their rule interpretations are going to cause considerable, if not impossible, problems. For example, it has been reported that in the case of repeater licensing they will limit the number of control stations to *no more* than six. When one considers this means that each control station must devote 28 hours per week just to keep the machine operational it is going to pose some serious problems for many clubs to keep their repeaters on the air.

We have also received a copy of a letter from one remote base owner whose application was rejected. One of the points of rejection was that for a remote base "Uplink stations for communications must be licensed as auxiliary link stations." Let's examine this requirement. An auxiliary link station cannot be operated portable or mobile; its location is fixed and cannot be changed. Unless we are reading this interpretation incorrectly, it means that a remote base can *not* be operated from a mobile. Only time will tell on some of these points but it appears that both repeater and remote base operators are in for some serious problems. -- WIICP

YL News *(Continued from page 101)*

encouraged his mother to get an amateur radio license so they could keep in contact while he was away. That did it. The resulting regular contacts plus assistance from the OM, helped with the code speed and in 1971 she passed the General Class exam. Edna says, "To an aspiring amateur happiness is two things: the moment after the code test when the brown envelope is handed out proving that stage is passed, and those beautiful words from the RI 'you passed' at the end."

A member of Penn-Jersey YLRC, and a member of YLRL, Edna is active on 80, 40, and 10 meters -- 80 for her cw operation, and 10 and 40 for phone.

A member of a ham family, WA3NGV enjoys rag chewing on both cw as well as phone and has acquired a number of certificates. At present the duties of District Chairman keep her busy gathering news of YLRL activity for publication in that club's official bulletin, *YL Harmonics*. **QST**

On Apr. 3, WB6URX (Ojai, CA) was contacted for assistance in locating a two-year-old girl that had wandered away from home. She relayed the information on the WA6SIN repeater. WA6LLI/mobile received the call and in 20 minutes had located the lost child. He notified WB6URX who called the sheriff's office. (WA6DEI, SCM SBar)

A trenching machine severed the telephone cable serving the Brownsville (TX) International Airport on Apr. 5 which caused loss of telephone and teletype service. W5OOG called on 2-meter fm for assistance and was answered by W5DX who called San Antonio National Weather Service via long distance and asked that they activate their hurricane emergency ssb transceiver. In less than 3 minutes the weather service was in full communications. W5DX also notified the telephone company and service was restored within three hours. - (W5DX)

Public Service *(Continued from page 76)*

quickly dispatched to the scene and the injured party was removed to a hospital. Operation was on 146.94 MHz from 2130 to 2158 GMT. - (WB4RGO)

Thirty-four SEC reports were received by the reporting deadline for March and listed 10,726 AREC members. This is down six reports from last month and down two reports from the previous March. Sections reporting: Alta, Colo, Conn, ENY, EMass, Kans. LA, Mich, Miss, Mont, Nebr, Nev, NFla, NNJ, NTex, Ohio, Okla, Org, Oreg, SV, SDgo, SBar, SCV, Sask, SIdak, SFla, STex, Tenn, Utah, Va, Wash, WVa, WMass, WPa. **QST**

How's DX?

CONDUCTED BY ROD NEWKIRK,* W9BRD

When:

Last month we were so poetically distasteful that we now apologize with something better. Much better. Try this:

"DX"
— A Poem —

To our wireless aristocracy, Knights of the Midnight Key . . . To you who crowd the voltage on the plate . . . To all the many members of Boiled Owl's fraternity . . . These verses I sincerely dedicate.

Oh, it's nice to handle traffic with stations close around . . . And always get a "NR I OK" . . . But there's nothing else in radio that brings such joy profound . . . As to hear a *distant* station's "QSA."

Though we figure out capacities and constants to a "T" . . . Our radiation never is enough . . . To satisfy our cravings; but can anyone foresee . . . The finish to this superdistance stuff?

Now, I am no old-timer but I well recall the day . . . When to hear an Eight was hailed as something grand . . . "I worked a fellow in Detroit," your friend would proudly say . . . And with honest pride you'd see his chest expand.

How is it now? Where are the men who used to get a thrill . . . When someone in the next state

*c/o ARRL, 225 Main St., Newington, CT 06111.

heard their call? . . . Just ask one of those same old boys and chances are he will . . . Reply, "I don't work local stuff at all."

"I'll get my signals though to England, I clear with Paris, too . . . I'm QSO Hawaii after eight . . . But to waste my time on local work will never do . . . My good friend, you are sadly out of date."

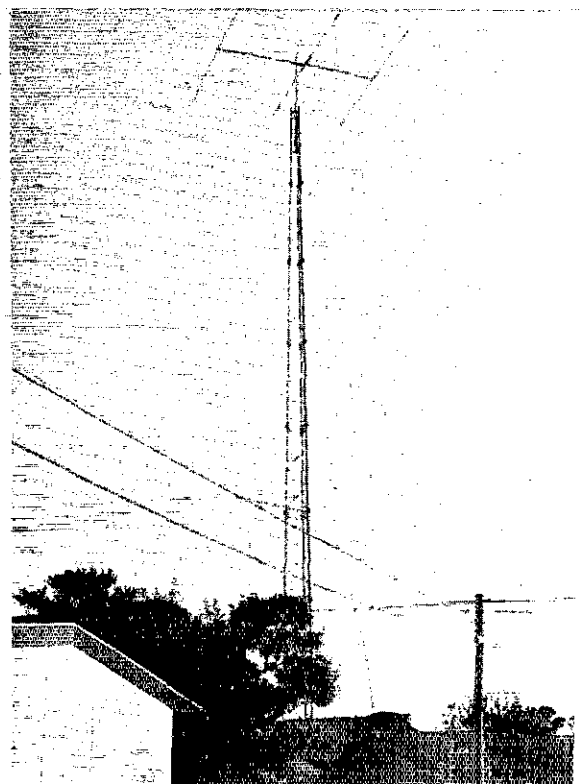
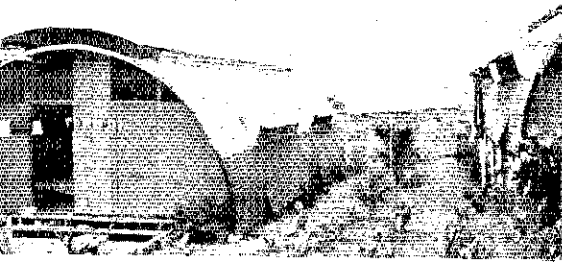
But there always is a limit to the length that we can go . . . And this globe is getting smaller every day . . . And the time is fast approaching when the farthest lands will know . . . The sound of signals from the U.S.A.

When there's no more world to conquer it is very plain to see . . . That the amateur will have to turn to stars . . . And I predict that some day we will read in *QST* . . . Of the First Trans-planetary Test with Mars.

If that sounds a little dated it has every right to be. Nostalgia, or the more things seem to change the more they stay the same. "W.S.C." penned those lines half a century ago for June, 1923, *QST*, at a time when cw's magic was supplanting spark, when short-wave magic was beckoning hamdom from 200 meters and down. He didn't reckon with Oscar, to be sure, but he was close.

In the same *QST* of long ago we see that MacMillan's arctic expedition would soon go north with Don Mix, 1TS, at the key of WNP courtesy

PY7ZAH/Ø and JH1WIX offer worthy QTHs of the Month almost a world apart. An inconspicuous 18AVT/WB vertical mounted between those quonset huts accounted for plenty of DX during Jim's Fernando de Noronha vacation last winter. "Poor propagation, mediocre skyhook, numerous power failures, rig problems, but lots of fun!" he writes, threatening to fire up PY7ZAH/Ø again this summer. JH1WIX has worked some 1500 Stateside Novices on 21 MHz over the past six months with an FL/FR400 feeding the CL33 atop that 90-foot Tokyo stick. Taroh, whose son signs JH1KLO, has been chasing DX since 1924 under such calls as J1ZB, AJ4ZZ, J1DO and J2GX. (Photo via WN6OSS)



ARRL An article on "Signal Report Cards" (Not yet called QSLs) is right-on today Careless sending in the recent Transatlantics is loudly lamented. Sound familiar?

An increasing flavor of DX just for the sake of DX is unmistakable throughout. But perhaps the most timeless and delightful piece in that wonderful issue is "On Being an Amateur" by H.F. Mason, three solid pages about that old ham spirit and how it comes to be. Elmer's been around a long, long time.

† † †

W h a t :

"You asked if any Novices were working DX in the new 28-MHz WN subband," writes WN5HII of Waco. "Well, I've contacted DJ6LM, G3EJV, PJ2JW, TG9CD, ZE3JJ, ZM2GH and ZS6ADE on ten meters so far." WN4BYS adds, "On weekends right after we got the new subband I QSO'd WNs 4VYU 7RRX 9KKB and some Generals. Tried 10 again in March with 18 watts crystal-controlled and raised VQ9R, Seychelles, on a CQ! Missed a fine South America opening while working on my antennas. Anyone for weekend skeeds on 28 MHz?"

Thus do we log another first for the "How's" Bandwagon. When the next upturn of the solar cycle sets in that 28,100-28,200-kHz slot will become *some* kind of DX band for newcomers. Even at this time southern-latitudes lads like WN4BYS and WN5HII find things interesting enough.

Summer short-skip fun will pep up the action, too. WB4JYX dropped down there to have a look around, quickly working WNs 6NSV 7SYR 7TMN and 7VDY. Novices in TV Channel 2 areas, by the way, may run into severe harmonic TVI problems. Channel 6 is also vulnerable. Good luck, and keep us posted!

† † †

H o w :

The '73 ARRL International DX Competition is ham history now, or will be upon subsequent reporting in *QST*. We think you'll enjoy excerpts from the spirited DX Test commentary generated by W8ZCQ, scribe for Columbus Amateur Radio Association's *CARAScope*. Take it, Dan

I think I ran into greater competition from a greater number of operators in the cw portion this year than ever before. Better operators, too. It seems for the most part that the chaps I was bucking heads with in the code fracas were the same fellows hitting the phone 'test.

This year's Contest, both on phone and cw, was marked by an absence of multipliers, lack of skip to Asia and the Indian Ocean, and the goldangest Ohio blizzard since the winter of '88. There were two good openings to Japan each day in the cw session, 1400 and 2200 GMT. The 2200 opening had an auroral flutter characteristic. A peek at South America while all the jousting was going on with the boys from the Rising Sun — behold! JAs were louder via the long path than over the north. The funny ringing sound was caused by a slight interval between arrival of signals from both directions.

As usual, much time-space effort was wasted by U.S.A. types who call CQ DX, almost invariably right on top of the choicest multipliers on the band. Eastern chaps are now very much aware of the existence of vast numbers of WB@s. Another thing worth mentioning is the terrific 40-meter opening to Europe on the second cw weekend. In all my years of DXing I never heard anything to equal it. Started at dark and continued for about five hours. Signals built up to much over S9, drowning out the 2s and 5s here in Ohio. I found myself clipping along at about a contact every three minutes with my poor antenna. If I had had a beam — boy!

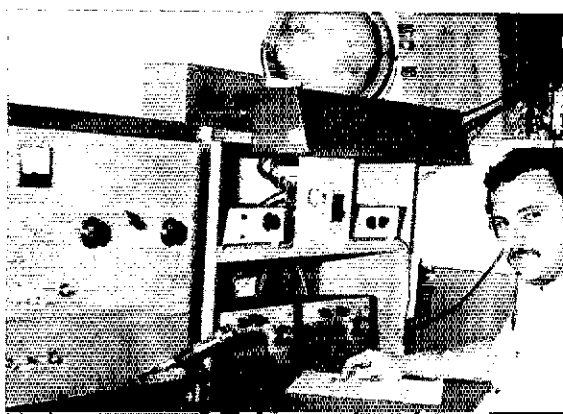
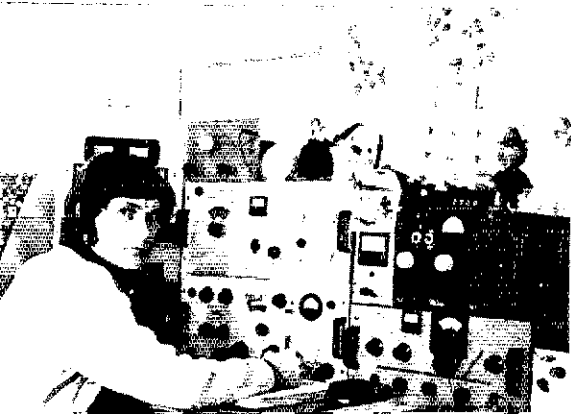
It wouldn't be quite kosher to report on a DX contest without giving due credit to that great law-giver, Mr. Murphy, who really got into the act at W8ZCQ. He conjured up the stinkiest mess of weather since Napoleon's march back from Moscow, icing up the 15-meter beam and the 80-meter dipole. Had to operate without 21 and 3.5 MHz for one whole weekend. That had dire results for I had concentrated on 20 the previous weekend. I think all who suffered at the hands of that danged Irishman should get their experiences with him compiled. If someone will get the stuff together I'll write it up. I've had bad times with him in years past, like a limb from a tree taking down the radials of my 40-meter ground-plane. At one A.M. I was on top of the garage, all snow-covered, putting them back up. Another year found me on top of the tower at three A.M. soldering a jumper across the coax connectors of my 14-MHz beam balun with a blowtorch in a blizzard. *Et tu, Murph!* CU FD?

† † †

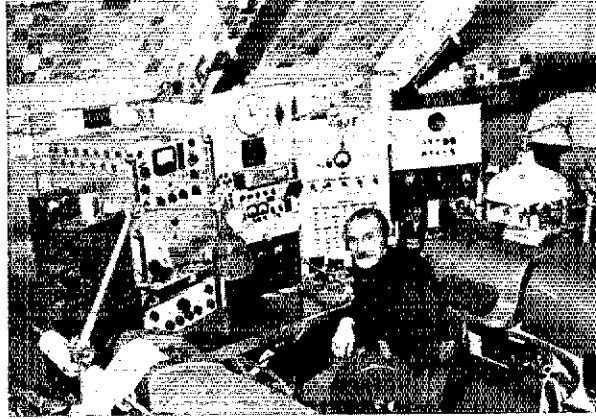
W h e r e :

NORTH AMERICA — DXcellent drop of "QSL-ers of the Month" nominated in mail from Ws IRML ISWX 2HIU, Ks 1N1H 2HYM 3QAP, WAs 2GMD 3KSO 5VAP 6CPP, WBs 4WHE 9CJS, WNs 2E0O 6OSS 9LCA, KH6HOU and VE7BAF, for unusually rapid pasteboard production: BV2A, CPs 1EU 6DH, CR7s FR RO, CT1QN, EA6BJ, F19I, F3KW, FK8KA, FO8BY, FR7AM/g, G6KC, GD3RFK, GI3JEX, GW3UCB, HB9AU, H18s

OK1ATP, left, and PY1DVG pace their respective continents in 160-meter DX activities, logging plenty of W/K/VEs. Jarda uses homespun gear and a big inverted-V at Usti Nad Labem. Rolf keeps Brazil on the 1.8-MHz map with his fine Rio de Janeiro layout. (Photos via Ws 1RB 4BRB)



G6JF has our Hamshack of the Month and fills it with interesting and varied DX doings. Reg currently concentrates on radiotelety by from his farm in Kingsbridge, Devon. (Photo via K2QHT)



CRO LPN, HKs 3CVW 3CXB ØBKX, HS3AIG, 16BQI, IS1ZDT, IT9EKO, JH1s CWZ WIX, JY9FOC, K5LWL/KH6, KG4s FK FU, KH6AA, KH6s GJY HIZ IJ RS SP, KV4s GB HW, KX6JS, KZ5s JF NG OF, LU6DJX, OAs 4QJ 6CS, OD5EJ, OE6s HTG HZG, OKIMAS, ON4XM, PAØABM, PJs 2ARI 2HA 2VD 7VD 9TED, PYICEV, SVØs WH WMM, TG9CD, VE8OR, VKs 3AXX 3BCV 5QB, VP2s ST VAN, VQ9HCS, WA3GHC/TF, XEs IOF 2MX 2VB 3L, YNs 1AZ 4FHJ/3, YO2BS, ZF1s BR WE, ZK2BD, ZL2BMK, ZM2GH, ZS1ANT, 4M4AGP, 5T5CJ, 6W8AL, 6Y5AR, 8P6EW and 9G1HE, plus QSL aides W2s LGY VMH, K4TSJ, WA1HAA, WBs 2JGZ 2QXX 4QFH, VE2FCL and ZS6GE. Any commendables we overlooked? . . . Halp! These parenthesized brethren seek ways and means toward securing QSLs from holdouts specified: (W1PLJ) VQs 2HC 4RF, 9L1GC; (W2QXA) HZ1HZ; (K4SD) XT2AC, 3B8CR, 3V8AH, 5B4AD, 9M8OEA; (WN6OSS) KA6HG, ZL3JC; and (VE3CU1) FM7WT. Any 'alp? . . . Anyone still needing deserved confirmation of QSOs for my operation as HR1RTS, HT1RTS, YN1RTS and/or WA7OJW/HR1 is welcome to apply via my new Virginia address. (WA4BVX) . . . Though Jack is reported still quite ill and inactive I am advised by K2MGA that famed QSL manager W2CTN is NOT a Silent Key. (W2GT) . . . So far my QSL returns for two hundred 1972 DX contacts are running only about thirty percent. Russian comebacks are nonexistent and South America very slow. (W1OJP) . . . Sent out 186 cards with just one return so far. My s.a.s.e. (self-addressed stamped envelope) has been on file with the K4 and Alaska ARRL Bureau branches for months. I'm still all for the League, ham radio and apple pie but this QSL business sure stinks. One reply so far for 186 cards sent out! (K4WLS/KL7) . . . Those "How's" QSLers of the Month help make up for some clowns who never come through at all. (WA6CPP) . . . KZØWPX displays a variant Canal Zone label. (DXNS) . . . It appears that such "BY5s" as AA EE and AR really are 6Y5s AA EE and AR miscopied on cw. (LIDXA) . . . ARRL QSL Bureau's Eightland franchise has lately been assisted by W8s BKO DCH DWP EE ELE OZA SJC ZCK ZCQ, K8s ACD AIK UHB UNG, WA8s BJQ VVG, WB8s EZN GBO HDR JND, WN8GGQ and assorted XYLs. Sincere thanks to all! (W8CFG, CARA)

EUROPE - Contacts still needing QSLs for our operation as EI2s VDT VDX, FØs AAZ OP, G5s ATG AUQ, GC5ATG, GW5s ATG AUQ, GD5ATG and 4UITU are urged to apply via our new address, 105 Tamalpais Dr., Vallejo, CA 94590. We've answered all requests so far. XYL WA5IEB and I keep busy tending QSLs for EL2CZ, KA8RO, VK9BM and VU2FBZ. We also have AP2KS logs for April-May, 1970. Stations for whom we manage QSLing are sometimes slow with their logs, a constant problem, but all requests on hand are cleared as rapidly as possible, usually on the same day that logs arrive. We provide card stock gratis if DX stations cannot do so because of international funding restrictions or other reasons. Any other needful DX operators care to become our QSL clients? We also work for the WB6

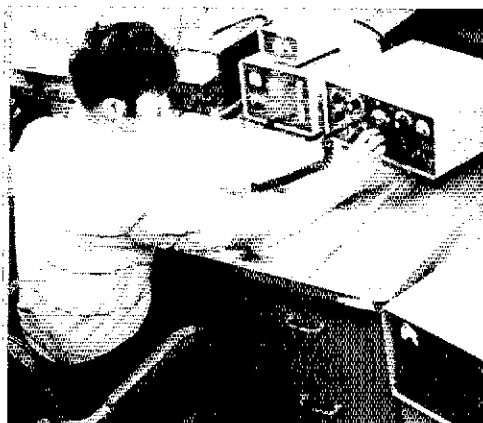
portion of ARRL QSL Bureau which has about six thousand cards on hand. Our files will hold only No. 35 (5 by 7-1/2 inches) envelopes, incidentally, and we accept no currency. WB6 patrons are advised to put one stamp on the outside of each s.a.s.e., additional postage inside if heavy shipment is expected. We use the proper amount and return excess postage inside. I am constantly amazed at the number of exotic QSLs that gather dust unclaimed. One local had four and a half pounds of cards taking up space in our stuffed files! (K6TWT) . . . As of March 17, 1973, I manage SVØWLL's QSLs, operator Robert Bofferding only. He's KØPAQ back home. (WA2FJW) . . . I have SVICH logs dating from March 16, 1969, through January 28, 1973, for W/K/VE/VO QSOs only. (WA3KSQ) . . . CT7s are CT1s, locations and suffixes usually the same. (DXNS) . . . C31FK's card finally came through with explanation that delay was caused by trouble obtaining QSL stock. Says He's now caught up with direct replies. (K2HYM).

ASIA - We hear that People's Republic of China considers using such amateur calls as, for example, BM1ABC wherein the second prefix letter would represent geographical district, A through V. (DXNS) . . . Russian contesters occasionally employ 4J and 4L prefixes. During March, 4J9B was in Leningrad, 4L3Z in UF6-land. (VERON) . . . April 1, 1973, was the changeover date for MP4T stations to become A6s. MP4TEE, for instance, became A6KF and Trucial Oman is now United Arab Emirates. A6XB is old MP4TDM. (WCDXB) . . . Israel's use of those "25" prefixes should extend through this month. (LIDXA)

SOUTH AMERICA - I manage QSLs for CP1ID of La Paz as of the first of this year, also for KV4AR was received through his WØAR address. Self-addressed stamped envelopes are requested from W/K applicants. (WBØBHE) . . . Why does Uruguay remain one of my QSL stumbling blocks? (K2HYM) . . . YY5MM (YV5AM) is the latest



I2ZGA and I1FGT, left and right, enjoyed a recent DXpeditionary jaunt to Liechtenstein. This photo should whet your appetite for Field Day. June is the month, you know - all set to romp?



Venezuela prefix switch. (DXNS) . . . Correction: CW3AA is not the same station as CX3AA. QSLs for CW3AA should go to Uruguay DX Club, Box 37, Montevideo, which has no connection with CX3AA. (CX3BH, W2QXA)

AFRICA - F9MS handles QSLs for FR7ZU/a/g/t, all right, but for no other FR7 operations. CQ6s and XX6s are CR6s with suffixes usually unchanged, and CR7s try their XX7 prefix now and then on the same basis. (DXNS) . . . XT2AF says no XT2BA was licensed a year ago April. Scratch another. (W1JUB) . . . QSL requests for my 9F3UA operation from April 7, 1971, to January 19, 1972, still go via VE3IG. No problems. (K3BSY)

OCEANIA - United States amateurs who send QSLs direct to overseas stations might find a study of international postal rates to their advantage. During the past year I have received U.S. postcards bearing postages from 10 to 22 cents, envelopes bearing from 21 to 32 cents. I hope all contacts have received cards from our Auckland Centennial ZL1AA activation by now. As promised, we did QSL 100 percent. (ZL1TB) . . . To the QTH catalog now, mindful that each suggested item is necessarily neither "official," complete nor accurate:

CO8RL, P.O. Box 1, Havana, Cuba
 ex-DJØPN, P. Esten, W6PN, 141 Summit Rd.
 Santa Barbara, CA 93108
 EP2EJ, M/Sgt E. Diehl, Jr., USA Ret., Box R-136,
 Page Comm. Engrs., APO, New York, NY
 09205
 ex-H18XAL-HS3AL-HS5ABD (to LU5HF1)
 HK5KX, Box 5083, Cali, Colombia
 HS3AHL, Box 4721, APO, San Francisco, CA
 96288 (or to WB8GWB)
 HS4AGZ, G. Goll (K5LGL), F&M Systems, APO,
 San Francisco, CA 96386 (or via K5LBU)
 HZ1HZ, A. Zaidan, Box 1999, Jeddah, Saudi Arabia
 JD1ABZ, R. Kabe, 1-24-13, Arada Kagoshima 870,
 Kagoshima Weather Station, Japan
 JY5HC, Box 2353, Amman, Jordan
 KG4FX, G. Salinas, NSGA Box 41, FBPO,
 Norfolk, VA 23593
 KX6RA, P.O. Box 285, Majuro, Marshall Islands,
 96960
 PZ9AB, Box 20, Moengo, Surinam
 T17GLU, Box 77, Liberia, Costa Rica
 UA3YH/m (via CRC, attn. UK3XAI)
 VE3EMF/VP7 (via VE3DFU)
 VK3FF, P. Fitzherbert, 34 Lillian Parade, Eltham,
 Victoria, 3095, Australia
 VKØRC, S. McPhee, 18 Centre, Dandenong Rd.,
 Cheltenham, Melbourne, Australia
 W4NUH/HC8, P.O. Box 120, Miami Beach, FL
 WA4MEH/HC8, P.O. Box 120, Miami Beach, FL
 XE3FV, Box 129, Oaxaca, Oaxaca, Mexico
 XX7s IKIU (to CR7s IKIU)

KA6DO/KR6DO, a vanishing Ryukyus breed, closes down on Kume Jima shortly. Operator WA3IUH believes many contacts still await confirmations of QSOs with this military club-station. Sam welcomes QSL inquiries via his home address.

YV3YD, Box 4, Guanare, Portuguesa, Venezuela
 ZB2s BL CO, P.O. Box 292, Gibraltar
 ZD7FT, P.O. Box 33, St. Helena
 ZD8TM, W. Ritter, 2607 Martina Av., Kissimmee,
 FL
 ZS6XO, F. Nel, Old Mutual Bldg., President St.,
 Germiston, R.S.A.
 3D6AX, via L. Levy II, 1516 1st St., New Orleans,
 CA 70130
 3V8BB, J. Sorenson, 106 Eyre Ct., St. Johns
 Wood, London, NW8, England
 8P6EX, Box 116, Bridgetown, Barbados
 9J2BL, SwedTel, P.O. Box RW65, Lusaka, Zambia
 9Y5KU, J. Morbia, Box 1198, Bujumbura, Burundi
 9Y4UA, P.O. Box 176, San Fernando, Trinidad

A6SB (via K1DRN)
 A6XF (via G3LOP)
 AF2KS (see text)
 CP1ID (via WBØBHE)
 CP5EB (to CP6EB)
 CQ6LF (to CR6LF)
 CW3AA (see text)
 DMØLMM (via DM4ZOM)
 EA8URE/9 (to EA8GK)
 EL2DK (via W5PAW)
 EL7D (via DK3IA)
 EL9A (via DK3IA)
 EL9A (via WA6TGW)
 EP2GW (via W2REB)
 FØKH/FC (to OH2BH)
 FØØX (via VE6AYU)
 GC5BAU (via K4ZCP)
 GC5BCM (to DL2OV)
 GD3UA (to GM3UA)
 HI7JM (via K3EST)
 ex-HR1RTS (to WA4BVX)
 HS4AIA (via VE6AKV)
 KA1CQ (via WA6AHF)
 KA8RO (via K6TWT)
 KG6RA (via JA2KLT)
 KP4DIW (via W3HNK)
 KV4AR (via WØAR)
 KZØWPX (via WA8TDY)
 ex-MP4TDM (to A6XB)
 OX4CT (via VE2MA)
 PI2HA (via VERONA)
 PYØEN (to PY1CNY)
 SK1AQ (via SM1CXE)
 SVØWLL (via WA2FJW)
 SVØWMM (to WB2JGZ)
 TA1TS (via WØETC)
 TG9KR (via W3HNK)
 TY1AAA (via DJ8DE)
 VA3JJ (via VE3AR)
 VE8DJ (via VE3DAM)
 VK9JT (via ZL4NH)
 ex-VKØWW (to VK3FF)
 VP2LAA (via W3HNK)
 VP2MYA (to W5MYA)
 VP2MQB (to W5QBM)
 ex-VR1O (to G3NRA)
 ex-VS5RL (to WB5HJZ)
 WA9YR/TF (via W9MK)
 YA1DT (via JH1AGH)
 ex-YN1RTS (to WA4BVX)
 YS1MB (via CRAS)
 YV4CME (to YV4YC)
 YV5MM (to YV5MM)
 ZB2AV (to G3SGQ)
 ZB2CJ (to G3ATU)
 ZC4PE (via G3XMQ)
 ZD9GC (to ZS6XO)
 ZS1ANT (via ZS6GE)
 ZS3AW (to DK4AV)
 ZX7AAD (to PY7AAD)
 3E1XTW (to HP1XTW)
 4J9B (see text)
 4L3Z (see text)
 4S7HB (via HB9GN)
 4Z25DZ (via W7TE)
 SR8BF (via F6AZN)
 ex-SZ4PN (to W6PN)
 6Y5SR (via W2GHK)
 9F3USA (see text)

Contributors of the preceding data are Ws 1CW
 1JUB 1RML 1SWX 1YL 2QXA 5PAW 6AM 6GSV,
 Ks 1ZND 2HYM 4SD 5LBU 9UCR, WAs 2HIU
 5VAP 8VRB/1, WB9CJS, WN6OSS, VE7BAF,
 VO1KE, CZ3BH, Columbia Amateur Radio
 Association CARAScope (WBZCQ), DX News-
 Sheet (G. Watts, 62 Bellmore Rd., Norwich, N.
 72T, England), Far East Auxiliary Radio League
 (M) News (KA2LL), International Short-Wave
 League Monitor (E. Chilvers, 1 Grove Rd., Lydney,
 Glos., GL15 5JE, England), Japan DX Radio Club
 Bulletin (JA3GZ), Long Island DX Association
 DX Bulletin (K2KGB), Newark News Radio Club
 Bulletin (M. Witkowski, Rt. 5, Box 167, Stevens
 Point, WI 54481), North Texas DX News (W5SZ),
 Northern California DX Club DXer (Box 608,
 Menlo Park, CA 94025), Southern California DX
 Club Bulletin (W6EJJ), VERON's DXpress (PAØs
 INA TO), West Coast DX Bulletin (WA6AUD) and
 Western Washington DX Club Totem Tabloid
 (WA7JCB). Have we had your help lately?

† † †

TJ1BG works for our embassy in Yaounde when not tantalizing the DX pack on 15 and 20 meters. Jim is WB4KPZ back home. (Photo via K3KWJ)



Whence:

ASIA - VU2JA asks me to tell U.S.A. amateurs that VUs are newly authorized to use 3650-3700-kHz radiotelegraphy. Joe calls CQ DX on 3650 at 0030 GMT on week days. He hopes to be catching W/Ks before summer static becomes too severe. (G6YL) . . . Yes, there are a number of VU2s on 80 now looking for DX at 0030-0130 and 1500 GMT. W4QQN was the first good 80-meter Stateside signal heard here. (VU2JA) . . . HS4AGZ frequents 14,202 kHz or thereabouts almost every Friday at 1200-1430 GMT. Goll hopes to clinch his WAS with Wyoming and Vermont QSOs before returning to the States next month. (K5LBU) . . . WIJAJ's son WA1FTK signs KA11W on two Jims. (W1ALP) . . . JA3AA, who works good DX with a kilowatt on 1910 kHz, is author of a 200-page JA-oriented 160-meter manual. (W1BB) . . . Novice-class VU2FBZ of the Andamans runs 25 watts cw to a quad and receives with a BC-312N of WWII vintage. Fred soon will take an exam for a higher-class ticket. (K6TWT, WA6IEB) . . . Finally scored a two-way with BV2A after a year of cw skeds. Tim says single-sideband licenses are now available on Taiwan and he intends to purchase ssb gear. (WA3KSQ) . . . HS3DR & Co. of Spratly Isle tallied on cw, 80 through 10 meters, 61-449-637-276-1 QSOs; on voice 161-93-1515-1007-242 contacts. (DXNS) . . . YA1AH hopes to try his DX luck in Sikkim shortly, and VK3JW of Mellish fame aims to activate Tibet one day soon, civil unrest in AC regions notwithstanding. (L1DXA) . . . Oman's sultan ordered a ham station replete with log-periodic beam, and we hear that Japan's August Field Day will feature 200 JAs doing battle with Murphy on Ogasawara Island. An Asian contact would give K5PFL all continents 75-meter mobile. (WCDXB) . . . UF6FE welcomes cw calls from W/K/VES while operating sideband around 7077 kHz at 2300 GMT Fridays, also near 3540 kHz at zero GMT Saturdays. (NTDXN)

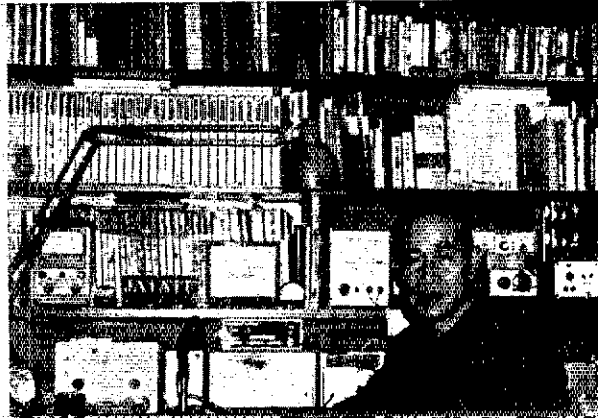
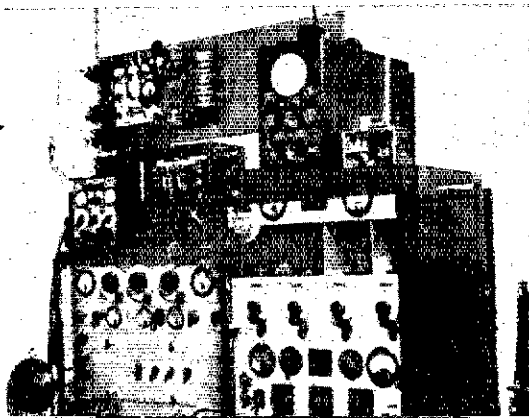
OCEANIA - W6GQU and K6GUY have DX-epeditions sights set on Tongareva near Manihiki for this month or next, and VKØRC heads for a VR4 meteorological assignment this month after an Australian vacation. (WCDXB) . . . ZL3JO and W3OQN have kept almost three thousand successful schedules. (W8OZA) . . . Vermont and Maine will complete KX6BB's WAS. He's regularly workable on 7030-kHz cw just after 0800 GMT. (W1BMR) . . . Just finished high school here and I'd like to

correspond with ARRL members about hamming, SWling and Indonesia. (VK2BVS) . . . We're stationed at Clark Air Force Base but there will be no QSOs for us from the Philippines unless the powers that be can get together on some sort of reciprocal licensing. (ex-9M8s OEA SPD via WA6AHF) . . . Japanese-speaking YJ8KS likes 21,190 kHz and responds to cw calls from our Novice gang. (WN7UMU) . . . NZART is already making plans for celebration of its fiftieth anniversary in June of '76. (ZL1TB) . . . I'm back in the States operating WB5HJZ/6 at Westminster. (ex-VS5RL) . . . ZL5AL of Ross Island, Antarctica, who likes 14,050-kHz cw around 0800 GMT, reports antenna temperatures of minus -33 Centigrade. (DXNS) . . . WØBWJ/KH6 opened up the ARRL Test from a Waikiki hotel room with an FT101 and window-mounted vertical. Sixteen hours later Carl resumed knocking 'em off from the Colorado end. (WCDXB)

SOUTH AMERICA - ZVØWH (PY2WH) claims four kiloQSOs collected during his March visit to Fernando de Noronha. (DXNS) . . . I frequent the YL-SSB net on 14,332 kHz. (9Y4VV) . . . I'll do a better job in W/K QRM when I succeed in finding a cw filter for my TR-3. (HK7UL) . . . DX on 80- and 40-meter cw is my favorite pursuit. (HK4AFJ) . . . This year's YVØAA action placed Aves Isle on 160 meters for the first time ever. (YV6BPG) . . . My quad on 40 gets me plenty of calls. Too many, perhaps - what QRM! (OA4OS) . . . Had an unexpected eyeball contact with Senator Goldwater, K7UGA, while visiting FM7s WG and WN. (WB2AQC) . . . I enjoyed a recent visit with PY3BSS at Porto Alegre. Alfredo's ssb kilowatt and quad are well heard in North America. PY3BSS is president of LABRE's Zone 3. (WN2BCE) . . . PAØKOR does scientific research in the Galapagos with hopes of joining the DX frolic from HC8FN or some other local station. (VERON)

† † †

JA1ATF offers some DX nostalgia, a photo of his pre-WW II Tibetan setup. Sakae was active as AC4TF in Lhasa from May through October, 1941, and also operated MX3H, Manchukuo, in 1939-'40. First licensed 43 years ago as J7CG, JA1ATF is still an avid DXer with the Tokyo installation at right.



Operating News

GEORGE HART, WINJM
Communications Manager
ELLEN WHITE, W1YL
Deputy Communications Mgr.

ASST. COMMS. MGRS.: DXCC, R. L. WHITE, W1CW; *Hq. Station*, C. R. BENDER, W1WPR;
Contests, F. D. NISWANDER, WA1PID; *Public Service*, W. C. MANN, WA1FCM.

Field Day Films. Last month's column contained announcement of the new film "CQ Field Day," now available for booking through the ARRL Training Aids program. As mentioned, this is a documentary of one group's Field Day, for reasons given - mainly, that we asked for contributions after the event instead of before. Thus, contributions were very sparse.

Would contributions have been better if they had been requested *before* the event? Let's find out. A film montage of FD shots across the two nations (U.S. and Canada) would still be a most interesting documentary. The job of editing contributions to come up with a half hour or so of FD footage is considerable, but if you fellows and gals will supply the footage, we'll tackle the job of editing.

Contributions of film footage cannot be returned (unless not used) and cannot be paid for. But you may be able to immortalize your club's Field Day this year by putting an extra Super-8 cartridge into your camera and spending five minutes taking shots of some of the more interesting features of your operation. Have the cartridge developed and send it in. It will be screened, and if there is a usable sequence it will be cut out (not likely we'll use the whole thing) and the rest returned if you request it. If none of it can be used, we'll return the whole thing. But please send it in *expecting* that it will *not* be returned, then there will be no recriminations to worry about.

The shots should be of some features of your operation that are unusual. Pictures of a couple of guys sitting at an operating position yakking, or struggling to erect an antenna mast, starting a generator, stringing wires - all these things are

great for your club archives so that viewers in years to come can say "There's old so-and-so!" But to general viewers they wouldn't mean a thing. How about something unusual? Or some spectacular close-up or other kind of expert or out-of-the-ordinary photography? A little comedy?

When you send in your contribution, include a note telling who, where, what, and explaining anything not apparent from the pictures. Use Super-8 cartridges only. Since work on this project will have to be sandwiched in or done on our own time, it may be months before you hear anything, but we'll at least acknowledge receipt of your contribution. If you eventually get your contribution back *in toto* - well, thanks anyway. If you get only part of it back, it means we are keeping the rest for consideration for the final product. You may never see it again, but if you do it'll be in whatever results out of the whole project.

"CQ Field Day" was a very low-budget production. This one will be *no-budget*. Let's see what can be done on a 100% voluntary basis.

Phone DXCC. There has been some unhappiness over the discontinuance of a separate Phone DXCC, although the hubbub hasn't been anything like it was a few years back when the same step was taken solely on an administrative basis, then rescinded. We just noticed that the reasons for the decision haven't been fully explained. We hope this will rectify the oversight.

Actually, it's basic and simple: in today's amateur radio it is actually easier to make DXCC by sideband phone than by any other mode. Mostly the reason for this is that more different "countries" are available on sideband than by cw, which is natural enough when you consider the popularity of voice over International Code as a communications mode - even overlooking some of the advantages of the latter. When Phone DXCC was first established, amateur sideband was not in existence, and working DX on a-m was a real



W3GRF (left), outgoing chairman of the ARRL Contest Advisory Committee, was presented with a plaque of appreciation by new chairman W1BGD on behalf of the entire CAC membership. This was a highlight of the Potomac Valley Radio Club Christmas dinner. (Photo by K4ORQ)

QST for

WIAW SPRING-SUMMER SCHEDULE

(April 29—October 28)

(The specific frequencies shown below are approximate and indicate general operating periods)

The ARRL Maxin Memorial Station welcomes visitors. Operating-visiting hours are Monday through Friday 1 P.M.—1 A.M. EDST, Saturday 7 P.M.—1:00 A.M. EDST and Sunday 3 P.M.—11:00 P.M. EDST. The station address is 225 Main Street, Newington, Conn., about 7 miles south of Hartford. A map showing local street detail will be sent upon request. If you wish to operate, you must have your original operator's license with you. The station will be closed May 28, July 4, and September 3.

Times/Days GMT	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
0000	← CW BULLETIN ¹ →							
0020-0100 ⁴	← PHONE BULLETIN ² →							
0100	OSCAR ¹⁰						7.15 Nov. ⁵	14.080
0105-0130 ⁴	← CODE PRACTICE ¹ (35-15 wpm TThSat, 5-25 wpm MWFSn) DETAILS BELOW →							
0130	← RTTY BULLETIN ³ →							
0230-0300 ⁴	← PHONE BULLETIN ² →							
0300	RTTY BULL. ³						1.805	3.580
0330	PHONE BULL. ²						7.290	7.290
0335-0400 ⁴	← CW BULLETIN ¹ →							
0400	← CODE PRACTICE ¹ (5-25 wpm MWF, 35-15 wpm TTh) DETAILS BELOW →							
0420-0500 ⁴	← OSCAR ⁹ →							
1240	← OSCAR ⁹ →							
1300	← OSCAR ⁹ →							
1700-1800	← OSCAR ⁹ →							
1800	← OSCAR ⁹ →							
1900-2000	← OSCAR ⁹ →							
2000-2030	OSCAR ¹¹						7.080	7.080
2030	← OSCAR ⁹ →							
2100-2130	← OSCAR ⁹ →							
2130	← OSCAR ⁹ →							
2200	← OSCAR ⁹ →							
2300	← OSCAR ⁹ →							
2330	← OSCAR ⁹ →							
	← CODE PRACTICE (10-13-15 wpm) DETAILS BELOW →							

¹ CW Bulletins (18 wpm) and code practice on 1.805, 3.580, 7.080, 14.080, 21.080, 28.080, 50.080 and 145.588 MHz.
² Phone Bulletins on 1.820, 3.990, 7.290, 14.290, 21.390, 28.590, 50.190 and 145.588 MHz.
³ RTTY Bulletins, on 3.625, 7.095, 14.095, 21.095, and 28.095 MHz. Bulletins repeated when time permits.
⁴ Starting time approximate, following conclusion of bulletin or code practice.
⁵ WIAW will time the indicated bands for Novice calls, returning the call on the frequency on which called.
⁶ Participation in section traffic nets.
⁷ Operation will be on one of the following frequencies: 21.02, 21.08, 21.1, 28.02, 28.08, 28.1 MHz.
⁸ Operation will be on one of the following frequencies: 21.260, 21.390, 28.590 MHz.
⁹ When an OSCAR satellite is in orbit, daily updated orbital data is sent at 18 WPM on cw frequencies.
¹⁰ OSCAR orbital data for the coming week, on RTTY frequencies.
¹¹ OSCAR orbital data for the coming week, on cw frequencies.

WIAW CODE PRACTICE

WIAW transmits code practice according to the following schedule. Approximate frequencies are 1.805 3.58 7.08 14.08 21.08 28.08 50.08 and 145.588 MHz. For practice purposes the order of words in each line may be reversed during the 5-13 wpm transmissions. Each tape carries checking references.

Speeds	Local Times/Days	GMT
10-13-15	7:30 PM EDST dy	2330 dy
	4:30 PM PDST	
5-7½-10-	9:30 PM EDST SnTThS	0130 MWFSn
13-20-25	6:30 PM PDST	
5-7½-10-	9:00 AM EDST MWF	1300 MWF
13-20-25	6:00 AM PDST	
35-30-25-	9:30 PM EDST MWF	0130 TThS
20-15	6:30 PM PDST	

35-30-25- 9:00 AM EDST TTh 1300 TTh
 20-15 6:00 AM PDST

The 0130 GMT practice is omitted four times a year on designated nights when Frequency Measuring Tests are sent in this period. To improve your fist by sending in step with WIAW (but not over the air!), and to allow checking the accuracy of your copy on certain tapes, note the GMT dates and QST practice text (from the issue 2 months previous) to be sent in the 0130 GMT practice on the following dates:

- June 11: It Seems to Us
- June 19: Correspondence
- June 22: League Lines
- June 28: ARPS
- July 2: World Above
- July 6: YL News

chore. Since today it's easier than doing it by cw, there is no real justification for a separate award; thus, the DXAC's recommendation and acceptance of same.

Why not separate phone and cw awards, then? To answer a question with a question, why not separate awards for all modes, all bands, for power gradations, for YLs, for novices, and any other kind of specialty? DXCC started out as a one-shot award. You made it, that was it, just like "making" any other award. Once you had it, you sought new

fields to conquer, to improve yourself, to diversify, to widen your field of experience and expertise.

**IN A COMMUNICATIONS EMERGENCY,
 MONITOR WIAW FOR SPECIAL BULLETINS AS FOLLOWS (times in GMT).**

Phone: On the hour.
RTTY: At 15 minutes past the hour.
CW: On the half hour.



DX CENTURY CLUB AWARDS



Radiotelephone listings follow the general-type "New Member" and "Endorsement" listings - March 1-31, 1973

New Members

JA3GZN	302	WB8GKL	135	W6CLP	117	SP6AEW	107	W3JZJ/8	103	WBSFIU	101
ZP5EC	265	F5HV	132	WB6KUC	117	DM3RE	106	DK3VV	102	WB9EBP	101
F5LQ	264	G3UYM	129	DL5BA	114	W6OWL	106	VU2AJW	102	G4AMJ	100
JA3MXR	205	K5JTN	127	DL6HU	110	YU1DKL	106	W1EWD	102	L4IL	100
W5CNU	201	SM6DUF	126	ET3USF	110	F6AXS	105	WA1NES	102	VE2BRW	100
K8KPU	189	WB0ECM	123	WB6BKN	110	DL2XR	104	WA7RKA	102	VS5RG	100
K4FCT	182	IS1AN	122	F3GI	109	VE5FG	104	WB0DSP	102	WA3NMG	100
JA3GSM	162	SM0CCM	122	K9YNF	109	WB2LYB	104	DK5JA	101	WA4DUS	100
WA9TXL	159	WA3QFG	121	W7MFU	109	ZD3Q	104	JH3JEX	101	WA5TXY	100
WA3NXW	148	KA2AS	120	DK5ZO	108	WB2OHU	103	VESDZ	101	WBSAZL	100
W9LF	146	WA3OHF	120	DL9H	108	WB4ORM	103	W3YMB	101	W6BHZ	100
G3DLH	138			SM4IM	107			WA3RCN	101		

JA3GZN	298	VE55M	169	WB6KUC	117	W9CTY	108	K6SF	103	KH6CU	100
W6ARJ	290	DL9JH	138	JA2UYS	112	WB6BKN	107	K9UQN	103	V01BT	100
W1YRC	286	W5CNU	134	I3GZI	110	WA8UUY	106	WB6JMA	103	VS6CY	100
WA6IPY	238	WA2EKP	132	HC'PK	110	DK4PA	105	W91JL	103	WB2DXW	100
ISPAC	208	WB8GKL	126	VE7AJ	110	ET3USF	105	WA2KAQ	102	WA3LRX	100
K3SXO	199	JA3GSM	124	W1DIS	110	W6OWL	105	WA2YPD	102	WA4DPV	100
DL3BH	171	BA2BW	120	LASKO	109	F6AXS	104	WA6PKN	102	W0AKT	100
		VE7PO	119	JRIINZ	108	W6MQS	104	DL9XW	100		

Endorsements

In the endorsement listings shown, totals from 120 through the 240 level are given in increments of 20, from 250 through 300 in increments of 10 and above 300 in increments of 5. The totals shown do not necessarily represent the exact credits given but only that the participant has reached the endorsement group indicated.

W2AGW	350	W6GC	290	W2AH	260	WA5ZWC	220	K1WJB	160	W7JAC	140
ON4NC	345	W8WT	290	W4DXI	260	WB6KIG	220	K2FJ	160	W9MLG	140
W1AFX	345	W9KEE	290	W9ZWH	260	W9KYZ	220	K3ZQL	160	VU3TFA	140
OZ3Y	330	K2FCB	280	DJ5GG	250	W9OEQ	220	VE7SE	160	9V1PM	140
WA2RAU	325	K4MG	280	K6TWT	250	ZL2ASM	220	W1HM	160	W1DKU	120
ISUA	320	W4YUJ	280	KP4DLW	250	VE3HD	200	WA2JRD	160	WA2DFC	120
W1FTX	320	W5LUJ	280	W2HUG	250	W4EH	200	W4FUJ	160	W3YKM	120
W9NLJ	320	WA9WJE	280	WA2BCK	250	W3ZBW/4	200	W4WOY	160	WB4ADT	120
W2HH	315	WA0NTC	280	WA6CCK	250	WA5QEQ	200	WB4PAB	160	WA8RIS	120
K1JHX	310	YU3EY	280	W7CNL	250	W9HDR	200	VE6BU/WS	160	WA9HEU	120
OH200	310	K5JZY	270	W9ALJ	250	W9LJL	200	W7GYP	160	WA9WIS	120
WA6IPY	310	K9VOK	270	W9ELG	250	WA9AUM	200	YU2CBM	160	WA9YZD	120
W9DH	310	VE6ABP	270	K6TXA	240	W0HBB	200	DK6FT	140	W0EGC	120
W9JK	310	W2ZZ	270	K6NM	240	DL0JK	180	JA1TNV	140	WA0TAS	120
YV5AE	310	WA4DRU	270	K6WD	240	K3YZZ	180	MP4TDM	140	WA0ECB	120
DK3PO	305	W5QBM	270	K7GYA	240	VK2BPN	180	SP9AQY	140	CT2AZ	120
OZ1LO	305	W6OL	270	K8CSG	240	W1LQO	180	VE4OP	140	DK22Q	120
WA3IKK	305	W8KCI	270	WA5UBV	240	WA2BAV	180	WA1PID	140	DL2WR	120
G6RC	300	WB9FJX	270	W0LDC	240	W4ZVX	180	W2QXA	140	F9GO	120
OE2FGL	300	ZL1AMO	270	DL1ES	220	WB9DRE	180	WB2HJW	140	HB9AR	120
MI1CXE	300	DJ5JH	260	JH1HWN	220	YU3PO	180	WA2MBP	140	K2DT	120
WA3HGV	300	K1LPL/5	260	K3SXQ	220	VE2DHF/YV1180	180	WA3ASQ	140	K0ROF	120
EP2TW	290	K4GFI	260	OZ7JZ	220	CX9HT	160	WA3AQ	140	VE3FXA	120
W21PM	290	SP2AJO	260	SP2HL	220	DL9DX	160	WA3LJP	140		

W2RGV	340	W9DH	290	W9DDL	250	W1EEP	220	SMSG	180	MP4TDM	140
ZS6LW	335	K4BYM	280	W9ZWH	250	W7FSE	220	WB2RLK/VE1180	180	W6P5Q	140
WA2RAU	325	K4MG	280	XE1J	250	CN8CG	200	W9OEQ	180	W8GIO	140
ISUA	320	K8AXG	280	ZP5EC	250	JA8ZO	200	K6YXA	160	W8KCI	140
VE2NV	320	WB6GKK	280	DK3LP	240	KH6GMP	200	VE3ZT	160	W9MLG	140
KH6OR	315	W8WT	280	K7GYA	240	OZ7JZ	200	WA2JRO	160	W9WNB	140
W3JK	315	K2ANT	270	K8CSG	240	PY7ASQ	200	W3GJW	160	ZL1ALE	140
W9HPS	315	CT1UA	270	L6GRL	240	VE2DJR	200	WA4NIB	160	K3JYZ	120
OZ3Y	310	W9EXE	270	OZ6RT	240	WB4PXW	200	WA7HCO	160	DK6FT	120
DK3PO	300	K4GFI	260	W3CDL	240	W5HCI	200	WA9FZQ	160	VK2BPN	120
EA4LH	300	VE6ABP	260	WB9FJX	240	WA5QEQ	200	WB9EAQ	160	W3GHA	120
G6LK	300	WA4DRU	260	HTJR	220	WB5DJA	200	YJ8BL	160	VE6BU/WS	120
WA3IKK	300	I3ANE	250	JH1HWN	220	DL0JK	180	VE2DHF/YV1180	160	W7CUJ	120
W4HA	300	W4FWG	250	LU8DB	220	F8NI	180	JA3LKB	140	W9OQI	120
CT1UE	290	W9MIJ/4	250	VP9GE	220	PY2CPK	180	K8VRZ	140	WA9TAA	120
EA8GZ	290									W0EGC	120

But DXCC became so popular that a demand arose for further awards in the DX field, and these demands took the form of more awards and honors for those already holding them. The membership demands, the headquarters responds, so DXCC and

all its cupolas gradually took more and more staff time until eventually it became a full-time job of one skilled and experienced staff member - the only ARRL award to reach this pinnacle of popularity.

But wait, the pinnacle was not yet reached! The demand for further attention to DX achievements along DXCC lines continued to burgeon, and another full-time person was added to help do the work involved, and this one activity became a separate branch of the CD. This branch now has more people and more work to do than the Public Service Branch, and the end appears not yet in sight as the demand is for more DX awards, super-awards, awards for the award-winners, and awards for the winners of these awards. The DXCC Branch is overtaxed with two full-time people, requiring occasional overtime for pure administrative purposes.

Where do we stop? Where do we draw the line? It is well known in promotional circles that nothing succeeds like success, that popularity begets greater popularity, that added-on services result in the demand for still more services. What the membership wants, the membership will get, one way or another - by Board of Directors order, if necessary. But somewhere along the line, the appeal to reason must be made. Do we really need more DX awards? Do we want them for a reason, or do we just want them because we want them?

Youngest Old Timer. In March *QST* we entered the claim of K2AZB to be the youngest holder of an ARRL OTC certificate. Now comes forward Dik Levine, WA2DDU, whose original call was WN8IJE, which appears in the Summer '52 call book. He is about six months younger than Mike and is in the OTC. Dik says he's confident he'll hold the title until shortly after this is printed in *QST*. - WINJM.

SCM ELECTION NOTICE

To all ARRL members in the Sections listed below.

You are hereby notified that an election for Section Communications Manager is about to be held in your respective sections. This notice supersedes previous notices.

Nominating petitions are solicited. The signatures of five or more ARRL full members of the Section concerned are required on each petition. No member shall sign more than one petition.

Each candidate for Section Communications Manager must have been both the holder of amateur Conditional Class license or higher (Canadian Advanced Amateur Certificate) and an ARRL full member for at least two years immediately prior to receipt of petition at headquarters. Petitions must be received on or before 4:30 PM Eastern local time on the closing dates specified. In cases where no valid nominating petitions were received in response to previous notices, the closing dates are set ahead to the dates given herewith. The complete name, address, Zip code of the candidate and signers should be included with the petition. It is advisable that a few extra full-member signatures be obtained, to insure that it will be valid.

Elections will take place as soon after the closing dates specified as full information on the candidates can be obtained. Candidates' names will be listed on the ballot in alphabetical order.

The following nominating form is suggested. (Signers should be sure to give city, street address and Zip code.)
 Communications Manager, ARRL (Place and date)
 225 Main St., Newington, Conn. 06111

We, the undersigned full members of the ARRL Section of the division, hereby nominate as candidate for Section Communications Manager for this Section for the next two-year term of office.

You are urged to take the initiative and file nominating petitions immediately.

George Hart, WINJM, Communications Manager

Section	Closing Date	Current SCM	Present Term Ends
W.Mass.	6/11/73	P.C.Noble, W1BVR	8/11/73
Kansas	6/11/73	R.M.Summers, K0BXF	8/18/73
Miss.	7/10/73	W.Coffey, W5NCB	1/2/73
Ala.	7/10/73	J.A.Brashear, Jr., WB4FKJ	1/28/73
S.Barb.	7/10/73	D.P.Gagnon, WA6DEJ	9/2/73
Canal Zone	7/10/73	J.L.McMillen, KZ5ZZ	9/10/73
Maritime	7/10/73	W.D.Jones, VE1AMR	9/10/73
N.C.	7/10/73	C.H.Brydges, W4WXZ	9/13/73
W.Va.	7/10/73	D.B.Morris, W8JM	9/18/73
La.	7/10/73	J.R.Rivoire, KSAGI*	6/11/74

* Resigned
4/18/73

SCM ELECTION RESULTS

Valid petitions nominating a single candidate were filed by members in the following sections, completing their election in accordance with applicable rules, each term of office starting on the date given.

Ark.	J.N. Lowrey, WA5VWH	3/10/73
Nev.	H.P. Leary, K7ZOK	3/10/73
Sask.	P.A. Crosthwaite, VE5RP	4/10/73
B.C.	H.E. Savage, VE7TB	5/1/73
Sac. Valley	N.A. Wilson, WA6JVD	5/7/73
L.A.	E.H. Violino, W6INH	5/19/73

In the Georgia Section, Mr. A.J. Garrison, WA4WOU and Mr. Ray LaRue, W4BYG were nominated. Mr. LaRue received 235 votes and Mr. Garrison received 220 votes. Mr. LaRue's term of office began April 13, 1973.

CLUB COUNCILS & FEDERATIONS

Amateur Radio Council of Arizona; Elmer Kraatz, WA7DTW, Secy.; 2524 Lema Drive, Mesa, Arizona 85205

British Columbia Amateur Radio Association, Inc.; Sid Young, VE7SM, Secy.; 2061 Weiler Ave., Sidney, British Columbia, Canada

Chicago Area Radio Club Council; Roger A. Baim, W89BDP, Secy.; 2753 W. Coyle, Chicago, Illinois 60645

Delaware Valley Council Radio Clubs; John Balch, W3AES, Secy.; 145 3rd Ave., Newton Square, Pennsylvania 21218

Federation of Eastern Mass. Amateur Radio Assoc.; Eugene Hastings, W1VRK, Secy.-Treas.; 28 Forest Avenue; Swampscott, Massachusetts 01907

Foundation For Amateur Radio; Ethel M. Smith, K4LMB, Secy.; 2012 Rockingham St., McLean, Virginia 22101

Hudson Amateur Radio Council; Irv Binger, W2IB, Secy.; 300 Pelham Road, New Rochelle, New York 10805

Los Angeles Area Council of Amateur Radio Clubs, Inc.; Rosemary Willis, Secy.-Treas.; 9276 Borden Avenue, Sun Valley, California 91352

Ohio Council of Amateur Radio Clubs; James W. Benson, W8OUU, Secy.; 2463 Kingspath Drive, Cincinnati, Ohio 45231
 Radio Society of Ontario, Inc.; Irene Williams, VE3BEI, Secy.; 18 Montgomery Ave., Agincourt, Ontario, Canada

Tri-Counties Council of Amateur Radio Clubs; R.S. Lunbeck, W6IDU, Secy.; 3978 Blackwood Street, Newbury Park, California 91320

West Virginia State Radio Council, Inc.; Vivian L. Kibler, WA80KG, Secy.; 182 Monterey Drive, St. Albans, West Virginia 25177

S-BAND AWARDS

(Updating the Feb. 1973 listing.)

5BDXCC: (Starting with number 222),
 K4KQ K4MQG KIOME HB9AHA EL2CB
 OABV K1LPL/3 SM5EXE PY3APH
 W2HUG I0JX WB6UDC OH1VA W9KB
 W2ZZ W6ISQ YU2DX W5KC.

5BWAS: (Starting with number 138),
 K4FAC W7GHT W3ZUH WA6OGW
 WA6HRS WASTYB WBSKBT K4MQG
 W01L.

New A-1 Operators

K1VHO K2EFN WA2MWO K4BI K4MQI
K5EDE WA5PWX W8UOQ K9CJM
WA9EED W0CAW W0UTD DJ1XP DM3BE
F3AT VP2ST.

ARRL AFFILIATED CLUB HONOR ROLL

In these days of raising requirements in one place and lowering them in another, the affiliated club that can maintain its ARRL membership at 100% deserves some special recognition. Headquarters bestows such recognition twice a year in the form of an honorary listing in *QST* and a special certificate.

Each year, as annual affiliated club questionnaires are received, those showing that all their members are also ARRL members are noted and put aside for this special honor. The list below are those clubs who are 100% ARRL according to questionnaires so far received. If your club is 100% ARRL and is not listed below, it means we do not have your questionnaire form yet; fill it out and send it in, so you will make the addendum of 100% ARRL Clubs in December *QST*. Ladies and gentlemen, our Affiliated Club Honor Roll!

- Adams County Amateur Radio Society, Gettysburg, Pa.
- Alexandria Radio Club, Inc., Falls Church, Va.
- Anderson Radio Club, Anderson, South Carolina
- Associated Mountain Toppers, Anaheim, California
- Atomic International-Rocketdyne ARC, Tazana, Calif.
- Beacon Radio Amateurs, Philadelphia, Pa.
- Bloomfield High School ARC, Bloomfield, Conn.
- Central Kansas ARC, Inc., Salina, Kansas
- Central Virginia Contest Club, Richmond, Va.
- Chicago Radio Traffic Assoc., Chicago, Ill.
- Christian Brothers ARC (CBARC), St. Louis, Mo.

- Columbia Amateur Radio Club, Columbia, Miss.
- Covington Radio Club, Andalusia, Alabama
- Crawford Amateur Radio Society, Guys Mills, Pa.
- Eden Amateur Radio Club, Eden, N. C.
- Estero Radio Club, Morrow Bay, California
- Greater Cleveland VHF RC, Maple Heights, Ohio
- Jefferson Barracks ARC, St. Louis, Missouri
- Jessamine Amateur Wireless Soc., (JAWS), Nicholasville, Ky.
- Kings County Band Scanners, Brooklyn, N. Y.
- Lockheed Amateur Radio Club, Burbank, Calif.
- Loudon County ARC, Lenoir City, Tenn.
- Louisville Gas & Electric Co. ARC, Louisville, Ky.
- Mass-Dixon Pirate Radio Soc., Wilmington, Del.
- Massillon Amateur Radio Club, No. Canton, Ohio
- Milke & Key Radio Amateur Club, Camarillo, Calif.
- Minnesota Wireless Assoc., Inver Grove Hgts., Minn.
- National Capitol DX Assoc., Clinton, Maryland
- Norfolk County Radio Assoc., Norwood, Mass.
- Norfolk Radio Club, Norfolk, Nebraska
- North Alabama DX Club, Huntsville, Alabama
- Northeast Nebraska Radio Club, Norfolk, Nebraska
- Northern Illinois DX Assoc., Elmhurst, Illinois
- 128 Contest Club, Merrimack, New Hampshire
- Oologah H.S. Amateur Radio Club, Talala, Okla.
- Order of Boiled Owls, Columbus, Ohio Chapter, Reynoldsburg, Ohio
- Potomac Area VHF Soc., Rockville, Maryland
- Potomac Valley Radio Club, Fairfax, Virginia
- Radio Amateur Transmitting Soc., Nashville, Tenn.
- St. Louis ARC, Inc., Webster Groves, Missouri
- Sarasota Amateur Radio Assoc., Sarasota, Florida
- Scarboro Amateur Radio Club, Scarborough, Ontario, Canada
- Shiawassee AR Assoc., Inc., Corunna, Mich.
- Skagit Amateur Radio Club, Seattle, Wash.
- Sterling Park ARC, Sterling, Virginia
- Texas DX Society, Alvin, Texas
- Virginia Commonwealth U ARC, Richmond, Va.
- Wabasha Area ARC, Kellogg, Minnesota
- York Amateur Radio Club, York, Pa.

ARRL QSL Bureau

The function of the ARRL QSL Bureau is to facilitate delivery to amateurs in the United States, its possessions and Canada, of those QSL cards which arrive from amateur stations in other parts of the world. All you have to do is send your QSL manager (see list below) a stamped, self-addressed envelope, about 5 by 8 inches in size, with your name and address in the usual place on the front of the envelope and your call printed in capital letters in the upper left-hand corner.

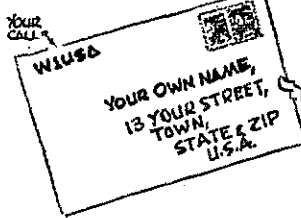
Cards for stations in the United States and Canada should be sent to the proper call area bureau listed below. Recent changes are in bold face.

- W1.K1.WA1.WN1 - Hampden County Radio Association, Box 216, Forest Park Station, Springfield, MA 01108.
- W2.K2.WA2.WB2.WN2 - North Jersey DX Assn. P.O. Box 505, Ridgewood, NJ 07451.
- W3.K3.WA3.WN3 - Jesse Bieberman, W3KTC, RD 1, Box 66, Valley Hill Rd., Malvern, PA 19355.
- W4.K4 - North Alabama DX Club, P.O. Box 2035, Hartsville, AL 35804.
- WA4.WB4.WN4 - J. R. Baker, W4LR, P.O. Box 1989, Melbourne, FL 32901.
- W5.K5.WA5.WB5.WN5 - ARRL WS QSL Bureau, Box 1690, Sherman TX 75090.
- W6.K6.WA6.WB6.WN6 - No. California DX Club, Box 11, Los Altos, CA 94022.
- W7.K7.WA7.WN7 - Willamette Valley DX Club, Inc., P.O. Box 555, Portland, OR 97207.
- W8.K8.WA8.WB8.WN8 - Columbus Amateur Radio Assn., Radio Room, 280 E. Broad St., Columbus, OH 43215.
- W9.K9.WA9.WB9.WN9 - Northern Illinois DX Assn., Box 519, Elmhurst, IL 60126.
- W0 - Reggie Hoare, W0OYP, P.O. Box 115, Mitchellville, IA 50169.
- K0.WA0.WB0.WN0 - Dr. Phillip D. Rowley, K0ZFL, Route 1, Box 455, Alamosa, CO 81101.
- KP4.WP4 - Alicia Rodriguez, KP4CL, P.O. Box 1061, San Juan, PR 00902.
- KV4 - Graciano Belardo, KV4CF, P.O. Box 572, Christiansted, St. Croix, VI 00820.
- KZ5 - Lee DuPre, KZ5UD, Box 407, Balboa, CZ. Box 407, Balboa, CZ.
- KH6.WH6 - John H. Oka, KH6DQ, P.O. Box 101, Aiea, Oahu, HI 96701.

- KL7.WL7 - Alaska QSL Bureau, Star Route Box 65, Wasilla, AK 99687.
 - VE1 - L. J. Fader, VE1FQ, P.O. Box 663, Halifax, NS.
 - VE2 - A. G. Daemen, VE2L, 2960 Douglas Avenue, Montreal 301, PQ.
 - VE3 - R. H. Buckley, VE3UW, 20 Almont Road, Downsview, ON.
 - VE4 - D. E. McVittie, VE4OX, 647 Academy Road, Winnipeg R3N 0E8, MB.
 - VE5 - A. Lloyd Jones, VE5H, 2328 Grant Road, Regina, SK. S4S 5S-3.
 - VE6 - D. C. Davidson, VE6TK, 1108 Trafford Dr. NW, Calgary 47, AB.
 - VE7 - H. R. Hough, VE7HR, 1291 McKenzie Rd., Victoria, BC.
 - VE8 - Yellowknife Centennial Radio Club, P.O. Box 1944, Yellowknife, NWT, Canada.
 - VO1 - Ernest Ash, VO1AA, P.O. Box 6, St. John's, NF.
 - VO2 - Goose Bay Amateur Radio Club, P.O. Box 232, Goose Bay, LB.
 - SWL - Leroy Waite, 39 Hannum St., Ballston Spa, NY 12020.
- † These bureaus prefer 4 1/4 by 9 1/2 inch or No. 10 business envelopes.

QSL Bureaus for other U.S. Possessions and for other countries appear in the "LARU NEWS" section of the June and December issues of *QST*.

IS YOURS ON FILE WITH YOUR QSL MGR?



Operating Events

de W1YL

JUNE

- 3 *Minnesota QSO Party*, p. 117 May.
- 6 *W6OWP Qualifying Run* (W6ZRJ, alternate) 10-35 wpm at 0400 GMT on 3590/7090 kHz. This is 2100 PDST the night of June 5. Please note that dates are always shown at least two months in advance and times are always the same local "clock time," i.e. 9 PM local Pacific time. Underline one minute of the highest speed copied. certify copy made without aid and send to ARRL for grading.
- 9-10 *VHF QSO Party*, p. 82 May.
- 10-14 *Worked All Mass. Cities and Towns Contest*, p. 117 May.
- 10-17 *Massachusetts Amateur Radio Week*, p. 117 May.
- 14 *WIAW Qualifying Run* (10-35 wpm at 0130 GMT) on 3.580 7.080 14.080 21.080 28.080 50.080 and 145.588 MHz. This is 2130 EDST (9 PM EDST) the night of June 13. Underline one minute of top speed copied, state no aids used (typewriters OK), sign and mail to ARRL with your full name, call (if any) and complete mailing address.
- 23-24 *FIELDDAY*, p. 80 May.
- 23-July 15 *NRL's 50th Anniversary Celebration*, p. 60 January.
- 27 *WIAW Morning Qualifying Run*, 1300 GMT (this is 9 am EDST). Same frequencies and details as under the June 14 listing.

JULY

- 1-Dec. 31 *Italian YL Club Mini-Contest*, p. 115 May.
- 5 *W6OWP Qualifying Run*.
- 7-8 *First Annual Oregon QSO Party*, sponsored by the Emerald Amateur Radio Society, to run the full 48-hour GMT period. Oregon stations score 1 point per U.S., VE, KH6 and KL7 QSOs, 3 points for DX contacts. One multiplier point for each new state, KH6 and KL7 included, VE province, and DX country. Oregon stations may be worked for multiplier and QSO points. U.S. and VE stations score 5 points for each Oregon QSO, 7 points for an Oregon Novice contact. One multiplier point for each new county worked. (Maximum Oregon counties = 36.) DX stations score 10 points for each Oregon QSO and 15 points for each Oregon Novice QSO. One multiplier point for each county worked. Stations may be worked once per band, regardless of mode. Only single operator stations may participate for the various award. To score, multiply QSO points times the multiplier points. Exchange: Oregon stations send RST and county. Non-Oregon stations send RST and state, province, or country. (Appropriate awards.) Suggested frequencies: cw, 1810 3550 7050 14050 21050 28050 kHz; phone, 1810 3990 7250 14280 21400 28600 kHz; novice, 3710 7110 21110 28110 kHz. Logs and summary sheets must be postmarked and mailed no later than July 31, 1973. Send to: EARS QSO Party Chairman WN7TDZ, 2188 East Irwin Way, Eugene, Oregon 97402. Send an s.a.s.e. if you wish results.

13 WIAW Qualifying Run.

14-15 "Open" CD Party, cw, this issue.

21-22 "Open" CD Party, phone, this issue. *HK Contest*, full 48-hour period, 80-10, ssb, am and cw, but no cross-mode contacts. Stations outside of America score 5 points for each HK contact. American stations score 3 points per HK contact; non-HK QSOs count 1 point. The total multiplier is the sum of the HK zones plus the number of countries worked on each band. Score is the total points times the final multiplier. Call CQ HK. Exchange RS(T) plus consecutive serial number starting with 001. (HK stations will send their HK zone.) Logs must be mailed before Sept. 30. Send to Independence of Colombia Contest, c/o LCRA, Ap. 584, Bogota, Colombia, S.A. Note categories: single op, one rig; multiop., one rig; multi-multi. *VHF Space Net Contest*, honoring Apollo 15, from 6:00 PM to 6:00 AM your local time. Single or multioperator, power classes 1-25, 25-100, 100 watts to 1 kW input. Special trophies, each complete QSO counts 2 points, each different zip code worked is a new multiplier. Each contact on a different band counts 2 points (zip codes count just once). All modes of operation, except repeaters. All stations submitting logs will receive a participation certificate. Logs must be postmarked no later than July 31. Send to: Tony Slapkowski, WB2MTU, Box 909, Sickenlerville, NJ 08081.

28-29 *Venezuelan Air Force World Wide CW Contest*, commemorating the 53rd anniversary of Venezuelan Aviation, the full 48-hour GMT period; 80-10 cw. Contest call CQ FAV. Classes:

single operator single band, single operator all bands, single transmitter multioperator, multitransmitter multioperator. Exchange 7-figure serial number consisting of RST plus a progressive 4-digit contact number starting with 0001. For non-YVs: contacts with YVs count 2 points, contacts with non-YVs 1 point. Contacts with stations in your own country are not valid. Multipliers are the different countries on the ARRL Countries List plus YV call areas. Final score is the total of QSO points multiplied by the sum of multipliers on each band. Special trophies for categories and continents plus a grand specially presented award. Entries must be postmarked no later than Sept. 30 and go to: Comandancia General de la Aviacion, Concurso 53rd Aniversario Militar Venezolana, Aeropuerto La Carlota, Caracas, Venezuela.

28-30 *Kentucky QSO Party*, sponsored by the Bluegrass Amateur Radio Club, from 2000 GMT July 28 through 0200 GMT July 30. Exchange signal report and (for KY) county, all others use state/province/country. Count 1 point per complete QSO. General and higher operators may count 2 points per Novice contact up to 20 QSOs. Additional Novice contacts count 1 point apiece. Multiplier, for KY, number of states, provinces and countries worked; for non-KY stations, the number of KY counties worked. A station may be worked once per band. Modes and bands may be mixed at the operator's discretion, but only 1 contact per station per band is permitted. Appropriate awards. Suggested freqs.: phone 3910 7250 14,285 21,360 28,600; cw 60 kHz up from the lower band edge; Novice 10 kHz up from the lower Novice band edge. Mail logs by Sept. 5 to WB4YDX, 3259 Roxburg Drive, Lexington, KY 40503. Send an s.a.s.e. for a copy of the results. *CW County Hunters Contest* 0000Z July 28 to 0600Z July 30. Exchange QSO no. and category (portable or mobile, P or M), RST, state (province or country), and county (U.S. stations). Stations may be worked once on each band and again if the station has changed counties. Portable or mobile stations changing counties during the contest may repeat contacts for QSO points. Stations on county lines give and receive only one no. per QSO, but each county is valid for multiplier. Score 1 point per QSO with fixed stations, 3 points for portables or mobiles. Multiply by the number of U.S. counties worked. Mobiles and portables calculate their score on the basis of total contacts within a state. Suggested freqs.: 3575 7055 14070 21070 28070 kHz. Appropriate awards. Logs must show category, date/time in GMT, station worked, exchanges, band, QSO points, location and claimed score. All entries with 100 or more QSOs must include a check sheet of counties worked or be disqualified from receiving awards. Enclose a large s.a.s.e. if results are desired. Logs must be postmarked by Sept. 1 and sent to: CW County Hunters Net, c/o Jeffrey P. Bechner W9MSE, 64 North Pioneer Parkway, Fond du Lac, WI 54935.

AUGUST

- 1 *W6OWP Qualifying Run*.
- 11-12 *CQ-WE VHF/RTTY*.
- 14 *WIAW Qualifying Run*.
- 18-19 *SARTG World-Wide RTTY Contest*.
- 25-26 *All-Asian cw (customary date)*.
- Sept. 8-9, *VHF QSO Party*.
- Sept. 22-23, *VE/W Contest*.
- Nov. 10-11, *SS, phone*.
- Nov. 17-18, *SS, cw*.
- Dec. 8-9, *160-Meter Contest*.

QST



Changes of Address

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

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, Roger E. Cole, W3DKX. PAM: WA3GSM. RM: W3EEB. W3KET, pres. Del. Repeater Assn., presented a Special Service Award to WA3OTV and WA3LUA. OTV saw a VW leave I-95 near Wilmington and shear a utility pole. He called LUA on WA3KXH repeater and requested him to phone for assistance. OTV then raised the VW enough to free the leg of the victim. Flashed time before arrival of ambulance, 4 minutes. W3PCZ with WA3SDU riding "shotgun" won the Mar. First State ARC transmitter hunt as did WA3JYW for the Mavericks. New Advanced Class licensees WA3LSN, WA3PKP, WA3QJV, WA3QJD and WA2SKF won a TR-22 and \$100 certificate at the Baltimore Hamfest. The Del. Repeater Assn. plus a few helpers from the Mid-Del. FM Repeater Assn. were commended for excellent communications work in the "Walk for Mankind." PSHR: WA3DUM 63, WA3GSM 61, K3KAJ 56. DFN QNI 130, QTC 30. DEPN QNI 70, QTC 21. Traffic: WA3GSM 147, K3KAJ 100, W3DKX 45, WA3DUM 40, WA3PKP 9.

EASTERN PENNSYLVANIA - SCM, George S. Van Dyke, Jr., W3HK - SEC: W3BFB. RMs: W3EML, K3BR, WA3AFI, K3MVO, K3PIE, W3CDB. PAMs: K3BHU, WA3PLP. OBS reports received from WA3AFI, WA3EUG, W3CL, W3MFY, WA3QOZ. OO reports from K3RDT, K3OIO, W3FTG, K3LWQ, W3NNC, W3CL, W3KEK, K3TXG, W3MFY, K3NSN. OVS reports from W3CL, W3ZRR, WA3H11, W3MFY. BPLs: WA3OGM, WN3SZD; PSHR: WA3PLC, W3ABT, K3OIO, WA3OGM, WA3ATQ, K3JCB, K3MVO, W3BNR. Didn't realize W3EML, our anchor man on TCC, was so seriously ill; send him a message!

Net	KHz	Operates	QNT	QTC	RM/PAM
PTTN	3610	6:30 P Dy	137	57	WA3AFI
EPA	3610	7:00 P Dy	336	337	K3BR
PFN	3960	5:30 P M-F	585	480	K3BHU
FPAET&TN	3917	6:00 P Dy	402	176	WA3PLP

New officers for Lancaster Radio Transmitting Society are WA3JMJ, pres.; W3CPF, vice-pres.; K3OEN, secy.; K3MAW, treas.; dir., K3OGX 1 year; W3DYT, K3HFC 2 years. New officers for Southern Chester County ARC are WA3NOG, pres.; W3ZAT, vice-pres.; WA3MMG, secy.; WA3IFC, treas. University of Pennsylvania ARC: WB2FWW, pres.; WA31YC, vice-pres.; WB2JIC, secy.-treas.; WA3NAZ, pub. rel.; WB2TAZ, QSL mgr. Abington ARC: WA3FYU, pres.; WA3LWR, vice-pres.; WA3RGN, secy.; WA3PLP, treas. WA3OGM has been doing yeoman work taking W3EML's place during Bill's recent seige of illness. WA3QOZ reports the DNTS has gotten off to a good start. WN3SZD made BPL this month, a first? Looks like K3PIE will soon be taking over for K3BR on EPA. K3MVO finally had to replace guys on his antenna after 12 years. WA3HBT having real success with ORP on 75! WA4TOB added a linear so he could be heard better on PTTN as NCS. WA3CKA going all out on vhf and fm. W3LC says if he could get the rf out of his shack he would have a good signal. WA3LAK can't find the gremlin in his rig. W3BUR reports CD getting reorganized in Bucks County. WA3CFU finishing up his masters. W3GMK raising his shack two feet to beat high water! W3EU's ORM is now officially WN3UNP! W3FTG battling with Murphy. WA3BSV temporarily QRT, no rig. K3VEU/6Y5 reports working many on the 1FC nets on 75 meters. Traffic: (Mar.) WA3OGM 594, K3BHU 404, WA3QOZ 404, K3DGB 259, WN3SZD 177, WA3KWU 173, K3BR 162, K3OIO 142, WA3ATQ 124, K3MVO 64, WA3QLG 63, W3ABT 55, K3NSN 45, WA3PLC 43, WA3HBT 40, W3MFY 39, WA3TQB 34, WA3AFI 27, W3ADE 18, W3HK 18, WA3CKA 12, WA3RKH 12, W3AXA 11, WA31YC 10, W3CL 9, W3OY 8, W3BUR 6, WA3CFU 6, W3KCM 6, K3MNT 6, WA3QNP 6,

WA3HIT 5, W3BNR 4, W3WRE 4, WA3BJQ 2, WA3BSV 1, W3EML 1, W3EU 1, WA3EUG 1, W3FTG 1, W3GMK 1, W3KEK 1, K3LWQ 1. (Feb.) W3EML 88, W3AXA 15.

MARYLAND-DISTRICT OF COLUMBIA - SCM, Karl K. Medrow, W3FA - RM MDD: W3EZE. PAM MDCITN: K3TNM. NCM MEPN: W3LDD. WA3PJQ enjoyed a visit to a maple syrup maker W8PMJ in Cleveland. W3JU reports his unexpected pleasure - Bremerton, Wash., on Oscar 6. W3CQJ, W3TN, W3OKN, W3IN and many others were at the QCW dinner Washington Chapter. Murphy is visiting WA3LQV. W3JZY making good use of 2 meters, and getting that old wanderlust feeling again. WA3FYZ finds 75 to his liking at late hours. W3TN has been sneaking reminiscent looks at his old logs. WA3TOM passed his Extra, and reports American U, still awaiting that station license. WA3RDU has been all over the country to satisfy the demands of his job. W3FCI keeps Potomac on the map. K3RUQ is doing his 2 meters on the Eastern Shore. W3OKN has a full card of schedules. W3ZNV is a late net MDD regular. WA3ABC is being groomed as FAR pres. in Washington. WA3RCI is hard at work in every branch of ham radio. WA3RJS hit the DX test ORP and reports WN3UDB and WN3UKB new neighbors with 2 more coming. K3ORW got his work hours changed and his rigs fully operational. MEPN directors are K3TNM, WA3RDU, W3HCS with K3ZPU alternate. WA3SWS has settled on 40 meters. WA3IIV makes PSHR without resorting to cw. WA3SCR is Dundlak. WA3RVU bemoans no third party traffic. W3ADQ leaves no stone unturned for Southern Md., deliveries. WA3EHK between school and RACES high water patrols keeps hoping. WA3MSW returns to the fold with work hours back to normal. WA3QIA is a busy soul. K3GZK says retirement to be official come June. WA3SQQ is a new activity in mid-Southern Md. W3FZV holds forth on Tue. nights. "Operation Wet Feet" was a highly successful exercise conducted by the AREC, RACES, and the Green Mountain Repeater Assn., with WA3TYM as NCS. CBers participated. Congrats to you all. With the nets: Sessions/traffic/QNI average - MDD 62/258/9.1. MDCITN 18/63/19.5 and MEPN 20/61/26.5. Traffic: W3TN 259, WA3RCI 189, WA3QIA 116, WA3SWS 113, W3OU 88, WA3AFI 87, W3OKN 79, W3FA 58, WA3PJG 53, WA3IIV 46, K3TNM 43, WA3EHK 40, WA3SCR 32, K3GZK 31, K3RUQ 27, W3PCS 24, WA3RVU 22, W3FZV 18, W3ADQ 14, W3FCI 11, W3ZNV 5, WA3FYZ 4, WA3SQQ 2, W3ABC 1.

SOUTHERN NEW JERSEY - SCM, Charles E. Travers, W2YPZ - Acting SEC: W2YPZ. PAMs: WB2EJE, WA2TRK. RM: W2J1.

Net	Freq.	Time (PM)	Sess.	QNT	Tjc.	Mgr.
NJPN	3950	7:00 M-S	31	5866		298WA2EJV
NJSN	3730	8:15 Dy	16	19		29WA2TRK
NIPON	3930	6:00 Su	4	91		29WB2FFE

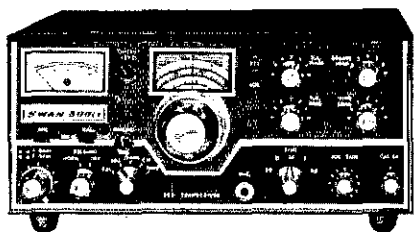
In attendance at the Wilmington, Delaware Repeater meeting were WA2KWB, WB2EJE and W2CDZ with XYL WA2EFGS. The NJS Slow Net operates each evening at 8:15 P.M. The new mgr. and NCS is WA2TRK. WA2TRK reports the Princeton YMCA Senior Radio Club officers for 1973 are WA2GHA, pres.; WB2FCD, vice-pres.; WA2TRK, secy.; Fred Ehrhardt, treas. Advisors to the club are WA2HQE, W2OHF. A project of the club at present is the formation of an active AREC program also getting ready for Field Day. Close contact with the members in the group is due to frequent meetings and accessibility to the club. A VHF net is planned for frequent drills and practice exercises in traffic handling. This is a good time to firm up plans for the coming Field Day. K2BG reports the Burlington Co. RC reports 40 members to date. Congratulations are in order for WA2OBU as an Extra and to Mark Orther as Advanced Class licensee. Recent appointment WA2TRK, PAM and OPS. Traffic: WB2VEJ 336, WA2TRK 123, WB2UVB 95, W2ORS 28, WB2FNK 27, WB2EJE 26, K2PWK 19, W2YPZ 15, WB2EWS 11, WB2MBC 9, WA2KNB 5, W2Z1 4.

WESTERN NEW YORK - SCM, Richard M. Pitzeruse, K2KTK - Asst. SCM: Rudy M. Ehrhardt, W2PVL. SEC: W2CFB, W2EDT, Rochester EC, and his AREC group were very active in the recent flooding along Lake Ontario - as was EC K2DNN and the Elmira group when the waters in that area again threatened to cause havoc. Met reports 40 stations were active in that flood area. WA2EXZ does a time job editing the Utica Amateur Radio Club's paper. The Syracuse VHF Club elected W2EEA, pres.; W2PJO, veep; W2RHQ,

SERIOUS RADIO OPERATORS RELY ON SWAN

No fooling around. If you want superior full-band performance combined with ease of operation, then it's time you invest in SWAN equipment. Reliable equipment that gives dependable service every time you're on the air.

Here are two single-sideband transceivers that seasoned radio amateur veterans put their trust in, both at home and on the move:



Install a SWAN 500CX and join an elite legion of hams whose experiences have made this the most desired 550 watt P.E.P. transceiver in its class. Enjoy unsurpassed tuning ease, extraordinary signal sensitivity, and transmissions that'll push through noise which would obscure readability in a lesser piece of gear.

500CX, less power supply . . . \$529.95; 117XC, matching AC power supply with speaker . . . \$109.95; 14-117, DC power supply (can be adapted to AC use with \$8.00 optional line cord) . . . \$139.95.



Perhaps portability is your need. You can have confidence in the deluxe 270B Cygnet. Compact and lightweight, it has 260 watts P.E.P., a built-in power supply and loud-speaker, plus a solid-state VFO. 12 volt operation is easily adaptable with an optional plug-in DC converter . . . should fit well with vacation plans.

270B, with built-in power supply . . . \$469.95; 14-A, DC converter . . . \$44.95.

Both the 500CX and the 270B cover the five most popular frequency bands — 10, 15, 20, 40 and 80 meters with CW or selectable sideband operation. See SWAN's 1973 catalog for complete specifications.

If you're serious, send us a 10% down payment to your SWAN REVOLVING CREDIT SERVICE account and we'll deliver your choice before another month goes by . . . we don't fool around.

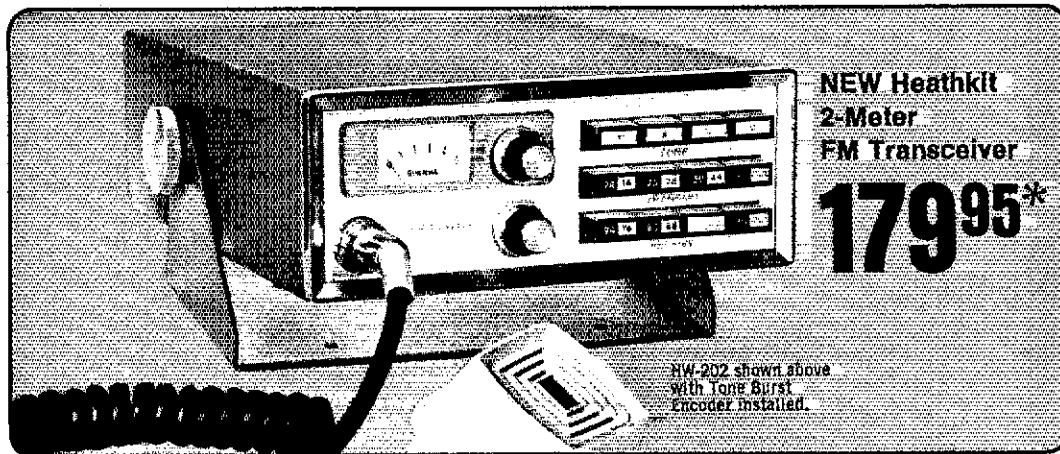


SWAN
ELECTRONICS

A subsidiary of Cubic Corporation

305 Airport Road • Oceanside, CA 92054 • Phone (714) 757-7525

Heathkit® 2-Meter FM gear is here!



• **All solid-state design** • **Can be completely aligned without instruments** • **36-channel capability** — independent push-button selection of 6 transmit and 6 receive crystals • **10-Watts Minimum Output** — designed to operate into even an infinite VSWR without failure • **Optional Tone Burst Encoder** — mounts inside, gives front-panel selection of four pre-settable tones

The Heathkit HW-202 compares with the best wired amateur 2M/FM rigs. Plus it has: 36-channel capability via independent selection of 6 transmit and 6 receive crystals. Solid-state circuitry with complete built-in alignment procedures using only the manual and the front-panel meter allow operation over a 1 MHz segment from 143.9 to 148.3 MHz. Removable front-panel bezel permits installation of the new Heathkit HWA-202-2 Tone Burst Encoder.

10-15 watts transmission into an infinite VSWR — indefinitely, with no failure! The HW-202 needs no automatic shut-down — it continues to generate a signal regardless of antenna condition. Transmitter deviation is fully adjustable from 0 to 7.5 kHz, with instantaneous deviation limiting. Harmonic output is greater than -45 dB from carrier. The push-to-talk ceramic microphone supplied has an audio response tailored to the HW-202.

Excellent reception — 0.5 μ V or less produces 12 dB Sinad, or 15 dB quieting. Output at the built-in speaker is typically 2 watts at less than 3% total harmonic distortion. The receiver circuitry utilizes diode-protected dual-gate MOSFETS in the front end; an IC IF that completely limits with less than a 10 μ V signal; dual conversion, 10.7 MHz and 455 kHz via a 4-pole monolithic 10.7 MHz crystal filter. Image response is -55 dB or better. Spurious response is -75 dB or better.

The Heathkit HW-202 comes with two crystals used in initial set-up and alignment, give you simplex operation on 146.94. Kit includes microphone, quick-connecting cable for 12-volt hook-up, heavy duty alligator clips for use with a temporary battery, antenna coax jack, gimbal bracket, and mobile mount that lets you remove the radio from the car by unscrewing two thumbscrews. The HWA-202-2 Tone Burst Encoder provides four pre-settable pushbuttons for instant repeater access. Fixed station operation is as easy as adding the HWA-202-1 AC Power Supply. The HA-202 2-Meter Amplifier puts out 40 watts for 10 watts in, and externally it's a perfect mate for your HW-202.

Kit HW-202, 11 lbs., mailable **179.95***

Kit HWA-202-2, Tone Burst Encoder, 1 lb. . . **24.95***

Kit HWA-202-1, AC Power Supply, 7 lbs. . . **29.95***

Kit HWA-202-3, Mobile 2-Meter Antenna, 2 lbs. **17.95***

Kit HWA-202-4, Fixed Station 2-Meter Antenna, 4 lbs. **15.95***

HW-202 SPECIFICATIONS — RECEIVER — Sensitivity: 12 dB SINAD* (or 15 dB of quieting) at .5 μ v or less. Squelch threshold: 3 μ v or less. Audio output: 2 W at less than 10% total harmonic distortion (THD). Operating frequency stability: Better than \pm .0015%. Image rejection: Greater than 55 dB. Spurious rejection: Greater than 60 dB. IF rejection: Greater than 75 dB. First IF frequency: 10.7 MHz \pm 2 kHz. Second IF frequency: 455 kHz (adjustable). Receiver bandwidth: 22 kHz nominal. De-emphasis: -6 dB per octave from 300 to 3000 Hz nominal. Modulation acceptance: 7.5 kHz minimum. **TRANSMITTER** — Power output: 10 watts minimum. Spurious output: Below -45 dB from carrier. Stability: Better than \pm .0015%. Oscillator frequency: 6 MHz, approximately. Multiplier factor: X 24. Modulation: Phase, adjustable 0-7.5 kHz with instantaneous limiting. Duty cycle: 100% with ∞ VSWR. High VSWR shutdown: None. **GENERAL** — Speaker impedance: 4 ohms. Operating frequency range: 143.9 to 148.3 MHz. Current consumption: Receiver (squelched): Less than 200 mA. Transmitter: Less than 2.2 amperes. Operating temperature range: -10° to 122° F (-30° to + 50° C). Operating voltage range: 12.6 to 16.0 VDC (13.8 VDC nominal). Dimensions: 2 $\frac{3}{4}$ " H x 8 $\frac{1}{4}$ " W x 9 $\frac{1}{2}$ " D.

*SINAD=Signal + noise + distortion
Noise + distortion

...and here!

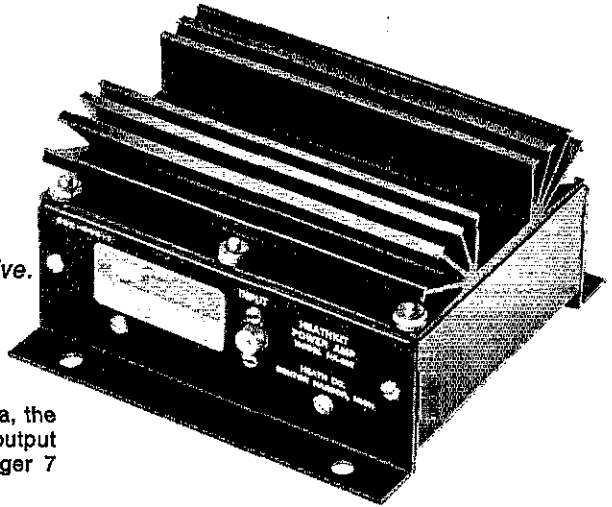
NEW Heathkit

2-Meter Amplifier for cleaner FM copy on the fringe... 69.95*

40 watts nominal out for 10 watts in — requires only 12 VDC supply.

Fully automatic operation — with any 2-meter exciter delivering 5-15 watts drive.

Solid-state design — all components mount on single board for fast, easy assembly.



If you're regularly working from a fringe area, the new Heathkit HA-202 can boost your mobile output to 40 watts (nominal), while pulling a meager 7 amps from your car's 12-volt battery.

Install it anywhere...in the trunk, under the hood or dashboard. Use it with any 2-meter exciter delivering 5-15 watts drive. Features fully automatic operation. An internal relay automatically switches the antenna from transmit to receiver mode when you release the mike button.

All solid-state design features rugged, emitter-ballasted transistors, combined with a highly efficient heat sink, permitting high VSWR loads. Tuned input-output circuits offer low spurious output to cover the 1.5 MHz segment of the 2-meter band without periodic readjustment. All components mount on a single printed circuit board for easy,

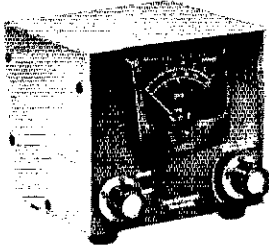
4-hour assembly. Manual shows exact alignment procedures using either a VOM or VTVM. And installation is just as simple.

Kit includes transceiver connecting cable, antenna connector. Operates from any 12 VDC system — additional power supplies are not required. Add HA-202 power to your mobile 2-meter rig, and boom out of the fringe. **Kit HA-202, 4 lbs.**

HA-202 SPECIFICATIONS — Frequency range: 143-149 MHz. Power output: 20W @ 5 W in, 30W @ 7.5W in, 40W @ 10 W in, 50W @ 15 W in. Power input (rf drive): 5 to 15W. Input/output impedance: 50 ohms, nominal. Input VSWR: 1.5:1 max. Load VSWR: 3:1 max. Power supply requirements: 12 to 16 VDC, 7 amps max. Operating temperature range: -30° F. to +140° F. Dimensions: 3" H x 4 1/4" W x 5 1/2" D.

...and here!

New Heathkit VHF Wattmeter/SWR Bridge... 29.95*



Perfect tune-up tool for your 2-meter gear. Tests transmitter output in power ranges of 1 to 25 watts and 10 to 250 watts ± 10% of full scale. 50 ohm nominal impedance permits placement in transmission line permanently with little or no loss. Built-in SWR bridge for tuning 2-meter antenna for proper match, has less than 10-watt sensitivity. **Kit HM-2102, 4 lbs.**

HM-2102 SPECIFICATIONS — Frequency range: 50 MHz to 160 MHz. Wattmeter accuracy: ±10% of full-scale reading.* Power capability: To 250 W. SWR sensitivity: less than 10 W. Impedance: 50 ohms nominal. SWR bridge: Continuous to 250 W. Connectors: UHF type SO-239. Dimensions: 5 1/4" W, 5 1/4" H and 6 1/2" D, assembled as one unit. *Using a 50 Ω noninductive load.

See them at your Heathkit Electronic Center — or fill out coupon for FREE Heathkit catalog

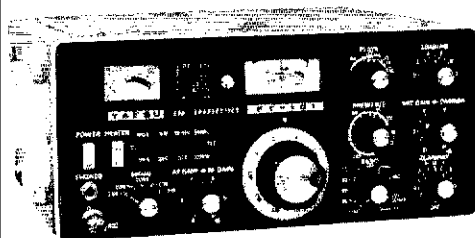
HEATHKIT ELECTRONIC CENTERS

ARIZ.: Phoenix, 2727 W. Indian School Rd.; CALIF.: Anaheim, 330 E. Ball Rd.; El Cerrito, 6000 Potrero Ave.; Los Angeles, 2309 S. Flower St.; Pomona, 1555 Orange Grove Ave. N.; Redwood City, 2001 Middlefield Rd.; San Diego (La Mesa), 8363 Center Dr.; Woodland Hills, 22504 Ventura Blvd.; COLO.: Denver, 5940 W. 38th Ave.; CONN.: Hartford (Avon), 395 W. Main St. (Rte. 44); FLA.: Miami (Hialeah), 4705 W. 16th Ave.; GA.: Atlanta, 5285 Roswell Rd.; ILL.: Chicago, 3462-66 W. Devon Ave.; Downers Grove, 224 Ogden Ave.; IND.: Indianapolis, 2112 E. 52nd Ave.; KANSAS: Kansas City (Mission), 5950 Lamar Ave.; MD.: Baltimore, 1713 E. Joppa Rd.; Rockville, 5542 Nicholson Lane; MASS.: Boston (Wellesley), 365 Worcester St.; MICH.: Detroit, 1845 W. Eight Mile Rd. & 18149 E. Eight Mile Rd.; MINN.: Minneapolis (Hopkins), 101 Shady Oak Rd.; MO.: St. Louis, 9296 Gravois Ave.; N.J.: Fair Lawn, 35-07 Broadway (Rte. 4); N.Y.: Buffalo (Amherst), 3476 Sheridan Dr.; New York City, 35 W. 45th St.; Jericho, L.I., 15 Jericho Turnpike; Rochester, Long Ridge Plaza; OHIO: Cincinnati (Woodlawn), 10133 Springfield Pike; Cleveland, 3444 Pearl Rd.; PA.: Philadelphia, 6318 Roosevelt Blvd.; Pittsburgh, 3482 Wm. Penn Hwy.; TEXAS: Dallas, 2715 Ross Ave.; Houston, 3705 Westheimer; WASH.: Seattle, 221 Third Ave.; WIS.: Milwaukee, 5215 Fond du Lac.

HEATH Schlumberger	
HEATH COMPANY, Dept. 9-6 Benton Harbor, Mich. 49022	
<input type="checkbox"/> Please send FREE Heathkit Catalog.	
Enclosed is \$ _____, plus shipping.	
<input type="checkbox"/> Please send model(s) _____	
Name _____	
Address _____	
City _____ State _____ Zip _____	
*Mail order prices; F.O.B. factory AM-281R	

AMATEUR ELECTRONIC SUPPLY

- has - **YAESU**



FT-101	Transceiver	\$649
FV-101	External VFO	99
SP-101	Speaker	19
SP-101P	Speaker/Patch	59
MMB-1	Mobile bracket	9
FA-9	Fan	19
MIR-1	FT-101 mod. kit	40
FL-2100	Linear Amplifier	339
FTdx-401	Transceiver	599
FLdx-400	Transmitter	339
FRdx-400D	Receiver	299
FRdx-400SD	Rec. w/6 & 2m	399
FV-401	External VFO	99
SP-401	Speaker	19
SP-401P	Speaker/Patch	59
FL-2000B	Linear	339
YD-844	Base dynamic mike	29
XF-3C/30C	CW filter	40
FTV-650	Transverter	149
YC-355D	Digital Counter	289
FT-2FB	2m mob. Xcvr	239
FT-2 Auto	Auto-Scan 2m FM	379

Order Direct From This Ad!
 1-Send Payment in Full with Order
 2-GECC Revolving Charge Plan*
 3-Master Charge*, BankAmericard*
 4-C.O.D. (20% Deposit)
 *A Min. Deposit of 20% is required on all Yaesu orders at this time.

NOTE: Yaesu products are warranted and serviced by the "Selling Dealer". Therefore, it is important for you to know that Amateur Electronic Supply has a Top Notch Service Dept., is Well Established and Enjoys a Good Reputation among hams.

AMATEUR ELECTRONIC SUPPLY
 4828 West Fond du Lac Avenue
 Milwaukee, Wisconsin 53216
 Phone (414) 442-4200
 Branch Stores in Cleveland, Ohio
 and Orlando, Florida

secy.; W2UKA, treas.; W2PFD, act. mgr. WA2OMN built a KW transmatch complete with built-in VSWR bridge. Congratulations to WB2IYJ on upgrading from Novice to Advanced. W2GPI with nearly a half-century of building gear, loves his new I-F-101. W2MK, the Money Keeper, draws interest with his new SB-102. W2WS recovering from an illness still manages a few QSOs. W2HB got himself his First Phone Commercial. W2PVI tells of two good NCSS on sbb. WA2SIS and WA2CEA. K2HOH has his NCX-500 back to good health. WA2ABL now operating mobile. BARA 2-meter and WNY 75-meter nets have combined efforts for emergency preparedness. ARATS has a breakfast at 9:30 A.M. every 4th Sat. W2PVI can supply details. All are welcome. W2SEX and ARATS received Public Service awards for work during the "Agnes" floods. Tickets for the Hamburg International Hamfest may be obtained through members of STARS, ARAIS and RAWNY. RAWNY elected W2KZ, WA2TOX, W2EWT and WA2GPO, dir.; W2KX, pres.; WA2GPO, veep; W2JPE, treas.; WB2YEM, secy. The Rochester crew are making good use of their "28/88" repeater for C.D. WN2JRX is quite active in traffic with his HW-100. The Eastridge High School Amateur Radio Club (Irondequoit) is in the process of securing a license. That club has eight student members and one adult advisor; 5 hams included. NYS handled 435 messages in 62 sessions with 901 check-ins for Mar. WB2LVW plans on a new TR-22 to join the 2-meter fm gang. Very sorry to report the passing of W2TIB, well known to all traffic handlers in the area. WB2ADW made BPL. Traffic with * indicating PSHR: W2RUF* 254, W2FR* 222, WA2AYC* 181, WB2ADW 166, K2UIR 127, WN2JRX 119, WN2FHX 101, WA2LCC* 101, W2MTA* 92, WB2NRK 69, WA2BCI 63, W2RUT 58, W2FZK 53, W2MSM 48, WA21KL/2 45, K2OFV 44, W2GLB 41, W2RQF* 41, W2HYM 40, WB2VND 40, WB2EEF 33, WA2LUF 31, WA2HSB 28, WA2PUU 27, W2EAF 20, W2PVI 18, W2PZL 18, K2RTO 14, K2IMI 12, K2KTK 10, WA2OMN 8, WA2AVZ 7, WN2LKK 4.

WESTERN PENNSYLVANIA - SCM, Robert F. Gawryla, W3NEM - SEC: W3KPI. PAM: K3ZNP. RMs: W3KUN, W3LOS, WA3IPU. WPA CW Net meets daily on 3585 kHz at 7:00 P.M. KSSN meets Mon. through Fri. at 6:30 P.M. on 3585 kHz. WPPN meets daily on 3896 kHz SB at 4:45 P.M. The first repeater station call in the 3rd region is WB3AAA issued to the Beaver Valley Amateur FM Assn. with officers W3VRZ, pres. & trustee; W3FCO, chief engr.; WA3LJS, secy.; K3VYY, treas. Frequencies are 25 in and 85 out. The Beaver Valley Amateur Radio Assn. has the following new officers: WA3PJ, pres.; WA3NOE, vice-pres.; K3KYN, secy.; K3POB, treas. 35 local amateurs met on Mar. 20 and formed the new Mercer County Amateur Radio Club with K3ULJ as pres. and K3SAN as secy.-treas. Good luck, men. The Crawford Amateur Radio Society also has a new slate of officers with K3YAK as pres.; WA3FUV, vice-pres.; WA3TCC, secy.-treas.; K3HWL and WA3JMPV, dir. W3IYI celebrated 40 years of amateur radio on Mar. 25 and has been working DX with 5 watts of power. Who needs high power? Congrats, Cliff. K3LVO is also working with low power - using a 1.0 watt transistor transceiver. The Nittany ARC has over 600 confirmed points for the "Oscar 1000" award. K3CR, Penn State Univ. ARC, has made BPL for three consecutive months. Congrats men! WA3RFL, WA3RWO and WA3SWT moved up from Novice to General Class. WA3ROZ went from Novice to Advanced and K3AMI went to Extra Class. Nice going! PSHR for Mar.: WA3QOR 45, W3LOS 39, W3NEM 39, W3YA 34. WPA CW Net broke the all time monthly QNI record with 502 for the month of Mar. They also had 31 sessions and 287 QTC. Nice month. Traffic: K3CR 219, WA3PXA 178, W3YA 151, W3NEM 150, W3LOS 91, W3KUN 72, K3HCT 63, K3ZNP 54, WA3QOR 46, WA3YA 30, W3MI 30, W3ATO 27, WA3EJO 21, W3SAY 18, K3SMB 15, K3VQV 11, W3SN 10, K3LVO 6, K3SIN 6, W3IDO 5, W3ELZ 4, WA3PMI 2.

CENTRAL DIVISION

ILLINOIS - SCM, Edmond A. Metzger, W9PRN - SEC: W9RYU. PAM: WA9CCP and W9PDI (yhf). RM: W9MUC. Cook County EC: W9HPG.

Net	Freq.	GMT/Days	ffc.
IEN	2940	1400 Su	no report
ILN	3690	0300 Dy	196
		2330	
NCPN	3915	1300 M-S	82
		1800	57
ILL PON	3915	1430	317
ILL PON	145.5	0200 MWF	15
ILL PON	50.28	0300 M	0
ILLN	3720	0100 Dy	247

W9HRY, mgr. of 9RN has resigned after many years of faithful service to the amateur fraternity. He is being succeeded by

The voice of



**HY-GAIN'S
THUNDERBIRD**

10-15-20

is heard around the world



Here's why Thunderbirds outperform all other tri-banders:

* **Thunderbird's "Hy-Q" traps** provide separate traps for each band. "Hy-Q" traps are electronically tuned at the factory to perform better at any frequency in the band—either phone or CW. And you can tune the antenna, using charts supplied in the manual, to **substantially outperform** any other antennas made.

* **Thunderbird's superior construction** includes a new, cast aluminum, tilt-head universal boom-to-mast bracket that accommodates masts from 1¼" x 2½". Allows easy tilting for installation, maintenance and tuning and provides mast feed-thru for beam stacking.

Taper swaged, slotted tubing on all elements allows easy adjustment and readjustment. Taper swaged to permit larger diameter tubing where it counts! And less wind loading. Full circumference compression clamps are mechanically and electrically superior to self-tapping metal screws.

* **Thunderbird's exclusive Beta Match** achieves balanced input, optimum matching on all 3 bands and provides DC ground to eliminate precipitation static.

* SWR less than 1.5 to 1 on all bands.

* 24-foot boom... none longer in the industry.

* Extra heavy gauge, machine formed, element to boom brackets, with plastic sleeves used only for insulation. Bracket design allows full mechanical support.

* Interlaced, optimum spaced elements for higher gain and better pattern control.

* 3 active elements on 20 and 15 meters. 4 active elements on 10 meters.

New 6-Element Super Thunderbird

Model 389

Suggested retail price, **\$179.95**

Improved 3-Element Thunderbird

Model 388

Suggested retail price, **\$144.95**

Fabulous 3-Element Thunderbird, Jr.

Model 221

Suggested retail price, **\$99.95**

Popular 2-Element Thunderbird

Model 390

Suggested retail price, **\$99.95**

Buy one today at your favorite Hy-Gain distributor!

HY-GAIN ELECTRONICS CORPORATION

P.O. Box 5407-HF, Lincoln, Nebraska 68505



AMATEUR ELECTRONIC SUPPLY USED GEAR

★ 10 Day Free Trial (Lose only Shipping Charges) ★ 30 Day Guarantee ★ Full Credit Within 6 Months on Higher Priced New Equipment ★ EZ Terms—Convenient REVOLVING Charge Payment Plan ★ Order Direct from this Ad

ALLIED A-2514 Speaker \$ 12 A-2515 Receiver 59 A-2516 Receiver 99	753 SSB Xcvr 119 752 DC supply 49 950 Res-Cap Comparator-Bridge 25	HQ-110AC Receiver 159 HQ-140X Receiver 119 HQ-170 Receiver 149 HQ-170C Receiver 159 HQ-170A Receiver 194 HQ-170A Receiver 194 HQ-170A/VHF 259 HQ-215 Receiver 125 HX-50A Xcvt 199	NCX-500 Xcvt 269 NCL-2000 Linear 375 AC-500 AC supply 75	SINGER PR-1 Panadaptor \$ 89	TAPETONE XC-50 (14-18) conv. \$2 TEMPO FMA 2m FM Xcvt \$23 ACA AC supply 2
AMECO GN-50 (30.5-34.5) \$ 29 PV-144 Preamp TX-62 VHF Xmt 79 621 VFO 39	ELMAC PMR-4A Receiver \$ 39 PMR-8 Receiver 79 PSR-612 Supply 19 AF-67 Transmitter 49	HEATHKIT HR-10 Receiver \$ 49 HR-20 Receiver 69 RX-1 Receiver 139 XC-6 6m Converter 25 HS-24 Speaker 99 DX-20 Transmitter 29 DX-25 Transmitter 35 DX-60 Transmitter 59 TX-1 Transmitter 99 HW-10 6m Xcvt 129 HX-20 Transmitter 125 HX-30 6m Xcvt 149 HX-20 6m L.inear 66 HW-12 75m Xcvt 75 HW-37A 20m Xcvt 85 HW-16 Transceiver 99 HW-10 Transceiver 249 SB-102 Transceiver 375 SB-30 SWL Rec 289 SB-303 Receiver 239 SB-500 2m Xverter 175 SB-620 Scanalyzer 119 HW-3 (Two'er) 39 VHF-1 (Seneca) 119 HF-25A AC supply 54 HF-25B AC supply 59 HF-411 calibrator 7 HO-13 Hamscan 69 HW-17 2m Xcvt 119 HWA-17-1 DC supply 16	REALISTIC DX-150A Receiver \$ 89 REGENCY HR-2 2m FM Xcvt \$149 ROBYN Digital 500 Xcvt w/ AC supply \$495 SBE SB-33 Transceiver \$189 SB-14 Linear 175 SB-34 Transceiver 279 SBZ-VOX SBZ-C Dopador 25 SBZ-MIC Mike 9	SWAN SR-120 Transceiver \$75 SR-140 Transceiver 75 NS-1 Silencer 24 410 VFO 85 VA-1 VDX 19 410C VFO 89 500 VFO 95 117B AC supply 59 350 Xcvt (early) 249 350 Xcvt (late) 189 500kc Calibrator 15 430C Swan Xcvt 369 500CX-541B Xcvt 489 500 Transmitter 349 117AC AC supply 59 117C AC supply 75 TV-2 2m Xverter 189 22B VFO adaptor 25 TV-2B 2m Xcvt 225 250 6m Xcvt 229 120 VFO 85 250C 6m Xcvt 339 1200C Linear amp. 199 FM-2K 2m FM 219	TOP BAND SYSTEMS 185-2000 Linear \$14 UTICA 650 6m Xcvt/VFO \$ 5 VARITRONICS FM-20MB amp/sup \$ 6 HT-2 Mk II 2m FM walkie-talkie 7 (4 HI-2 2m FM (2 FD-M-2A 2m FM PA-50A 2m FM amp

NEW EQUIPMENT SPECIALS & CLOSEOUTS
Due to the low prices and limited quantities of the merchandise listed below all prices are for "Payment in Full With Order—No Trade".

COLLINS 75A-4 (ser.# 765) \$325 75A-4 (ser.#2146) 375 75A-4 (ser.#3535) 399 75A-4 (ser.#4125) 449 755-1 Receiver 325 R-290 Receiver 795 R-390A Receiver 795 32V-2 Transmitter 149 32S-3 Transmitter 645 KWR-1 Transceiver 249 351D-1 Mount 35 KWM-2 Transceiver 649 SIF-1 AC supply 75 SIF-2 AC supply 75 SIF-1 carrying case 60 MM-1 mobile mike 15	GOSETT Comm IV 2m \$149 Comm IV 6m 125 Comm IV 270Mc 200 CG-105 2m Xcvt 119 G-50 Transmitter 139 910A 6m Xcvt 199 Thin-Pak 1 G-76 DC supply 49 972-A Control 2m 12vdc Linear Amp — 180 watt 149	HALLICRAFTERS SX-3A Receiver \$ 39 SX-62 tuning eye 129 SX-62 Receiver 129 SX-62A Receiver 159 SX-71 Receiver 99 5-76 Receiver 69 SX-101A Receiver 189 SX-100 Receiver 99 SX-117 Receiver 189 SX-130 Receiver 139 R-46B Speaker 9 HT-32 Transmitter 209 HT-44 Transmitter 189 HT-46 Transmitter 219 SR-140 Receiver 169 PS-150-10 AC sup. 75 PS-150-12 DC sup. 75 SR-400 Xcvt 539 P-500AC AC supply 89 P-500DC DC supply 95 SR-2000 Xcvt & sup.995 HA-2 Transmitter 99 HA-4 Transmitter 99 P-26 AC supply 189 SR-34 (AC DC) 45 SR-46 Xcvt 79 HA-26 2-m VFO 39	JOHNSON Accutester \$ 29 Valians I 139 Valiant II 189 Invader 200 325 Invader 2000 495 275W M'box/SWR 69 6N2 VHF Xmt 89 TR Switch 19 KNIGHT R-100 Receiver \$ 59 X-10 Calibrator 9 T-50 Transmitter 24 T-150A Transmitter 69 TR-106 6m Xcvt 69 V-107 VHF VFO 19 TR-108 2m Xcvt 69	LAFAYETTE HA-900A Receiver \$ 89 HA-25 Receiver 79 HA-750 6m Xcvt 49 HB-50 AC supply 19 LAKESHORE Bandhopper VFO \$ 59 MILLEN 5220 Transmatch \$ 99 MOSLEY CMI Receiver \$ 39 NATIONAL NC-98 Receiver \$ 89 NC-125 Receiver 75 NC-155 Receiver 119 NC-270 Receiver 125 NC-300 Receiver 125 NC-308 Receiver 199 NC-300C-6 6m conv. 29 HRO-501 Receiver 125 HXY-60 Receiver 199 NCX-5 Mk II Xcvt 369 NCXA AC supply 75 NCXD DC supply 75 NCXB AC supply 75	COLLINS 755-3B Rec.-New display \$1101 \$880 325-3 Xmt-New display 1310 1064 351D-2 mob.-New display 337 187 R. L. DRAKE L-4B Linear-New Display \$875 \$649 TC-4 6m xmt.converter 378 48 TC-2 2m xmt.converter 378 378 SC-6 6m Rec. converter 71 71 C-1 Converter console 49 49 CP-1 Power supply 20 26 SCC-1 VHF calibrator 37 26 RV-4 VFO for TR-4 110 95 3-4 Console \$ 395 305 2-C Receiver \$ 295 255 * limited inventory at old prices! ETO FA-70V Linear w/160m \$1875 \$1375 ELC 351 AC supply - kit \$ 79 \$ 49 351 AC supply - wired 109 79 752 DC supply - kit 79 49 752 DC supply - wired 109 69 ELECTRA BCU UHF Scanner \$149 \$ 99 GALAXY AC-710 AC supply/booster \$ 49 \$ 25 GT-500A New Display 595 450 GOSETT 902A DC supply \$ 79 \$ 39 GSB-201 Mk IV Linear 660 360 HY-GAIN 2035A 3 el. 20m Beam (shipped to enter to a customer) \$129 \$ 69 HB251 stacked 2m Halos 126 39 SD-150B 159-174Mc 1-pole 125 9 HB-254 4 stacked 2m Halos 54 19 400-209 - New Display 229 189 LINEAR SYSTEMS (ADCOM) 350-4 6V DC supply \$125 \$ 35 REGENCY HR-2A 2m FM Xcvt \$229 \$179 SIGNAL/ONE CX-7A new, factory warranty \$295 \$1295 SBE SB-36 Xcvt. - New Display \$669 \$769 SB-5V Scanvision Monitor and Camera - New Display 999 780 SB-144 2m FM - New Disp. 259 229 SB-2MIC Mike (dynamic) 16 12 SONAR FM-3601 2m FM 8 ch. 10w \$299 \$169 FR-2511 Low-band Scanner 189 89 7902 Porta-Pak for FR-104 59 25 STANDARD SR-C146A - New Display \$289 \$239 SR-C876MA - New Display 398 279 SR-C14U - New Display 595 476	SWAN 410 VFO for 500C reg. NOV 500CX-5516B - New Disp. \$120 \$ 8 600R Custom - Demo 589 53 600T Xcvt - New Display 589 48 1200W Linear (110V) 295 150 1200W Linear (230V) 295 150 330 600R VFO 129 9 TEMPO reg. NOV FMV 10w, 2m FM \$249 \$149 200G Linear 295 335 VARITRONICS reg. NOV FD-2M & BP-1 \$262 \$140 FM-20M Mobile Amp 150 50 FM-20MB Base Amp-supply 235 75 PA-50A 2m FM Amp, 12v 129 80 FDHM-25 (mod. for MARS) 310 160 * w/90-day A.E.S. warranty WATERS reg. NOV 346 Neutriver, 6-2 conv. \$175 \$ 70 REGENCY CB Imperial 23 ch. 110 & 12v \$299 \$199 KAAR CB Skyhawk II, 23 ch. 12v \$229 \$129
---	---	---	---	---	---	---

AMATEUR ELECTRONIC SUPPLY

4828 West Fond du Lac Ave. Milwaukee, Wis. 53216
Phone (414) 442-4200

HOURS: Mon & Fri 9-9; Tues, Wed & Thurs 9-5:30; Sat 9-3

IMPORTANT! - Please Be Sure to send all Mail Orders and Inquiries to our Milwaukee store, whose address is shown above. The following Branch stores are set up to handle Walk-in business only.

17929 Euclid Ave.; Cleveland, Ohio Phone (216) 466-7330
621 Commonwealth Ave.; Orlando, Florida Phone (305) 894-3238

ORLANDO HAMFEST & SOUTHEAST FM CONVENTION

JUNE 2 & 3 1973
At the Orlando Exposition Park
Downtown Orlando, Florida

Prizes Galore, Equipment Displays
Large airconditioned Flea-market,
ARRL Forum, QUA QOTY, AWA
MARS, FM & REPEATER Meetings

Florida State ARRL Convention, Harry
Daniels, Pres. of ARRL, guest speaker

FAMILY FUN! Visit Disney World,
Cape Kennedy, Cypress Gardens,
Atlantic & Gulf beaches all nearby!

ADVANCE REGISTRATION \$1
Send to:
Orlando Amateur Radio Club
8024 Charlton Parkway
Orlando, Florida 32807

Receive ticket & info by return mail

While at the Orlando Hamfest, be
sure to also visit Amateur
Electronic Supply's New Orlando,
Florida branch store and register
for their Grand Opening Door Prize
Drawing, which will include many
major items including a SWAN
SS-200 solid state transceiver.

AMATEUR ELECTRONIC SUPPLY

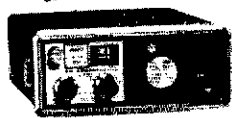
is the Best Place to purchase your new

DRAKE *gear for the following reasons*

- TR-72 2m FM Xcvr, 12vdc, 23 ch. \$299.95
- TR-22 Portable 2m FM Xcvr. 219.95
- AA-22 Rec./Xmtr. Amplifier 149.95
- MMK-21 Mobile Mount. 9.95
- AA-10 10 watt 2 meter Amplifier ... 49.95
- AC-10 supply for TR-22/AA-10 TR-72 39.95
- Extra crystals for TR-22, TR-72 each 5.00
- DSR-1 Digitally synthesized Receiver 2195.00
- Rack panel adaptor for DSR-1 125.00
- 2C Receiver \$295.00
- 2AC Calibrator for 2C 18.75
- 1CS Speaker for 2C 22.00
- 2CS Speaker/Q-multiplier for 2C 49.00
- 2NB Noise Blanker for 2C 26.95
- R-4C Receiver 499.95
- 4NB Noise Blanker 65.00
- Filters: 250, 500 cycle; 1.5, 6.0kHz 50.00
- MS-4 Speaker for TR-4C, R-4C, SW-4A 22.00
- TR-4C Transceiver for 80-10 Meters ... 599.95
- 34PNB Noise Blanker 100.00
- RV-4C Remote VFO for TR-4C 110.00
- FF-1 Crystal cont. adapt. for TR-4C 46.95
- AC-4 AC supply for TR-4C, T-4X 99.95
- DC-4 12vdc Supply for TR-4C 125.00
- MMK-3 Mobile Mounting kit for TR-4C 6.95
- MC-4 Mobile Console for TR-4C 69.00
- 2NT CW Transmitter 175.00
- T-4XC SSB Transmitter 530.00
- L-4B Linear Amplifier 825.00
- MN-4 Antenna Match Network 99.00
- MN-2000 Antenna Match Network 195.00
- W-4 RF Wattmeter (2-30Mc) 61.95
- WV-4 RF Wattmeter (20-200Mc) 73.50
- C-4 Station Control Console 395.00
- SW-4A AM Shortwave Receiver (tube) ... 335.00
- AL-4 Loop Antenna - BC Band 29.00
- AN-5 Short Wave outdoor antenna 8.80
- TV-47-LP 100w Low-pass Filter 8.95
- TV-1000-LP 1000w Low-pass Filter 18.75
- TV-300HP High-pass Filter 6.95
- LN-4 Line Filter, 120v, 5 amp. 8.00
- Crystals for 2C, R-4C, SW-4A, T-4XC 5.00
- Fixed-Frequency Crystals 7.50
- 7295RD Microphone with plug 19.95
- SPR-4 Programmable Receiver 579.00
- ACCESSORIES FOR SPR-4
- SNB Noise Blanker \$ 65.00
- DC-PC DC Power Cord. 5.00
- TA-4 Transceiver adaptor for SPR-4 ... 25.00
- SCC-4 Crystal Calibrator 20.00
- RY-4 Teletype adaptor 10.00
- DIAL Crystal Selector - plain 7.35
- CRYSTAL KITS FOR SPR-4
- Aeronautical Overseas - 7 crystals ... \$ 32.00
- Amateur Bands - 6 crystals 27.00
- Citizens Band - one crystal 5.00
- Marine Bands - 11 crystals 49.00
- MARS - 5 crystals 22.00
- Teletype Commercial - 4 crystals 18.00
- Time & Freq. Std, WWV - 5 crystals ... 22.00

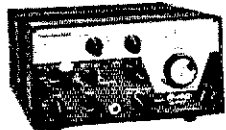


TR-72



TR-22

**Order Today
Direct from this Ad**



R-4C



L-4B

- **TOP TRADES** for your good clean equipment
- **STAY-ON-THE-AIR PLAN** - Enables you to keep your trade-ins until your new gear arrives - Lose no operating time!
- **PERSONAL SERVICE** from fellow hams who understand your problems.
- **SAME DAY SERVICE** on most Orders and Inquiries from our Centrally Located Modern Facilities
- **Top Notch Service Department**
- **LARGE COMPLETE STOCK** means Fast Deliveries. United Parcel Service available to most parts of the country. - UPS Blue Label (AIR) to the West Coast.
- **GECC Revolving Charge Plan.** Only 10% Down. LOW Monthly Payments - for Example: \$10 a month finances up to \$300; \$20 up to \$610. Write for complete information and credit application.

SAVE up to \$100.

If you purchase any of the new Merchandise listed below at the Regular Price and Without a Trade-in, you may take the "Bonus" Credit indicated below toward the purchase of other merchandise (such as power supplies, antennas, towers, microphones, crystals, linears, accessories, etc.)

TR-22 2m FM	\$10 Bonus	SPR-4 Receiver	\$40 Bonus
TR-72 2m FM	\$20 Bonus	TR-4C Xcvr	\$50 Bonus
R-4C Receiver	\$40 Bonus	C-4 Console	\$40 Bonus
T-4XC Xmtr	\$40 Bonus	L-4B Linear	\$100 Bonus



SIX EZ-WAYS TO PURCHASE

1. CASH
2. C.O.D. (20% DEPOSIT)
3. MASTER CHARGE
4. BANK AMERICARD
5. AMERICAN EXPRESS
6. GECC REVOLVING CHARGE



Ray Grenier, K9KHW
Mer. Mail Order Sales

To: AMATEUR ELECTRONIC SUPPLY

4828 W. Fond du Lac Ave, Milwaukee, Wis. 53216

I am interested in the following new equipment: _____

I have the following to trade: (what's your deal?) _____

Ship me: _____

I Enclose \$ _____ I will pay balance (if any):

COD (20% Deposit) GECC Revolving Charge Plan

Master Charge* BankAmericard American Express

AMATEUR ELECTRONIC SUPPLY

4828 West Fond du Lac Ave. Milwaukee, Wis. 53216
Phone (414) 442-4200

HOURS: Mon & Fri 9-9; Tues, Wed & Thurs 9-5:30; Sat 9-3

IMPORTANT! - Please Be Sure to send all Mail Orders and Inquiries to our Milwaukee store, whose address is shown above. The following Branch stores are set up to handle Walk-in business only.

17929 Euclid Avenue; Cleveland Ohio Phone (216) 486-7330
621 Commonwealth Ave.; Orlando, Florida Phone (305) 894-3238

Account Number: _____

Expiration DATE _____ * Master Charge Interbank number _____ (4 digits)

Name: _____

Address: _____

City & State: _____

Send used gear list

get a fair deal at

TRIGGER Electronics

where the HAM IS KING



free

TRIGGER CATALOG

TO HELP YOU SHOP BY MAIL

Everything for the Ham!

Send for this reliable buying guide to carefully selected Amateur gear. You'll find it easy to shop at TRIGGER by mail. We make fast shipment from complete stocks of all the leading brand equipment—generally the same day your order comes in.

CHECK COUPON FOR YOUR FREE CATALOG

BEST TRADES IN HAMDOM

Trade high with TRIGGER. You'll find we allow you more for your present gear. Write for quick quote.

Instant Cash for Your Used Gear

Describe fully what you have: Make, model, modifications, accurate description of condition:

GET A GOOD DEAL FROM TRIGGER

SHOP EASILY AT OUR STORE

ON THE WEST EDGE OF CHICAGO

ALL PHONES: 312/771-8616

TRIGGER Electronics, Dept. 11-JU
7361 North Ave., River Forest, Ill. 60305

Send FREE TRIGGER Catalog

Name
PLEASE PRINT

Address

City _____ State _____ Zip _____

FREE
Catalog

WA9EED his former asst. We wish Bob the best for a job very done. New Novices in the Jefferson Junior High School incl WN9S LHT, LJE, LLI, LLJ, LNH, LNZ, LNY, LTU, LTZ, L. LJA, LTX and LXX. WB9GXB, K9OZY, WB9I VG, WA9IWO WB9IIN are the new officers of the Hamsters ARC (Chic. WB4EWM has announced that the Continental Traffic net open Wed. and Fri. on 14313 at 1830 GMT and would like some of Ill. section gang to check in. This column's sympathy to the tar and friends of W9VC who recently passed away. WN9LUK is a Novice in McLean. The newly elected officers of the Iroquois County ARC are WA9GGU, WB9HAD and WA9IHF. Field Dr. around the corner and now is the time to get all that emerge equipment together and give it a test. See you all in June on F Day. K9DDA has qualified for his CW WPX award - all with watts. New ORS appointee this month is W9KRR. WN9KXE par his General and is awaiting his new ticket; WB9LIG has received his General Class license. W9IXV is portable on a vacat in W5-Land. Traffic: K9MWA 386, W9AES 174, W9MUC 1 W9KRR 101, W9IXV 69, K9TXI 67, WB9HEG 67, WA9LDC W9OYL 56, W9FLF 49, WB9FVG 37, WB9UPS 28, W9NXG K9AVQ 23, WB9FLP 23, W9HOT 19, W9PRN 18, K9KHS.

INDIANA SCM, William C. Johnson, W9BJQ - S WA9YXA. RMs: WA9LED, W9HRY, WB9KVN, PAMS: WB9I vht W9HWR, W9PMT.

Net	Freq.	Time(Z)Days	Tfc.	M
11tcN	3810	1330-2300 Dy	481	WB9I
QIN	3656	0100-0400 Dy	289	WA9E
IPON	3910	1300-2130 Su 2000 S	30	WB9A
IPON VHF	50.7	0100 M-W-Th	3636	WA9U
IPON CW	3712	0000 Dy	87	WB9K
IPON SSB	50.2	0200 Dy	69	W9M
Hoosier VHF			22	W9P

With deep regret I report W9LSB, W9IH as silent keys. IR meeting held Apr. 1, 1973 was the largest gathering for the past 1 years. W9HPG was the speaker. WN9IHH made BPL for I WB9FOT was appointed as PAM for 11tcN. W9HRY resigned as I of 9RN and WA9EED is now RM for 9RN. WB9LH is RM for Q W9IMI, W9DZC, W9DKP are back after a vacation out of st. W9NYW back on the air after 17 years! K9VHI reports Hamf Southern US Novices are WN9LDS, WN9LIA, WN9IZF. W9IIV K9RWQ home from the hospital. W9BUQ lost his Oscar track antenna. QIN has 20 members on their roster - how about in check-in? WA9LGO, Red Cross ARC station, has been set up handle any emergency. W9DZC trying for a record check-in S morning 1330Z on 11tcN. To all clubs in Ind. - let's make this y 1973 the best by helping Novices to advance to a higher class: joining ARRL. QIN Honor Roll: K9IHD, K9HYZ, WA9E WB9KVN, WB9LHI. Amateur radio exists because of servi rendered. BPL: WN9IHH. Traffic: (Mar.) WB9KVN 331, WA9I 259, WN9IHH 190, W9FWH 184, WB9AHJ 172, K9FZX 1 WB9FOT 109, K9HYV 103, W9OLW 102, W9BUQ 67, WA9TIS K9YBM 48, WB9LH 47, K9CXY 46, K9RPZ 44, K9HDP WB9EAY 30, WA9OHX 30, W9PMT 26, W9HRY 25, W9IBO WA9AXF 22, K9JQY 21, W9RTH 21, WB9RAP 18, W9KWB WA9DLH 18, K9PSL 14, W9LIG 11, WA9OKK 9, WB9CAC W9BDP 7, K9FOT 7, WA9OAD 6, W9DZC 2, K9ILK 2, the WN9IHH 152.

WISCONSIN SCM, Joseph A. Taylor, W9OMT - S W9NGT. PAMS: K9IHI, WA9OAY, WA9OKP. RMs: W9U K9KSA.

Net	kHz	Time(Z)Days	QMI	QTC	M
WSBN	3985	2230 Dy	1244	163	K9I
WIN(L)	3662	0000 Dy	-	-	W9I
WIN(L)	3662	0400 Hy	-	-	WB9H
BEA	3985	1700 Dy	-	-	WA9D
BWN	3985	1145 M-S	549	641	WA9C
WSSN	3662	2330 MWf	63	6	K9K

For any new Novices and old ones as well here's a chance to le net procedures. W9MFG has a Novice Net for the State going 3725 kHz beginning at 1200Z. Drop in and learn a few procedures. RM W9UCR also has a nice program set up on national traffic system. If any of you club program chmn. need good program contact W9UCR, you'll find it interesting & informative. Congrats to K9UTO who received WAC award. W9B has a new Swan 175 for mobile. K9IQE has new standard 2-m unit along with a new RP synthesizer. W9RQM's DXCC total n 320/319 with the addition of QSLs from XV5AC and VK0 WA9AJW will be operating airborne mobile this spring and summ The "Bring 'em Back Alive" program, which has for so many y been supported by section amateurs, has been dropped by the A they feel they are able to cover the state with police facilities should be noted and credit should be given that this program started by amateurs. The Green Bay Repeater group was ac



for over 20 years we've
 been designing VHF-FM
 antennas for some
 pretty tough customers.

we know
 you're just as tough.

A product in the amateur market gets a reputation very quickly. It measures up to what you expect in engineering, performance and quality — or else. That's why A/S amateur antennas are built to the identical design and construction standards as their commercial counterparts. Standards that have made them specified for more police and public safety vehicle installations than all other brands combined.

**HM-177
 2 Meters**

Features new high conductivity copper and nickel coated 17-7 PH stainless steel whip. Shunt fed coil encased in waterproof PVC jacket. All fittings chrome plated brass. Easy snap-in mounting.

**NEW! HM-223
 1 1/4 Meters
 (220 MHz)**

High performance 3/8 wavelength design for the new 220 MHz activity! Directly fed with low loss coil in new low-profile design. Spring and whip easily removable leaving only 1 3/8" high base for car wash clearance.

**HM-175
 3/4 Meters**

Collinear design with truly hot performance! Base fittings have silver plated contacts. Can handle 100 watts. Whip and phasing coil assembly is a one piece molded design to resist vibration and moisture.

**HM-4
 2 Meters**

Tough, virtually indestructible antenna for hand-helds. Completely insulated. Base fitting matches Motorola HT, E. F. Johnson, and Standard portables.

HM-5

Same as above but for Drake and other packset portables with SO-239 fittings.

NEW ASCOM® TOWERS

High strength, low maintenance aluminum towers for HF and VHF antenna installations. There is a complete line of ASCOM self-supporting towers — in heights from 30 to 90 feet — at attractive prices!

WRITE FOR FREE AMATEUR ANTENNA
 and/or TOWER CATALOGS



© "Stripes of Quality"

**the antenna
 specialists co.**

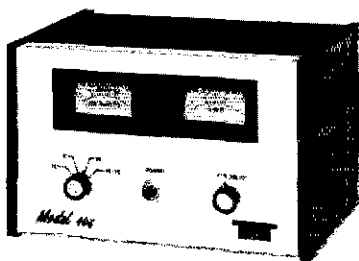
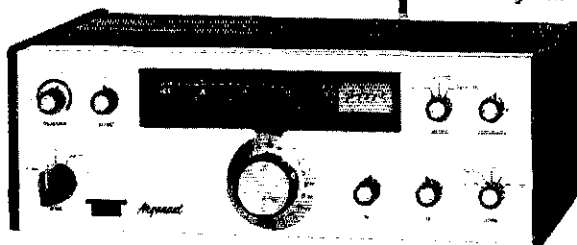
Division of ORION INDUSTRIES, INC., 12435 Euclid Ave., Cleveland, Ohio 44106

Export: 2200 Shames Dr., Westbury, L.I., New York 11590 Canada: A. C. Simmonds & Sons, Ltd.

Summertime is Ten-Tec time...

Wherever you go, take Ham Radio with you. A TEN-TEC solid-state transceiver will keep you in touch with old and new friends.

Enjoy the out-of-doors, operate on vacation, mobile or portable, with a rig you will use year around.



ACCESSORIES

- Model 210**
115/230V AC to 12V DC, for
Argonaut onlyPrice \$24.95
- Model 250**
115/230V AC to 12V DC, for
Argonaut and "405" Linear....Price \$49.00
- Model 215**
Ceramic microphone for
ArgonautPrice \$17.00
- Model KR5**
KeyerPrice \$34.95
- Model 206**
Calibrator, 100 kHzPrice \$23.95

- Argonaut**
80-40-20-15-10 meters SSB/CW.
5 Watts inputPrice \$288.00
- Model 405 Linear**
Solid-state, 100 watts input.
12V DC.Price \$149.00
- PM3A**
40-20 meters, VFO CW. 5
Watts inputPrice \$89.95
- PM2B**
80-40-20 meters, VFO CW. 3
Watts inputPrice \$65.95

WRITE FOR DETAILS

TEN-TEC, INC.
SEVIERVILLE, TENNESSEE 37862

during recent flooding from high northerly winds off Green Bay. Participating were WA9SKN, WA9SWX, WA9SRW, K9JQE, W8BLP, WA9MCC, W9OMT and WB9KOA provided vital communications for evacuation for the Red Cross and at times even helped the Fire Dept. when they couldn't get through. Rib Mountain Repeater probably second one licensed in 9th call area WR9AAB. The Wausau Club having good time with 5 hidden transmitter hunts since Jan. Traffic: W9CXY 460, W9DND 155, K9FHI 75, W9AYK 65, K9UTQ 53, W9WJH 52, W9UCR 36, WA9OAY 33, K9KSA 28, W9KRO 26, WA9AJW 13, W9RQM 5.

DAKOTA DIVISION

MINNESOTA - SCM, Casper H. Schroeder, WA0VAS - No report for MSN (Minn. Sr. CW Net). MJN (Minn. Jr. CW Net) reports sessions 27, QNI 177, QTC 22. NC's WA0YAH, WA0TFC, WA0RRA, WA0VYB, WB0FMR, K0VMF. Novices: WN0LBO, WN0IZO, WN0FMA, WN0FMQ, WN0GKH, WN0FJW, WN0JCM. TEN Net rep.: W0RIQ, W0ZHN, WA0RRA, WB0CMM. MSPN Noon Net K0FLI PAM; sessions 31, QNI 997, QTC 163. MSPN WA0VYB PAM; sessions 31, QNI 1204, QTC 93. PAW WA0VYT N mgr.; QNI 3453, QTC 223, 169 hours, phone patches 77, average 20.43. Everyone should check into the AREC Net as much as possible. WA0NQH is the new SEC for Minn. Please give him all the help you can before and after the severe weather watches. Traffic: WA0VAS 1084, WB0FMN 609, WA0GRX 234, WB0HOX 221, WA0VYT 221, W0IYP 139, K0ZRD 129, WA0TFC 127, WB0FTL 114, WA0RRA 96, W0BUC 86, W0WFA 81, WA0VTZ 77, WA0VYB 45, K0PIZ 40, WA0RKF 37, WA0YAH 36, WA0BUR 32, K0FLT 31, K0ZBI 29, WA0IIB 27, WB0FMR 26, K0TJW 26, WB0FMI 25, WB0BQA 24, WA0MIF/0 24, W0RIQ 23, W0WAS/0 23, WA0PRS 20, WA0YGE 19, WA0CCA 18, WA0MMV 18, K0EDS 17, K0MVF 13, WB0FNK 12, WB0CYM 11, W0OPX 10, WA0NQH 8, K0WXH/0 8, WA0JPR 7, K0ICG 5, W0FDM 4, WB0DDH 3, K0GNI 3.

NORTH DAKOTA - SCM, Harold L. Sheets, W0DM - SEC: WA0AYL. OAKS: K0PVG. RM: WA0MLE. OO: W0BF. K0PYZ back from his annual Chicago trek and WA0JPT is again on. WB0BMH received her WAS. K0PVG reports gathering of a group to consider repeater operation on 2 meters. WA0RWM reports FD will be held at Ft. Abercrombie June 23, 24. K0FRP getting leave from the Navy to be there. WA0RWL went to the State Science Fair held at Dickinson. WA0WLP moving back to Bismarck. WA0CSL and WA0CSK are busy working Oscar. WA0CSI is editor of the Forx Radio publication The Feedline; also has been acting as a Net Control station on Thur. for the YL WX Net. W0DM spent a week in Minneapolis. The NDN suspended operations until fall. WA0MLE will serve as liaison with TEN to give him your out of state traffic. He made BPL and the PSHR again this month. He also found time to work 27 countries in the ARRL DX Contest. WA0MLE checked in to TEN 41 times, WA0UNA 3 and WA0ELA 1 in Feb. During SET WA0MLE was the N.D. representative. International Ham Fest coming up in July.

Net	kHz	CDT/Days	Sess.	QNI	QTC	Mgr.
Goose River	1990	0900 S	4	63	1	W0CDO
RACES	3996.5	1730 M-F	44	794	33	WB0ATJ
		1830 M-F				WA0SUF
YL WX	3994.0	0730 M-F	22		346	WA0GRX
PON	3996.5	0900 S	13	290	11	WA0SJB
		1830 S-S				
NDN	3642.0	2150 M-F	15	38	13	WA0MLE

Traffic: (Mar.) WA0MLE 263, WA0RWM 138, WA0SUF 41, W0WWL 41, WB0FDT 25, W0CDO 24, W0DM 10, WA0JPT 8, W0MXI 4, K0PVG 4, W0BHT 2. (Feb.) WA0RWM 218.

SOUTH DAKOTA - SCM, Ed Gray, WA0CPX - SEC: WA0QVR. RM: WA0TMM. PAM: WA0YAK. Net Mgrs.: W0HOJ, W0ZWL, W0MZI, WA0VRE, WA0ZXV and W0NEO. Indications are that repeaters may be completed in the northern Black Hills, Medicine Butte, Mitchell, Huron, Yankton and Watertown this year. If you are interested in one of these repeaters contact some of the other local amateurs for information or drop a note to WA0CPX. The Sioux Falls Amateur Radio Club has an auction on the 5th Mon. of any month with five Mon. in it. Net reports: Morning WX - 321 QNI and QTC 362; NJQ - 669 check-ins and 21 formals; Early Net - 774 check-ins and 11 formals; Late Net - 1540 check-ins and 28 formals; SDN CW - 266 check-ins and 94 formals. Traffic: WA0UEN 222, W0HOJ 214, WA0ROK 145, W0IG 51, K0OFF 51, W0CLS 50, WA0BZD 29, K0AIE 27, W0CAS 26.

DELTA DIVISION

LOUISIANA - SCM, Acting SCM, Louis Muhleisen, Jr., WBSAEH - SEC: K55VD. RM: W5GHP. VHF PAM: W5KND. 73

See the TEN-TEC line of solid state transceivers at any of these stocking distributors:

- ALABAMA**
James W. Clary Co.
Birmingham
- ALASKA**
Yukon Radio Supply
Anchorage
Fairbanks
- CALIFORNIA**
M-Tron
Oakland
Communications Headquarters
San Diego
Quement Electronics
San Jose
L.A. Electronix Sales
Torrance
- COLORADO**
CW Electronics
Denver
- CONNECTICUT**
Hstry Electronics
Hartford
- FLORIDA**
Amateur-Wholesale Electronics
Miami
Amateur Electronic Supply
Orlando
The Ham Shack
Sarasota
- GEORGIA**
Johnson Electric Sales
Griffin
- ILLINOIS**
Spectrosconis, Inc.
Chicago
Trigger Electronics
River Forest
- INDIANA**
Graham Electronics
Indianapolis
Radio Distributing Co.
South Bend
- IOWA**
Hobby Industry
Council Bluffs
- KANSAS**
Electronics, Inc.
Salina
- MICHIGAN**
Purchase Radio Supply
Ann Arbor
RSE Electronics
Clawson
Electronic Distributors, Inc.
Muskegon
Niles Radio Supply
Niles
- MISSOURI**
Ham Radio Center, Inc.
St. Louis
- NEW HAMPSHIRE**
Evans Radio, Inc.
Concord
- NEW JERSEY**
Atkinson & Smith, Inc.
Eatontown
- NEW MEXICO**
Lektronix Supply
Farmington
- NEW YORK**
Aidronack Radio Supply
Amsterdam
Arrow Electronics
Bayside
Harrison Radio Corp.
Farmingdale
Grand Central Radio
New York
Barry Electronics Corp.
New York
- NORTH CAROLINA**
Freck Radio & Supply Co.
Asheville
- Vickers Electronics
Durham
- OHIO**
Amateur Electronic Supply
Cleveland
Universal Service
Columbus
ARC Electronics
Columbus
- OREGON**
Portland Radio Supply Co.
Portland
- PENNSYLVANIA**
Electronic Exchange
North Wales
Tydings Company
Pittsburgh
"Ham" Burger, Inc.
Willow Grove
- SOUTH DAKOTA**
Burghardt Amateur Center
Watertown
- TENNESSEE**
Russ Hellen's "CB Center"
Memphis
- TEXAS**
Ed Juge Electronics, Inc.
Dallas
Ed Juge Electronics, Inc.
Fort Worth
- VIRGINIA**
Arcade Electronics
Annadale
- WASHINGTON**
Amateur Radio Supply Co.
Seattle
- WISCONSIN**
Amateur Radio Supply
Milwaukee
- CANADA**
Ray Hunter & Associate
Toronto, Ontario
C. M. Peterson Co. Ltd.
London, Ontario
Payette Radio Ltd.
Montreal, Quebec
- EXPORT**
E. D. Magnus Co.
Chicago, Ill.

TEN-TEC, INC.
SEVIERVILLE, TENNESSEE 37862

CUSH CRAFT

FM ANTENNAS

FCC APPROVED

FOR USE BY

AMATEUR

REPEATERS

Refer to manufacturer and
type number listed below

AR-2

AFM-4D

AFM-24D

AFM-44D

Polar plots and literature
available upon request.

Cush  **Craft** CORPORATION

Cush Craft

2 METER FM ANTENNAS

NEW

FROM THE WORLD'S LEADING MANUFACTURER OF VHF/UHF COMMUNICATION ANTENNAS

(A) **FM GAIN RINGO:** The most popular — high performance, half-wave FM antennas. Give peak gain, and efficiency, instant assembly and installation.

AR-2	100 watts	135-175 MHz	\$12.50
AR-25	500 watts	135-175 MHz	17.50
AR-220	100 watts	220-225 MHz	12.50
AR-450	100 watts	420-470 MHz	12.50
AR-6	100 watts	50-54 MHz	18.50

(B) **4 POLE:** A four dipole gain array with mounting booms and coax harness 52 ohm feed, 360° or 180° pattern.

AFM-4D	1000 watts	146-148 MHz	\$42.50
AFM-24D	1000 watts	220-225 MHz	40.50
AFM-44D	1000 watts	435-450 MHz	38.50

(C) **FM MOBILE:** IMPROVED Fiberglass $\frac{1}{2}$ wave mobile antenna with new molded base and quick grip trunk mount. Superior strength, power handling and performance.

AM-147	146-175 MHz mobile	\$26.95
--------	--------------------	---------

(D) **POWER PACK:** A 22 element, high performance, vertically polarized FM array, complete with all hardware, mounting boom, harness and 2 antennas.

A147-22	1000 watts	146-148 MHz	\$49.50
---------	------------	-------------	---------

(E) **4-6-11 ELEMENT YAGIS:** The standard of comparison in VHF/UHF communications, now cut for 2 meter FM and vertical polarization. 4 & 6 Element models can be tower side mounted.

A147-4	1000 watts	146-148 MHz	\$ 9.95
A147-11	1000 watts	146-148 MHz	17.95
A220-11	1000 watts	220-225 MHz	15.95
A449-6	1000 watts	440-450 MHz	10.95
A449-11	1000 watts	440-450 MHz	13.95

(F) **FM TWIST:** A Cush Craft exclusive — it's two antennas in one. Horizontal elements cut at 144.5 MHz, vertical elements cut at 147 MHz, two feed lines.

A147-20T	1000 watts	145 & 147 MHz	\$39.50
----------	------------	---------------	---------

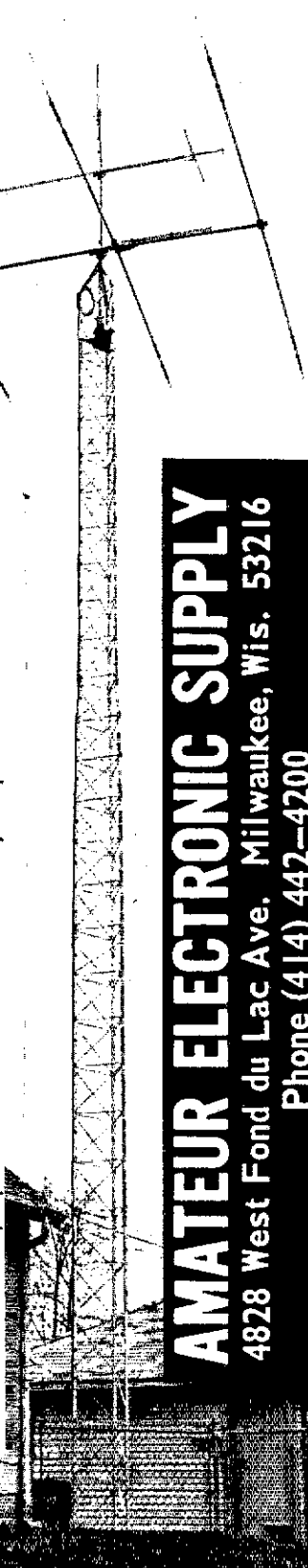
IN STOCK WITH YOUR LOCAL DISTRIBUTOR

Cush Craft
CORPORATION

621 HAYWARD STREET
MANCHESTER, N.H. 03103

UNIVERSAL Aluminum Towers are GREAT!

★ Strong ★ Lightweight ★ Easy to assemble ★ Rust-Free (less maintenance) ★ Self-Supporting Models are available from 30-90 feet with a choice of wind loads to meet your specific needs. Write us for literature. Shown here is a Model 18-50 (18 sq. ft. wind load - 50 ft. high) installed at Ted Willett's house (W9NHE), our Print Shop Manager. **AMATEUR ELECTRONIC SUPPLY** can recommend the proper **UNIVERSAL TOWER** to fit your particular needs.



AMATEUR ELECTRONIC SUPPLY
 4828 West Fond du Lac Ave. Milwaukee, Wis. 53216
 Phone (414) 442-4200

to K5AGI who was transferred to Seattle. John more than any one person was responsible for an all time high in La. ARRL activities. In less than a year as SCM he traveled over 10,000 miles, and visited over 100 amateur radio functions throughout La., and the Delta Division. Thanks John, for a job well done, and best of luck to you and Mary while in Seattle. W5OYI received a citation from Nicaraguan Govt. for his assistance in disaster communication. Twin City Hams helped local and state authorities with communications during recent floods. Again this year NOVHF Club provided communications for the G.N.O. Golf Tournament. Shreveport FM Assn. recently organized and now operating repeater K5JRV on 22-88. Another new Shreveport ARC is now in the formative stages. No name as yet, however officers are K5RNM, pres., W5GWK vice-pres., W5NFVF, secy.-treas.; W5NHRP, official Chaplin. All Shreveport area hams are welcome. Good luck gang. Congrats to W5ZZN on receiving 25 wpm endorsement. IARC plans to have a hamfest date tentatively set for Oct. Tribander at GNOARC is back in service following recent disaster. Congrats to new hams W51MH, W51LR. FD is June 23 and 24, and in conjunction with this Gov. Edwin Edwards has proclaimed the week of June 18 to June 24 as Amateur Radio Week in La. Be prepared! Please forward all future info. for this col. to W5AEH, who will be assuming the duties of SCM. Traffic: W5MI 142, W5CHP 103, WA5ZZA 48, WA5QVN 23, W5EA 20, WA5WBZ 14, W51DVV 1.

MISSISSIPPI - SCM, Walker J. Coffey, W5NCB - Asst. SCM: Gene McGahey, WA5JWD. SEC: W5FHL. PAMS: W5JHS, WA5KEY. RMs: W5YZW, W5DEK. PSHR: W5EIN, W5AMZ, W5DLW, K5YTA, W5FML. I regret to report a Silent Key - W5EMM. Appointments: W5THM/5 as OO and ORS, W5FML as ORS. New QTH for W5CAC is Saigon. Congrats to W5LMT and W5EYZ now Generals. W5EIN has his 25 wpm CP certificate. K5GVV has agreed to act as the 2-meter repeater frequency coordinator for the section. Please let him know if you plan to put a repeater on and he will help you avoid interference to it. Welcome to new hams: W51UU, W51UV, W51VB, W51VC, W51WA, W51WH. Natchez Hamfest was super.

Net	Freq.	Time(Z)/Days	QNT	QTC	Mgr.
MTN	3665	2345 Dy	172	209	WA5YZW
MNN	3733	0100 TTS	86	51	WB5DEK
GC5BN	3925	2330 Dy	-	-	W5JHS
GC5HN	3935	0100 Dy	1313	108	WA5VVV
MSPON	3970	2345 MS	437	42	WA0GVO/5
MSBN	3987.5	0015 Dy	1070	157	WB5BUE

Traffic: W5EIN 245, W5SBM 149, WA5YZW 142, WB5DLW 101, W5NCB 83, W5E1D 54, W5AMZ 49, K5YTA 49, WB5BUE 47, W5WZ 39, W5THM/5 33, W5FHL 23, WA0GVO/5 21, W5NSHNZ 11, W5BW 7, W55BK 6.

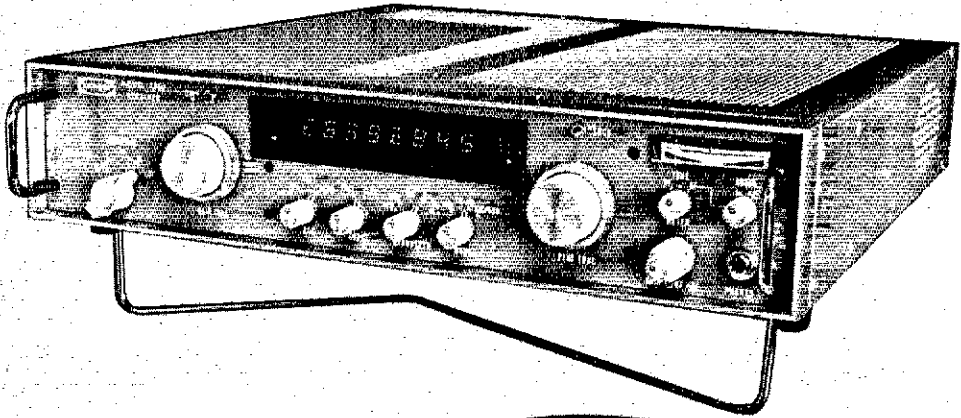
TENNESSEE - SCM, O.D. Keaton, WA4GLS - SEC: WB4DYJ. PAMS: W4PFP, K4MOI, WA4EWW, WA4NEC. RM: W4ZJY.

Net	Freq.	Time(Z)/Days	Sex.	QNT	QTC	Mgr.
TPN	3980	1245 M-F 1400 SSuH	31	1412	63	W4PFP
FSSBN	3980	0030 T-Su	24	1471	91	K4MOI
ETPN	3980	1140 M-F	20	524	18	WA4EWW
TCN	3980	0200 Th	4	43	0	W4CYL
FPON	3980	0030 M				WB4BHZ
TN	3635	0000 Dy	31	191	97	WR4YCV
FNN	3707.5	0000 Dy				WB4NIR
ETVHEN	50.4	0000 TThS	12	206	0	W4SCI
ETVHEN	145.2	0000 WF	8	35	0	WB4DZG
ETTMN	28.7	0200 WF	8	72	0	WB4NFI
KVHEN	50.7	0100 T	4	16	0	WB4MPJ
KVHEN	146.22	0100 F	4	9	0	WB4MPJ
	146.82					
MUTMN	28.8	0200 TF	8	55	0	W4EAY
ACARECN	146.28	0100 M	4	73	0	WB4DYJ
	146.88					

New officers of the RAC of Knoxville are WA4ZCX, pres.; WA4WZJ, vice-pres.; WB4LSK, secy.; WB4ONO, treas.; WB4KMK, act. mgr. WA4YEM was commended by the City of Oak Ridge, Tenn. Civil Defense and by Knoxville TV media for services rendered during the Southern Airways' DC-9 hijacking on Nov. 11, 1972. He has also been recommended for ARRL's Public Service award. Everyone get organized for a great Field Day on June 23 and 24. The NARC is moving into their new quarters. Traffic: K4CNY 273, WB4YCV 177, W4OGG 114, WB4NIR 74, WB4DJU 63, K4VVE 25, W4PFP 24, WB4ANX 22, WA4GLS 21, WB4VZQ 20, WB4BZC 17, WB4TEC 16, WB4DYJ 14, W4WBK 14, W4CYL 12, W4SCI 10, K4SJV 10, WB4MPJ 7, W4RUW 6, W4MEA 4, W4TYV 4, K4UMW 3, WB4UZD 3, WB4WHE 2, WA4IAX 1.

GREAT LAKES DIVISION

KENTUCKY - SCM, Ted H. Huddle, W4CID - SEC: WA4GHQ.



RAYTHEON

**MODEL - 1230
RECEIVER**

THE NEW STANDARD OF RECEIVER EXCELLENCE

- **SYNTHESIZER STABILITY**
(Better than 1 Hz/day at any freq.)
- **CONTINUOUS TUNING (2-30 MHz)**
- **TRACKED PRE-SELECTION ON ALL BANDS**
- **DIRECT DIGITAL READOUT TO NEAREST Hz**
- **PHASE LOCKED DETECTORS FOR AM, FM, FSK**
- **INDEPENDENT SIDEBAND AVAILABLE**
- **ALL SOLID STATE including DISPLAYS**

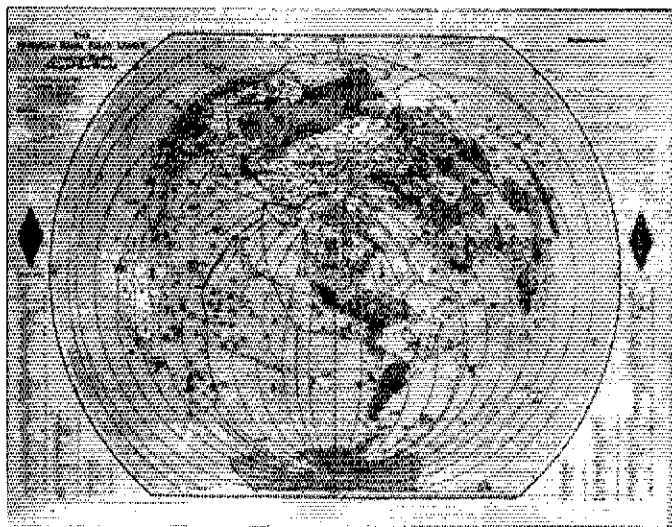
\$4475

FOR MORE INFORMATION WRITE TO:

RAYTHEON COMPANY

MARKETING DEPT. (8P)
P.O. BOX 1642
GOLETA, CALIFORNIA 93017
AREA CODE 805 967-5511

1973 EDITION



We are pleased to announce a brand new edition of the ARRL WORLD MAP!

Just revised and updated by Rand-McNally, the new edition shows the latest geographical/political changes around the world. Latest changes in call sign prefixes, too.

As in previous editions, country prefixes are shown on each country as well as in the marginal index, for easy reference. Continental boundaries and time zones are clearly indicated.

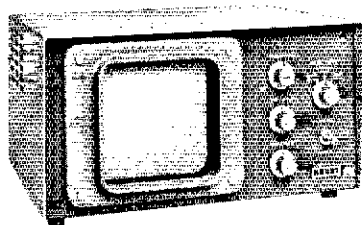
A big 30 X 40 inches, heavy map paper, printed in eight colors.

Easily the best bargain in an operating aid you will ever find, since the price is still only . . .

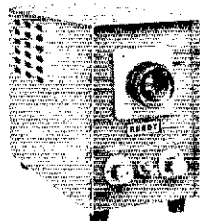
\$2.00

Postpaid anywhere in the world

THE AMERICAN RADIO RELAY LEAGUE, INC.
NEWINGTON, CT. 06111



①



②

A

B

C

D

E

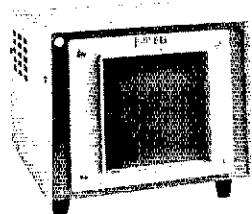
F

G

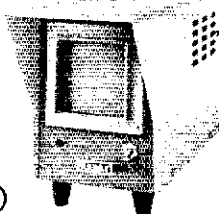
H

④

⑤



③



We guarantee you'll be satisfied with the complete line of Robot Slow Scan TV equipment.

① MODEL 70 SSTV MONITOR

Displays amateur standard pictures from any SSTV audio source: station receiver, tape, camera. Six inch (diagonal) display. Front panel controls for easy station operation. Connectors for receiver, transmitter, microphone, tape, waveform monitor. All solid state except cathode ray tube. **\$295**

② MODEL 80 SSTV CAMERA

Generates amateur standard SSTV pictures and fast scan video for viewfinders. Ample sensitivity in ordinary room light. Controls for contrast, brightness, vidicon beam, SSTV signal level. All solid state except vidicon. All station cabling included; requires suitable C-mount lens. **\$295**

④ LENSES

Lens	Focal Length m.m.	Min. f stops (All 22 max)	Min. focus (in inches)	Price
A	12.5	1.9	10	\$ 49
B	25	1.9	24	\$ 25
C	25	1.4	24	\$ 37
D	close-up lens set for use with lens C only			
E	25	1.4	6	\$ 54
F	50	1.9	42	\$ 43
G	150	3.2	96	\$ 79
H	18-90	2.0	60	\$220

③ VIEWFINDERS

Choice of 4 inch diagonal (Model 60) or 6.5 inch diagonal (Model 61) display to fit your station.

Displays fast-scan video pictures to simplify setting camera focus and field of view. All solid state except cathode ray tube. Tripod mountable (Model 60 only).

Model 60: **\$249**

Model 61: **\$239**

⑤ VIEWING HOOD

Two piece detachable hood. Fits monitor bezel to block outside light. **\$25**

CALIBRATION TAPES

Three inch reel or cassette tape recording aids setting monitors and cameras to SSTV standards.

Cassette **\$4** Reel **\$3**

All Robot equipment carries a one-year warranty. Four easy ways to purchase: cash, C.O.D., Master Charge, BankAmericard.



ROBOT RESEARCH, INC.

7591 Conroy Court
San Diego, California 92111
Phone 714-279-9430

Enclosed \$ _____ Please send the following equipment via AIR or SURFACE

Name _____

Call _____

Address _____

City _____

State _____ Zip _____

California residents add 5% sales tax. Prices do not include shipping.

know this sign



To most people this is a symbol from Greek mythology. But to hundreds of thousands of active amateurs, Pegasus is the symbol of the Radio Amateur CALLBOOK the single most useful operating reference for active amateur stations. The U.S. Edition lists over 285,000 Calls, Names and Addresses in the 50 States and U.S. possessions while nearly 200,000 amateur stations in the rest of the World are listed in the DX edition.

Both editions contain much other invaluable data such as World Maps, Great Circle Maps, QSL Managers around the World, ARRL Countries list and Amateur Prefixes around the World, Time information, Postal Information and much, much more. You can't contest efficiently, you can't DX efficiently, you can't even operate efficiently without an up to date CALLBOOK.

To make the CALLBOOK even more valuable, three supplements are issued each year which bring your copy completely up to date every three months. These are available at a modest extra cost. Full details in every CALLBOOK.

Get your copies of the big new 1973 CALLBOOKS today.

US CALLBOOK
(less service editions)

Just \$8.95

US CALLBOOK
(with service editions)

\$14.95

DX CALLBOOK
(less service editions)

Just \$6.95

DX CALLBOOK
(with service editions)

\$11.45

Mail orders add 50¢ per CALLBOOK postage and handling.

See your favorite dealer or send today to:

WRITE FOR FREE BROCHURE

RADIO AMATEUR **callbook** INC.
Dept. A 925 Sherwood Drive
Lake Bluff, Ill. 60044

Licenses: K4FPW as OVS and OBS; W4KJP as OPS; WA4JOS as FC District 15. Appointed: K4UNW and WB4ZMK as RMs.

Net	QNI	QTC	Net	QNI	QTC
KRN	405	30	KYN	517	284
MKPN	631	42	KNTN	176	232
KYN	1348	149	KPON	107	

On Mar. 31, W4BAZ retired as RM of KYN. JR has held this post for many years and has done a terrific job of making KYN an A-1 traffic handling net. He will be missed. K4UNW will succeed JB as RM of KYN. WB4ZMK will be RM of KN1N. Across the board change in our CW nets. The Louisville group had the opportunity to help CD when a recent train derailment threatened that city with toxic materials. WA4WSW is now one of Uncle Sam's finest. WB4ZMK has been soliciting for traffic from servicemen at Ft. Knox. The results put him in BPL figures this month. WB4IDW now has his Extra. BPLs for Mar.: WB4RFQ, WB4ZMK and WA4JOS. Traffic: WB4WCM 345, WA4JOS 241, K4UNW 213, WB4ZMK 193, K4TXI 169, WB4ZSA 132, W4BAZ 109, WB4BEQ 108, WB4NHO 95, K4MAN 86, WB4HUS 80, W4CID 71, WB4EOR 64, WB4AUN 33, K4DZM 27, W4IQZ 25, WB4REN 21, W4BTA 18, WN4CKW 18, W4NBZ 18, W4AVV 16, WA4ENH 16, WA4FAI 16, W44RC'D 13, W44VZ 12, W4FLG 9, W44AGH 8, W4CDA 8, W46KTN/4 R, K4LOL 6, WB4FOT 5, K4AVX 3, WB4GCV 3, W4YOK 3, K4OHZ 2, WB4TNZ 1.

MICHIGAN SCM. Ivory J. (Jinghouse), WRZBT - SEC: W4MPD. RMs: WB1YA, WBWVL, W8RTN, K8KMO, W8GLC. PAMs: W8GVS, W8KHB, W8HOS. VHF PAMs: K8AEM, W8WVV.

Net	Freq.	Time/Days	QNI	QTC	Sess.	Mgr.
QMN	3663	2300 Dy	1427	460	92	WB1YA
W8BN	3935	0000 Dy	789	89	30	W8GVS
RR/MEN	3930	2230 S-F	758	76	26	W8KHB
UPLN	3920	2230 Dy	692	56	31	W8HOS
GLEFTN	3932	0230 Dy	840	90	30	W8BAI
PON	3955	1600 Dy	1061	148	31	K8LNE
PON/CW	3645	2400 M-S	198	27	26	VE3DPO
M:6M	50.7	0900 M-S	29	21	24	W8VKE
MNN	3720	2230 Dy	220	127	31	W8BJD

K8ZWR reports the SW M. Weather Net held 4 drills with 63 QNI, SW M. 2-Meter nets held 16 sessions with 196 QNI and 3 QTC. Wayne County ARCC has started a traffic training net on 7124 kHz and with 13 sessions had 124 QNI and 8 QTC. W8VOG is Mgr. Michigan Nets will be on 1:01 after Apr. 28. W8KA is reported as a Silent Key. Wolverine SB net elected W8GVS, mgr.; K8JHA asst. mgr. and W8KPI for secy-treas. at their meeting in Muskegon. Yellow River DX ARC elected W8RXP, pres.; W8BII, vice-pres.; W8BMR, secy.; W8LLY, treas. for 1973. Huron Valley ARA officers for 1973 are W8RBOG, pres.; W8SISV, vice-pres.; W8BLOU, treas.; W8BCIN, info. officer. Blossom Land ARA elected officers for 1973, K8TKK, pres.; W8BDNQ, vice-pres.; W8BLW, secy.; W8BLLY, treas.; W8OFC, trustee. W8BDKQ, W8UOQ and W8SKOX were busy in Mar. (Red Cross month) sent 21 R.C. messages and received many replies. W8UOQ became the third Mich. amateur to contact all 3079 U.S. counties and also received an A-1 Op. certificate. Grand Rapids ARA officers for 1973 are K8UNZ, pres.; W8BIIJS, vice-pres.; K8ELK, treas. W8BIRS is new tech. in Sturgis W8PSV has a new 2-meter beam. W8AUN is playing chess on 2 meters. W8UUYW is on USB on 6 with a home brew rig. March of Dimes bread sale was a success in Lansing. Participating hams were K8ILF, W8SDB, W8BFIY, W8OOL, W8BLOA, K8ACO, W8AQCV, K8ZKM. W8THZ was control station. Mi. PON Amateur of the Month is K8PYN and Special Award goes to W8BLYM. Traffic: (Mar.) K8KMO 347, W8WZF 261, W8GLC 259, W8BJD 258, W8PFW 191, W8PIM 191, W8LX 190, K8LNE 125, W8UES 117, K8IYI 105, W8BFBG 94, W8ZBT 69, W8BDKQ 62, W8TZZ 61, W8MIM 57, K8PVC 57, W8NDI 56, W8RRYB 50, W8HHB 49, W8IZ 48, W8NOH 48, K8SKL/B 47, W8LUC 47, W8MO 45, W8FOI 41, W8LXY 41, W8WVL 40, W8HOS 38, W8KTB 35, W8BDIS 32, W8HPZ 32, W8OW 31, W8BHPY 23, K8WRJ 22, W8RDT 19, W8BUI 19, K8RCI 19, W8OKW 19, W8D'N 18, W8ARRL 18, W8F'XR 17, W8ACW 16, W8BAI 15, W8TRP 15, W8DEU 14, W8RU 14, W8RFD 14, W8CSO 13, K8IFD 13, W8SCW 13, K8JHA 12, W8RTN 12, W8CUP 11, W8BZ 10, W8RDT 10, K8GGO 10, W8WVV 10, W8BMR 9, W8BOJ 9, W8BYM 8, W8MDK 8, K8SDA 8, W8VIZ 8, K8ACO 7, W8VXM 7, K8CKD 6, W8LZL 6, K8GKV 6, W8HKL 5, W8UOM 4, W8R'UN 4, W8MFG 4, W8BBI K 2, K8PYN 2, W8YAN 2, W8GR 1, W8OB 1. (Feb.) W8R'UO 99, W8BII 41, W8VVG 39, W8UP 27, W8AEU 6.

OHO - SCM, William E. Clausen, W8IMI - Asst. SCM: Kenneth E. Simpson, W8ITX, SEC: W8ACO. RM: W8WAK. PAM: K8URK. VHF PAM: W8ABU.

FREE:

Apply for your personal SWAN Credit Card simply by completing and mailing this form to **SWAN ELECTRONICS**, 305 Airport Road, Oceanside, CA 92054.



SWAN REVOLVING CREDIT SERVICE APPLICATION Q (PLEASE PRINT)

Name: _____
(First Name) (Middle Name) (Last Name)

Mailing Address: _____
(Street) (City)

_____ How long at this address: _____ Phone: _____
(State) (Zip Code) (Area Code) (Number)

Former Address _____
(If less than two years at present address:)

_____ How Long: _____

Occupation: _____ Birthdate: _____

Social Security #: _____ Amateur Radio Call: _____

Employer: _____ How Long: _____

Company Address: _____
(Street) (City) (State) (Zip Code)

Former Employer: _____ How Long: _____

Name of Your Bank: _____

Address: _____
(Street) (City & State)

Savings _____ Checking _____ Loan _____ Home Loan Account No.: _____

Bank Loans, Finance, etc.:

_____ (Name of Firm) (Address) (City & State) (Account #)

Current Credit Cards:

_____ (Name) (Account No.) (Name) (Account No.)

_____ (Name) (Account No.) (Name) (Account No.)

Relative or Personal Reference:

_____ (Name) (Address) (City) (State)

The above information is true and correct. I/We will make no charge purchase until reading the Swan Credit Service Agreement and Disclosure to be provided.

Your Signature: _____ Date: _____

Signature of Spouse: _____ Date: _____

For

The Newcomer . . .

UNDERSTANDING AMATEUR RADIO is written for the beginner and explains in simple language the elementary principles of electronic and radio circuits; tells how transmitters, receivers and antennas work and includes complete how-to-build-it information on low cost gear—receivers, phone and code transmitters up to 150 watts, v.h.f., measurements, and easy-to-build antenna systems. It is profusely illustrated with hundreds of clear-cut photos, charts, diagrams and tables.

The 320 pages of this helpful publication contain a great amount of down-to-earth information unavailable to the beginning radio amateur in any other single publication.

Its 16 chapters cover:

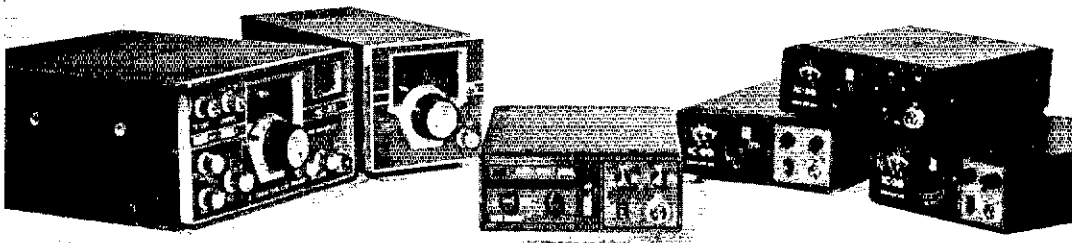
- 1 Setting Up a Station
- 2 Some Needed Fundamentals
- 3 How Receivers Work
- 4 How Transmitters Work
- 5 What You Should Know About Phone
- 6 Antennas and Feeders
- 7 Workshop and Test Bench
- 8 Building Receivers
- 9 Accessories for Your Receiver
- 10 Building Transmitters
- 11 Transmitting Accessories
- 12 The Power Supply
- 13 Modulators and Speech Amplifiers
- 14 Making Measurements
- 15 Antennas and Masts
- 16 Operating Your Amateur Station

UNDERSTANDING AMATEUR RADIO is a "must" guide for the newcomer in setting up and operating his amateur station.

\$2.50 *Postpaid*

U. S. A. • \$3.00 Elsewhere

The **AMERICAN RADIO RELAY LEAGUE, Inc.**
NEWINGTON, CONN. 06111



the ICOM family.

The foremost family of amateur VHF communications in Japan is at your U. S. Dealer today. See him for complete details on model specifications and prices

With features like helical cavity front ends and modular construction, it is no wonder the Icom Family has grown to be the largest, most complete line of ham FM equipment Icom builds the best.

Please support the dealer in your local area. If he does not carry Icom... turn him in to us! We'll reward you both!!!

Get the most for your dollar, devalued, or plain. Get an Icom Radio NOW.

ICOM WEST

1251 170th Street N.E.
 Bellevue, Washington 98008
 206-641-0554

ICOM EAST

Div ACS, Inc.
 Box 331
 Richardson, Texas 75080
 214-235-0479

ADIRONDACK RADIO SUPPLY

185 West Main Street
 Amsterdam, NY 12010
DEALERS!

**GET WITH THE SATISFIERS!
 WRITE TODAY FOR DETAILS!!!**

IC-20 12 Channel Two-Meter Unit 10 Watts Output, 5 American Channels Supplied.

IC-21 24 Channel, Base/Mobile Unit, AC or DC Operation, Discriminator Meter. Seven American Channels Provided

IC-22, Not Shown, Non Modular 22CH Mobile Unit 10 Watts, 5 US Channels

IC-30 450 MHZ, 12 Channels, 10 Watts

IC-60 Similar in all Respects to the IC-20 but for 6 meters.

IC-200A The Ultimate Mobile Station This is a Synthesized 10 Watt Radio that you will be Hearing Lots More About in the Next Few Months. Operating on 30KHZ Channel Spacing Over The Entire 146-148MHZ Two-Mtr Band

ALABAMA

WOLFE ELECTRONICS
 BX 358
 FOLEY, ALABAMA 36535

ARKANSAS

GAVIN ELECTRONICS
 516 RIDGEWAY
 LITTLE ROCK, ARK. 72205
 501-686-7804

ARIZONA

ELL DEE ENTERPRISES
 1342 AE INDIAN SCHOOL RD.
 PHOENIX, ARIZ. 85014
 602-942-9715

CALIFORNIA

ICOM FM SALES
 6234 A. FOUNTAIN BLVD.
 HOLLYWOOD, CALIF. 92028
 213-225-6620

SEQUOIA STEREO
 773 8TH ST.
 ARCADIA, CALIF. 95521

HENRY RADIO COMPANY
 11240 W OLYMPIA
 LOS ANGELES, CALIF. 90064
 213-477-6701

SICHEL EQUIPMENT CO.
 245 E. HARRIS AVE.
 S. SAN FRANCISCO, CALIF. 94080
 415-871-7500

ILLINOIS

ERICKSON COMMUNICATIONS
 4653 N. HAVENSWOOD
 CHICAGO, ILL. 60640
 312-334-3200

MARYLAND

COM ELECTRONICS
 900 CRAIN HWY. S.W.
 GLENN BURNIE, MD. 21061
 301-781-3666

NEW MEXICO

ROBERT FOSTER
 BOX 198 ESCABOSA STAR RT.
 TIJERAS, N. M. 87059
 605-281-3975

NEW YORK

R. E. NEBEL LABORATORIES
 31 WHITEHALL BLVD.
 GARDEN CITY, N. Y. 11530

BARRY ELECTRONICS
 512 BROADWAY
 NEW YORK, N. Y. 10012
 212-925-7000

OHIO

H & C ELECTRONICS
 6271 HANMEL AVE.
 CINCINNATI, OHIO 45237

OKLAHOMA

BLACKS RADIO COMPANY
 413 N.E. 38TH TERRACE
 OKLAHOMA CITY, OKLA. 73105

ROLAND RADIO COMPANY
 5923 E. 31ST STREET
 TULSA, OKLA. 74114
 918-836-6833

TEXAS

BELLAIRE ELECTRONIC SUPPLY
 5204 BELLAIRE BLVD.
 BELLAIRE, TEXAS 77401
 713-667-4294

ELECTRONIC CENTER INC.
 2929 N. HASKELL
 DALLAS, TEXAS 75204
 214-526-2023

SOUTH CAROLINA

ELECTRONIC SYSTEMS INC.
 1518 GREGG ST.
 COLUMBIA, S. C. 29201

GOLDSTEINS
 BOX 3561
 PENSACOLA, FLA. 32508

WASHINGTON

ABC COMMUNICATIONS
 17541 15TH N.E.
 SEATTLE, WASH. 98155
 206-364-6410

ABC COMMUNICATIONS
 2002 MADISON AVE.
 EVERET, WASH. 98200
 206-353-6616

PROGRESS ELECTRONICS
 852 COMMERCE ST.
 LONGVIEW, WASH. 98632
 206-636-6100

DEALERS!!! WRITE TODAY FOR INFORMATION. MANY AREAS STILL AVAILABLE.



Build NRI's NEW 25" Solid State Color TV as you learn Radio-TV Servicing in your home

Start earning \$5 to \$7 an hour in your spare time servicing television and radio sets . . . with NRI's TV-Radio Servicing Course. NRI supplies you with simple "bite-size" texts, a step-by-step learning program; and an exclusive 25" square picture tube, solid state, color TV set that you build yourself as you learn.

NRI also offers home study courses to obtain your FCC license; automotive mechanics, appliance servicing, computer electronics, air conditioning and refrigeration. Get full details about any of the home-study programs offered by NRI . . . the leader in its field. Mail the coupon for your free catalog. There's no obligation. NO SALESMAN WILL CALL. NRI Training, 3939 Wisconsin, Washington, D.C. 20016.

AVAILABLE UNDER GI BILL. If you served since January 31, 1955, or are in service, check GI line in coupon.

MAIL NOW for FREE CATALOG



NRI TRAINING 19-063
3939 Wisconsin Avenue, Washington, D.C. 20016

Please rush me the free catalog I have checked below. I understand there is no obligation. NO SALESMAN WILL CALL.

- | | |
|--|---|
| <input type="checkbox"/> TV-Radio Servicing (with color) | <input type="checkbox"/> Air Conditioning & Refrigeration |
| <input type="checkbox"/> Advanced Color TV | <input type="checkbox"/> Master Automotive Technician |
| <input type="checkbox"/> Complete Communications Electronics | <input type="checkbox"/> Automotive Tune-Up & Electrical Systems |
| <input type="checkbox"/> FCC License | <input type="checkbox"/> Computer Electronics |
| <input type="checkbox"/> Aircraft Communications | <input type="checkbox"/> Electronics Technology |
| <input type="checkbox"/> Mobile Communications | <input type="checkbox"/> Electronics for Automation |
| <input type="checkbox"/> Marine Communications | <input type="checkbox"/> Basic Electronics |
| <input type="checkbox"/> Amateur Radio | <input type="checkbox"/> Math for Electronics |
| <input type="checkbox"/> Electrical Appliance Repair | <input type="checkbox"/> Basic Data Processing & Computer Programming |

CHECK HERE FOR FACTS ON GI BILL.

Name _____ Age _____
(Please Print)

Address _____

City _____ State _____ Zip _____

Accredited Member National Home Study Council

Net	QNT	QTC	Secs	Freq.	Time(Z)	Mgr.
OSSBTN	2621	960	84	3472.5	1430/2000/ 1245	K8UBK
BN	633	386	62	3577	2300/0200	WASWAK
OsMtrN	453	57	30	50.16	0100	WASADU
OSN	250	81	31	3577	2225	WASWAK
BN RFTY				3695	2200	WNSZU
BN Novice				5730	2300	WN80BK

New appointees: W88AYM, EC, Knox Co.; W88KPN, EC, Belmont, Noble, Monroe and Ghersey Co.; W88IBZ, ORS/OPS. Renewals: W8FDU, OBS; W8ETW, ORS/OPS; W8ETX, ORS/OPS/OO; W8RFL, ORS; K8LH, EC; W8ZNC, ORS/OPS. WN80BK reports the formation of RNN, the Buckeye Novice Net, and seeks your support daily at 2300Z on 3730. The Apricot Net provided communications for Cleveland's St. Patrick's Day Parade and operated display station K8LME (BPL) at the annual Sportsmen's Show. ARRL Asst. Secy. W1UDD spoke at five Ohio club meetings during Apr. The Ohio Army MARS Annual Meeting was held at the Dayton Hamvention. W88KZD won Ohio first place awards in the Penna., Mass., and Calif. QSO parties. EC W8MGI reports that Stark Co. AREC/RACES provided 23 stations (13 were mobile) for a drill sponsored by the county disaster planning council. W8JVF reports the Steubenville ARC built a six cavity duplexer for the repeater. OVS W8KPN worked stations from Iowa to N.H. on six cw during an aurora opening - sounded like 40 meters at contest time. Mount Vernon ARC's newsletter reports six area hams provided emergency communications for two hospitals during a telephone outage. W8KLT was named Ham of the Year by the Toledo Radio Club. June 17 is the date of the Goodyear ARC Hamfest-Picnic and the Southwest Ohio AREC Family Picnic. Central Ohio AREC provided communications support to the Cancer Society and Southwest Ohio AREC was active in the United Clothing Drive and the K of C Relays. The Queen City Emergency Net handled communications for the Snowflake Sportscar Rally. Congratulations to W8YFW, one of the first to win the Satellite DX Award. The Cuyahoga Falls RC Newsletter reports K8LJL won their homebrew contest and W8IGY, K8PHJ and K8DOA were runnersup. The Westpark Radiops heard W8KRG of the FAA speak on air safety and W8APB from Wright-Patterson AFB spoke to the Dayton ARA on video recording. Good luck on Field Day! Traffic: W8MCR 540, W8CUT 345, W8PMJ 283, W8HIGH 253, W8SUS 233, K8LME 209, W8ZSM/8 184, W8RHUP 182, K8MLO 182, W8YVLE 169, W8OCU 161, W8MGA 146, W8WAK 134, W8KKI 118, W8TJB 93, W8GVX 92, W8NRC 90, W8RMKZ 89, K8URK 88, K8BPX 86, W8CHT 80, W8ETX 75, W8UPD 74, W8DWL 73, W8BALU 72, W8KZD 68, W8JD 64, W8BJGW 59, W8RCLF 56, W8REX 55, W8KWD 51, W8YIB 49, W8ENI 47, W8YVLE 46, W8NSD 43, W8KXV 42, W8OZK 42, W8OE 40, W8FGD 33, W8MAZ 31, W8C8H 30, W8FCI 29, W8ADJ 28, W8KAG 28, K8JDI 27, W8LPI 27, W8BLH 26, W8DDG 26, W8RIZ 25, W8BSX 24, W8MOK 23, W8FTU 22, W8RCX 21, W8RAF 21, W8RNGA 21, K8ZFR 20, W8BHL 19, W8ETW 19, W8WEG 19, W8ZNC 18, W8AYC 15, W8SSH 15, W8VWH 15, W8ARW 14, W8FCO 14, W8NOQ 14, W8JSW 13, W8BGG 12, W8MHM 10, K8CKY 9, W8MGI 8, W8B1W 7, W8RSI 6, W83GE/8 5, W8GCE 5, K8HNL 4, W8RMYA 4, W8RCOC 2, W8JBP 2, K8OYR 2, W8STX 2, W8MXU 1.

HUDSON DIVISION

EASTERN NEW YORK - SCM, Graham G. Berry, K2SIN - Asst. SCM/PAM: Kenneth Kroth, W2VJB. SEC: W2URP. RMs: W2FBI and W21XW. RTTY RM: K2DN. Nets: Watch for EDST time changes; all times here are GMT. NYS daily at 0001Z and 0300Z on 3.675 MHz; ESS (10 wpm) daily at 2300Z on 3.590 MHz; Novice Traffic Training Net. 0045Z on 3.677 MHz; NYRTTY daily at 2330Z on 3.613 MHz; Section P/R Net 2nd and 4th Sun. 2200Z on 3.925 MHz all clubs welcome. NYSPT&EN daily at 2300Z on 3.925 MHz. Plans under way to launch ECs and asst. EC's net to meet twice monthly. Send your ideas on time and frequency to W2URP please for ball kick-off. New York Phone net picnic set for Glimmer Glass State Park Aug. 18; details from secy. W2HLV. Appointments: W2SYH and W2CUI now OPSs. For record, EC's active are W2PKY, Secnecy duty; W2EAH Albany; W2SRW Rensselaer; W2CSQ Columbia; W2HO Orange; K2CXO Rockland; W2JWL Westchester W2WGS Ulster; K2YLL Greene. With the clubs: Secnecy duty heard W2DEG on Oscar V. Overlook Mt. welcomed nine new calls: W2N2 NDI, LYU, Q1N, LYR, MYL, MYJ, MYV, MBB and PXG, and had visit from Division Director K2SJO in Mar. Communications Club of New Rochelle heard W2OYF on hearing process and aids. Albany ARA heard W2PNB on operations at K1FFK Repeater. Harmonic Hills Annual Dinner for June 8, details from W2FWU. Westchester Cy ARA heard Julius Jones from J&R Electronics on SSTV equipment. Belated welcome to



escape from the **2** meter crowd

The all new
220 MHz Clegg FM-21 Transceiver
 puts you in tomorrow's channels today!

220 MHz FM is *the* early solution to overcrowded 2 meter channels. Here's your chance to get in on the ground floor of the FM future. The new FM-21 all solid-state transceiver is an opportunity to "do it right" this time and start with the leader. The FM-21 uses only 1 crystal in any channel . . . one crystal gives you a separate transmit and receive frequency as well as automatic 1.6 MHz programming in the repeat mode. We call this unique triple-duty crystal feature Clegg Crystal Saver Frequency Control. For the complete story, see your Clegg Dealer or call or write us today for detailed data sheet and avoid the crowd.

CHECK THESE FEATURES

- 8-10 watts output (minimum).
- Speech clipping.
- Sensitive receiver—.25 μ V (max.) for 12 db Sinad.
- Selectivity—Adjacent channel (40 KHz) down 50 db.
- Each crystal does triple-duty, providing a transmit and receive frequency (Crystal Saver Frequency Control).
- Monolithic crystal filter.
- Compact, 7" x 2 $\frac{3}{4}$ " x 9".

Amateur Net \$299.95



Clegg DIVISION

3050 Hempland Road, Lancaster, Pennsylvania 17601

Tel: (717) 299-3671

Telex: 84-8438

LOW COST DIGITAL KITS

NEW BIPOLAR MULTIMETER: AUTOMATIC POLARITY INDICATION



Model ES 210K

Displays Ohms, Volts or Amps in 5 ranges • Voltage from 100 Microvolts to 500 V • Resistance from 100 Milliohms to 1 Megohm • Current from 100 Nano Amps to 1 Amp \$77.00
Case ex. \$12.50 (Optional probe) \$5.00

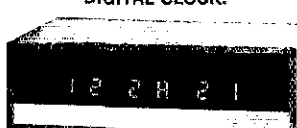
40 MHz DIGITAL FREQUENCY COUNTER:

- Will not be damaged by high power transmission levels.
- Simple, 1 cable connection to transmitter's output.



ES 220K — Line frequency time base.
1 KHz resolution, . . . 5 digit: \$69.50. Case extra: \$10.00
ES 221K — Crystal time base.
100 Hz resolution, . . . 6 digit: \$109.50. Case extra: \$10.00

DIGITAL CLOCK:



ES 112K/124K • 12 hour or 24 hour clock: \$46.95.
Case extra: Walnut \$12.00 • Metal \$7.50.

CRYSTAL TIME BASE:

ES 201K — Opt. addition to ES 112K, 124K or 500K.
Mounts on board. Accurate to .002%. \$25.00

I.D. REMINDER:

ES 200K — Reminds operator that 9 minutes and 45 seconds have passed. Mounts on ES 112 or 124 board.
Silent LED flash: \$9.95. Optional audio alarm \$3 extra.

Dependable solid state components and circuitry. Easy reading, 7 segment display tubes with clear, bright numerals. These products operate from 117 VAC, 60 cycles. No moving parts. Quiet, trouble free printed circuit. Each kit contains complete parts list with all parts, schematic illustrations and easy to follow, step by step instructions. No special tools required.



ORDER YOURS TODAY:
Use your Mastercard or
BankAmericard
Money Back Guarantee

10418 La Cienega • Inglewood, Ca. 90304 (213) 772-6176

Slide Mt. ARS (Onteora HS) in Boiceville, WB2CCY Advisor individual station activities: WA2CNE to Advanced Class, RM WB2FBI set for ZFI and 6YS activity this summer. W2APF interviewed over WRGB-TV re his trip and activities in Managua WA2PIL stretching his V-beam to 280-ft. on each leg. W2URP a WB2IWE week ends for fishing. ECs, SEC, SCM, Division Director and WA1PCM from Hq. met at Kingston for first section-wide session of AREC "heads" in April. WN2AKK new member New Rochelle Club. See you all on FD '73 barring another Agnes or who have you via K2YCI/2. Traffic: (Mar.) WA2CNE 296, WA2LIK 162, WA2PIL 36, K2UYK 30, WA2WGS 28, W2URP 21, K2SJM 18, WB2EBP 13, WB2IXW 9, K2HNW 6. (Feb.) K2IDN 40, WA2PIL 20, W2SZ 18, WA2FBI 14.

NEW YORK CITY AND LONG ISLAND - SCM, Fred J. Brinjes, K2DGI - Asst. SCM: John H. Smale, WB2CHY. SEC: K2HTX. RM: WB2LZN. PAM: WA2UWA. VHF: PAM: WB2RQE.

NLI*	3630 kHz	1900/2200 Dy	WB2LZN RM
NLS*	3730 kHz	1830 Dy	WA2CLB Mgr
NLS*	145.8 MHz	1930 MTWTF	WB2RQE PAM
NLI Phone*	3928 kHz	1730 Dy	WA2CXY Mgr
Clear House	3925 kHz	1900 Dy	WA2VYT Mgr
M Svc.	3928 kHz	1300 Dy	W2OE Mgr
Mic Farad	3925 kHz	1100 Dy	W2OE Mgr
NYSTPEN	3925 kHz	1800 Dy	WB2QAP Mgr

*Denotes section nets; all times local! All kinds of news this month for instance: WB2CHY being appointed as Asst. SCM. John will lend a helping hand in the area of maintaining League appointments and sending out reminders of renewals. He also will act as my liaison with the section traffic nets to keep me advised of schedule changes, managers, liaison problems etc. I ask that you give him the cooperation given me to help bring this section to as an efficient operating machine as it should be, and one to be proud of. Other news brings congratulatory note to K2RHL and WA2CLB for their efforts in obtaining the coveted Advanced Class license! W2TUK was honored at a special gathering in his old stamping grounds in HP-Land (Panama and Canal Zone) while on a stop over from his trip to Chile, and the 2nd Region ITU Conference. K2DDK, now WIGRE and K2DGI celebrated their 20th year as licensed amateurs at the QTH of WIGRE with the staff of ARRL Hq. on hand to help drink the champagne. WB2WFJ, not to be out-done, will be taking on a bride July 15. He expects to be QRT until he gets a new QTH station. K2HK has reached the DXCC-300 mark recently in the ARRL DX Contest. W2AML has recently completed the 3-meter ANTALGO described in *Use, QST 1964?* WB2EKK looking for the state of Nev. to complete his WAS. WB2BYY reports ready to "smoke test" his 2-meter fm receiver per Aug. 1972 QST. The NLI section offers its respects to W2PE who recently lost his wife. WA2OQR reports he and K2EFB have been making good use of Oscar 6. I would appreciate word of others who have been working with Oscar 6 so that we can publicize through the newly formed Hudson Division Publicity Dept. (WB2PFI). WB2DAR has recently set up for Telefax operation to get on the latest bandwagon of operational mode. W2NNH has been appointed I.C. for Queens County. I would appreciate all you Queens-sites giving him all the cooperation he may need in bringing Queens County AREC/RACES to an active and first rate operation on 10 meters. W2ELO and OM W2LH enjoyed a trip to the Holy Land this past spring and visiting with the 4X4 fraternity. Hope you all enjoy your vacations now that we are entering the summer season. W2PL went to WB2WFJ Traffic: WB2WFJ 530, WB2LZN 268, W2IC 243, WB2OYV 120, WB2LGA 89, WB2CHY 51, K2VGD 29, WB2DAR 21, W2DBO 16, K2JFF 12, WA2PLI 12, W2EVS 11, WB2BYY 10, WA2MDX 9, W2EW 8, WA2VXN 8, K2FV 7, W2PF 5, WB2EKK 3, WA2RGG 3, WA2GLP 2, WA2GMD 2.

NORTHERN NEW JERSEY - SCM, John M. Crovelli
WA2UOO - SEC: K2KDO. RM: W2ZEP. PAMS: K2KDO and WA2VH.

Net	kHz	Time (PM)	Days	Sess.	QNT	Tfc.	Mgr.
NJN	3695	7:00	Dy	31	576	275	W2ZEL
NJN	3695	10:00	Dy	31	289	89	W2ZEL
NJNS	3740	8:15	Dy	16	19	3	WA2TRF
NJPN	3950	6:00	M-S	31	386	261	WA2FVH
NJPON	3930	6:00	Su	4	91	29	WB2FJ
PVTEN	145710	7:00	Dy				K2KDC

New appointments: WA2DNU as EC for Glen Rock and vicinity WA2RYD as EC for Fair Haven and vicinity; K2YTF as OVS WA2NPP as ORS. Endorsements: W2CU, WB2FEH, WB2JAE, W2ZEP as ORS; WA2EUO OPS. W2ZZ reports receiving the SBDXCC award. WA2UDF built an IC keyer. WA2SRQ completed third antenna coupler. WA2VH says liaisons with NJN and D2RN functioning well. WA2TRK replaces WA2RYD as mgr. of NJSN. The Slow Net can use your support. WA2SEC and K2KVT active on

the TELEX PROFESSIONALS

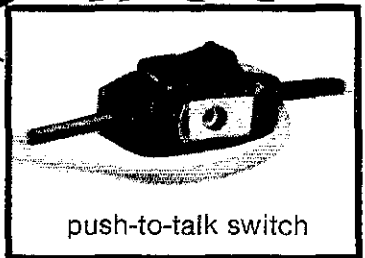
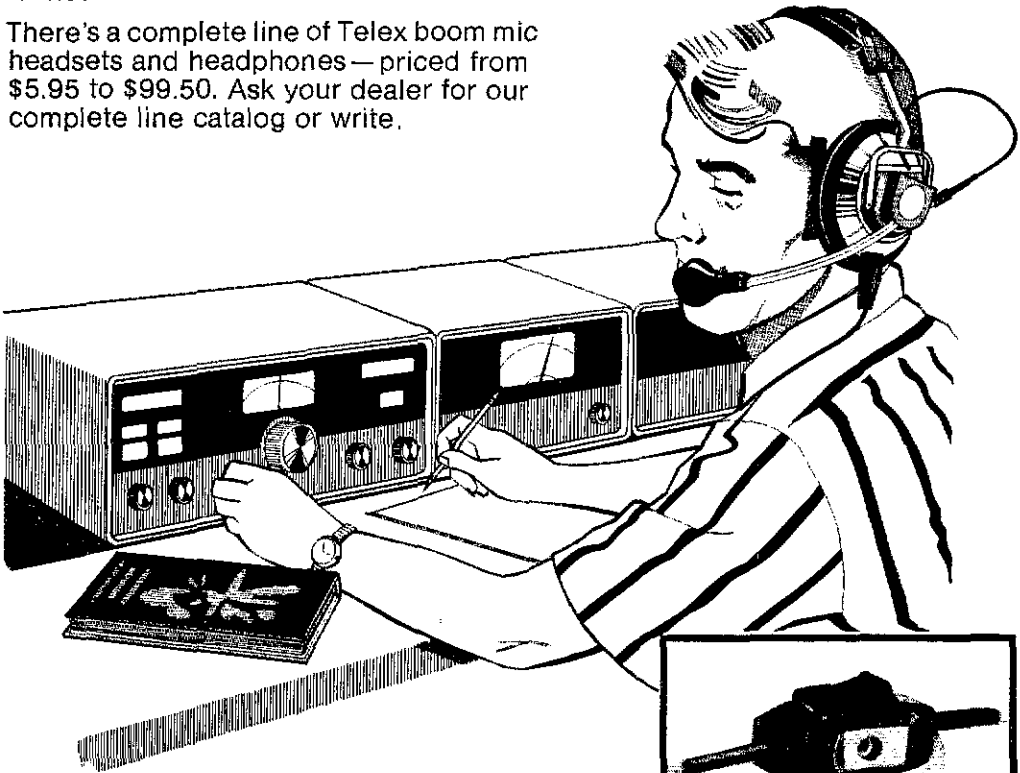
for "hands free" radio communications

Telex boom mic headsets provide you with the ultimate convenience in radio communications. The adjustable boom mic gives you "hands free" operation for logging or frequency adjustments, plus added mobility. And the mic is always properly positioned for instant, intelligible voice transmission.

Telex headsets feature an easy to reach, inline push-to-talk switch, which can also be wired for voice operated transmission.

Boom microphones are especially designed for "close-talking" use to limit outside noise pick-up. Both Telex boom-mic headsets and headphones seal out ambient noises, concentrate the signal at your ear, and add to the effectiveness of your rig. Adjustable and lightweight, they can be worn for hours without discomfort.

There's a complete line of Telex boom mic headsets and headphones — priced from \$5.95 to \$99.50. Ask your dealer for our complete line catalog or write.



push-to-talk switch

PRODUCTS OF SOUND RESEARCH
TELEX[®]
COMMUNICATIONS DIVISION

9600 ALDRICH AVENUE SOUTH
MINNEAPOLIS, MINNESOTA 55420

CANADA: Double Diamond Electronics Ltd, 34 Progress Avenue, Scarborough 4, Ontario
INTERNATIONAL: Telex Export Dept., 9600 Aldrich Ave. So. Minneapolis, Minn. 55420 U.S.A., telex: 28-7053

If you want to be the top in Broadcast

take 2 giant steps

THOROUGH BROADCAST KNOWLEDGE

FCC LICENSE

CIE will give you a hand!

If you want to be a Broadcast or Transmitter Engineer, Federal Law requires you to have an FCC License. And in TV and radio today, there is a growing demand for licensed personnel. Cleveland Institute of Electronics will prepare you at home, in your spare time, for your FCC exam with this assurance: when you complete any CIE licensing course, you'll be able to pass your FCC exam or be entitled to a full refund of all tuition paid. Warranty is valid during completion time allowed

for your course. The next big step to the top in broadcasting is a thorough and up-to-date knowledge of electronics technology. CIE offers the courses you need... with lessons that keep pace with the rapidly advancing state of the art: solid state and IC technology, for example. And with CIE AUTO-PROGRAMMED® Lessons, regardless of your station working hours, you can study at home, at your convenience. You set your own pace... establish your own goals.

APPROVED UNDER G.I. BILL

All CIE career courses are approved for educational benefits under the G.I. Bill. If you are a Veteran or in service now, check box for G.I. Bill information.

Mail coupon today for TWO FREE BOOKS. For your convenience, we will try to have a representative call. If coupon is missing, write: Cleveland Institute of Electronics, Inc., 1776 E. 17th Street, Cleveland, Ohio 44114.

CIE Cleveland Institute of Electronics, Inc.
1776 East 17th Street, Cleveland, Ohio 44114
Accredited Member National Home Study Council

Please send me your TWO FREE BOOKS:

1. "How to Get a Commercial FCC License"
2. "Succeed in Electronics"

Name _____ (please print)

Address _____

City _____ State _____ Zip _____

Veterans and Servicemen:
 Check here for G.I. Bill information. QT-02

450 ATV Recent additions to Navy MARS include W20DV, WN2JVK, WB2YBA, WB2PDA, WA2BSU, WA2SHT, WA2PCS, W2UMB, WB2NSV, WA2QIK and WA2MVO. WA2SHT erected a 40-meter dipole. WA2ATO has a new six-element beam for 20 and awaiting the 40-meter beam to arrive. W2CVW working on 5BDXCC. WA2QJU has his HW-101 on the air. WB2IKL moved back to Syracuse. Kearny ARC station K2BDX operated by WB2-WW. W2WHB looking to add a trap vertical to his (ORR) station. WA2CAX putting up an 80-meter long wire and 20-meter dipole. WA2RIU operating bicycle mobile with his new TR-22. WB2AEH has raised all of his sky hooks and will be attending Rutgers next year. W2NPT is now K4OD. OO reports from W2TPI, WB2ILC and WB2TFI. WN2FON reports joining Essex Co. CD but will soon be moving to Penna. WB2RXC working with Radio Control. WA2NZE looking to get back on 2-meter fm. The Knight Raiders ARC auction was a big success. K2SJO and W2FMI both spoke at GSARA meetings this month. SEC K2KDO actively recruiting members for AREC. Please contact him for further details. WB2CST reports the Fair Lawn AREC is using 2 fm for drills. I would appreciate clubs forwarding their bulletins to me best of luck to all on Field Day. Traffic: (Mar.) WA2RYD 386, WB2CST 296, WA2RUU 175, WB2AEH 134, W2ZEP 122, WA2NPT 65, WA2UOI 64, WB2NOM 46, W2CU 36, K2ZFI 25, WA2FVY 71, WB2RIJ 17, WA2CAK 15, K2BDX 12, WA2CCF 11, K2EOP 10, W2CVW 8, W2ABL 5, WN2CSX 4, WA2QNT 3, W2ZZ 1, Feb. K2RKO 184, WA2UO 95, WA2SRO 41, WA2SHU 24, WN2CAX 16, K2OOI 11, K2EOP 10, W2OPE 7, WB2HGV 2.

MIDWEST DIVISION

IOWA - SCM, Al Culbert, KØYVU - SEC: KØCLI. KØOOD has a new job with the Iowa Chapter of the American Red Cross. WNØJPB is a new ham in Osage. During the recent Iowa High School Basketball Tournament, a plaque was presented to WØDSP who pioneered in announcing the first broadcast of the tourney. WAØTAQ and KØDDA have taken to Oscar 6 to relay their monthly traffic totals. WØØPH has become an Army MARS member. Congratulations to the many fellows who provided communications for the Onap Sunnyside Pony Express band Drive. WØPKJ has been transferred to Des Moines Tech High. KØLKH is readying the Iowa 2-meter repeater directory. The 3900 Club had their quarterly dinner meeting Mar. 24 at Storm Lake. Trust that by now all the faithful have made their plans for the annual Field Day and re-acquaintance with Mr. Murphy.

Net	QNI	QTC
Iowa 75 meter (noon)	1647	10
Iowa 75 meter (eve)	1082	2
14CN (cw)	177	5
In-State (cw)	107	2

Traffic: WAØAUX 209, KØAZJ 181, KØDDA 175, WAØTAQ 18, KØYVU 15, WØØAVW 13, WAØVZH 9, WØØDBG 8, WØWSV 8, WAØOTO 4, WØØPH 3, WAØVDX 1.

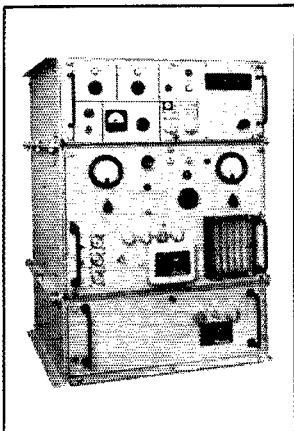
KANSAS - SCM, Robert M. Summers, KØBXF - SEC: KØJMF. RM: KØMRI, PAMS: WØGCJ, WØØBCL. VHI: PAM: WAØTRO. The CKARC, Salina participated in a Walk-A-Thon providing communications through the 20 mile walk. Two meter, 34-94 was used with 14 amateurs participating. WØØBCL walked over 19 miles carrying a portable transceiver. Thirteen Zones of the Kans. AREC reporting activity this past month, one of the best in reporting yet with 1049 QNI, 34 QTC in 80 sessions. WNØGQL reports that Novice YL Net with 63 QNI and 27 QTC. This will be the last of the spotless Weather Net reports for the summer. KWN reports QN 546, QTC 187 and no severe watches. WØØBCL reports the Midstates Mobile Monitor Watch with another fine month 1841 QN serving 88 mobiles, handling 88 calls or patches and 104 QTC, in 9 hours of operation. Many thanks to all the NCS for a fine service. Kans. Sideband Net KSBN QNI 1009, QTC 86 in 27 sessions. KPI QNI 217 and 9 QTC in 16 sessions, WØGCJ reporting. The Kans. E Net changed frequency to 3920 Fri. at 7 P.M. local time. All EQ take note and get your gang informed. Mar. QNI for KEC 48, HBI report for Mar. QNI 371, QTC 68 in 23 sessions. Don't forget the picnic July 28-29. QKS reporting QNI 582, QTC 225 in 62 sessions. QKS SS QNI 245, QTC 342. Traffic: (Mar.) WØHI 264, WNØGV 257, WNØHTR 225, KØMRI 221, WNØGQL 220, WNØESL 211, WAØLLC 140, WØØHBM 79, WØMA 60, WØCHJ 43, KØJMF 42, KØBXF 36, WNØHTH 36, WØGCJ 31, WØRBO 30, WØCZR 2, WØØXI 22, KØZHO 22, WAØTAX 19, WAØSRQ 16, WAØYXK 14, WØØSGV 13, WAØZTW 13, KØKU 8, WAØOWH 7, WØFDJ 4, WA2HSR/Ø 2, WAØSRR 2, WØECL 1. (Feb.) WA2HSP/Ø 4.

MISSOURI - SCM, Larry S. Phillips, KØVVH - Asst. SCM. Clifford Chamney, KØBIX. SEC: KØHNE. New appointment

Give yourself a tactical advantage!

HARRIS
Communications and
Information Handling Equipment

The RF-130
1 KW HF/ISB
Transmitter
With Plus...
And More Plus



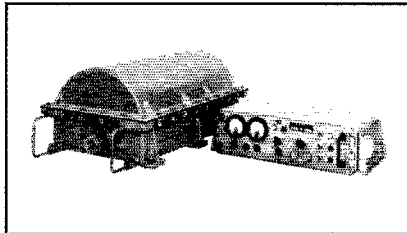
When you get right down to it in tactical communications . . . the need to know and the need to tell . . . what do you really need?

You need narrow-band secure voice and high speed data capabilities. You need rapid automatic tuning, power source flexibility, full remote control capability, and *dependability*. In short, you need the best the state-of-the-art has to offer: the versatility of the RF-130 1 KW HF/ISB Transmitter.

The RF-130 has exactly what you need . . . and more! Modes of operation include USB, LSB, AME (compatible AM), CW, and 2 or 4 channel ISB (DCA or CCIR compatible). Plus solid-state design, modular construction offering ease of maintenance, and much more. *Give yourself the tactical advantage transmitter.*

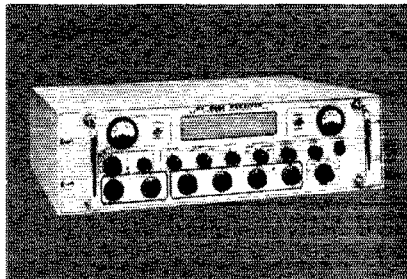
Plus RF-601A AUTOMATIC ANTENNA COUPLER

If you don't have a broadband antenna available, the advantage you gain from an auto-tune transmitter can easily be lost. The RF-601A Automatic Antenna Coupler was designed to tune whip and long-wire antennas up to 500 feet away. Its accurate and reliable tuning assures frequency changes in less than ten seconds anywhere in the HF band.



Plus RF-505A HF SSB/ISB GENERAL PURPOSE RECEIVER

The RF-505A, the first really new HF synthesized receiver in over a decade, is the perfect companion to the RF-130 Transmitter. Full coverage from VLF to HF (up to 30 MHz) . . . all solid state . . . LSB, USB, AM, CW, ISB, for reception of voice, telegraph, teletype, facsimile and high speed data signals. Two words describe it: *versatile and dependable*. *Stack it with the RF-130 Transmitter for your tactical advantage.*

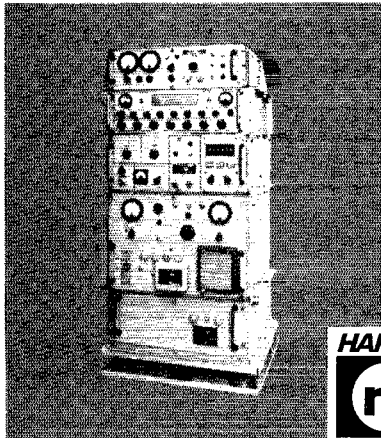
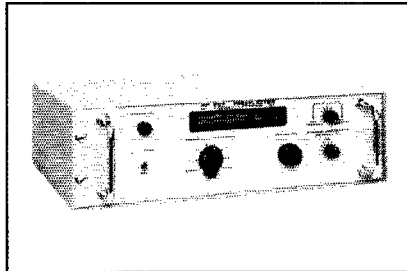


Plus RF-507 PRESELECTOR AND PROTECTION UNIT

Critical communications often require transmitting and receiving at the same time, often at relatively close frequencies. This leads to a drop in receiver performance from blocking, intermodulation and cross-modulation, and can even lead to permanent receiver damage. The RF-507 Preselector and Protection Unit is designed to eliminate these problems and increase overall receiver sensitivity and selectivity.

The RF-507 is completely self-contained, including power supply, and is a perfect companion to the RF-505A Receiver/RF-130 Transmitter, permitting full duplex operation.

There are more PLUS details available. Write us today for illustrated brochures. Then you can . . .



Rack them...
Stack them...
Build what
you need.

HARRIS



RF COMMUNICATIONS, INC.

1680 University Avenue, Rochester, New York 14610, U.S.A.
Telephone: 716-244-8830; Cable: RFCOM Rochester, N. Y.;
TWX: 510-253-7469.
A Subsidiary of Harris-Intertype Corporation

JUST OFF THE PRESS



NEW 1973 VINTAGE RADIO

Enthusiastic readers bought out our first edition. Now you can send for the fascinating new edition of this pictorial history of wireless and radio, 1887-1929. It's the collector's bible, with 263 pages and over 1,000 illustrations. Available in handbook or deluxe hard cover.

McMAHON'S 1921-1932 GUIDE

Be an instant expert. Lists 9,000 radio models by maker and year introduced, with original price, description and circuit type. A must for every radio buff or antique collector.



ORDER NOW! Send check to
 McMahon's Vintage Radio, Box 2045,
 Palos Verdes Peninsula, Calif., 90274
 Vintage Radio, handbook \$ 4.95
 Vintage Radio, hard cover 6.95
 McMahon's 1921-32 Radio Guide 3.95
 California residents add 5% State Sales Tax.

Name _____
 Street _____
 City _____ State _____ Zip _____

TEN DAY MONEY-BACK GUARANTEE

KØBIX as asst. SCM; WØBV as RM; KØHNE as SEC; KØHNE as OPS.
 Renewals: WØBV as ORS; KØONK as OPS.

Net	Freq.	Time(Days)	Sess.	QNT	QTC	Mgr.
MOSSB	3963	2400 M-S	27	1340	72	KØHNE
MON	3585	0100 Dy	31	194	133	WØBV
MON2	3585	0345 Dy	31	113	51	WØBV
MSN	3703	0130 T-S	25	98	48	KØBIX
		2200 Su				
MOCN	3963	1830 M-F	21	99	60	WØEE
WEN	28.6	0130 M	4	38		2WA5KBBH/Ø
ICAREC	146.94	0330 T	4	30	0	WAØRV
MOSSB2	3963	0230 M-W	3	18	0	KØHNE

I would like to thank the hams of the Mo. section for the friendly response that I have met as I start my new job as SCM. Congratulations to WØBV as new mgr. of MON and MON 2. Also to WØNUT as new mgr. of MEN. With deep regret I report WAØZCQ as a Silent Key. Glad to hear WØNVM has a new 2-meter beam. Congratulations to new Extra Class WAØZJU; new Generals WØGWE and WØUIY; new Tech. WØERD and WØHVF; new Novice WØJNL. Happy to report that your SCM has a new tower and beam. See you all in Jefferson City at MOSSB Net Picnic. Traffic: KØONK 616, WØBV 151, KØBIX 99, WAØVGB 88, WØUD 46, KØDEQ 36, WAØFMD 33, KØPCK 33, WØGWE 31, KØENH 22, WAØKUH 19, WØGBI 18, WØEOV 16, WAØTAA 16, KØVVH 11, WAØDKS 7, WAØQWW 5.

NEBRASKA - SCM, V.A. Cashion, KØOAL - Asst. SCM: Velma Sayer, WAØGHZ. SEC: KØODF. Appointments: WAØHFH EC; WØCAU, WØDMY, WAØDX, WAØQEX OPSs. Endorsements: WAØQGM EC; WAØULX OVS and OBS; WAØQEX, WØCAU, WØDMY ORS; WØHOP, WØBFN OPSs.

Net	Freq.	GMT/Days	QNT	QTC	Mgr.
NSN I	3982	0030 Dy	1370	20	WAØLOY
NSN II	3982	0130 Dy	982	34	WAØLOY
Neb. 160	1995	0130 Dy	372	244	WAØCJ
NMN	3982	1330 Dy	1303	24	WAØJF
WNN	3950	1400 M-S	647	18	WØNIK
AREC	3982	1430 Su	194	1	WØIRZ
CHN	3980	1830 Dy	1395	90	WAØGHZ
SHN	3950	1930 Dy	145	12	WØDJO
DEN	3980	2100 M-F	383	8	WAØAUX

North Platte ARC officers: KØBYK, pres.; WAØGAT, vice-pres.; WØYV, secy-treas. WAØLOY and LRQ participated in Jan. CD Party. WØEXP has newly decorated ham shack. WAØPCC and WØLOD home from wandering. KØEYV building typewriter type keeper. WØMW building power supply for HW-12. Lincoln ARC providing communications for YMCA Sports Festival end of month and March of Dimes "March-a-Thon" Apr. They will be active at State Fair (10 days) this year. LARC will sponsor ARRL Midwest Division Convention Oct. 5-6-7 at Villager Convention Center in Lincoln. Plans being made for another repeater in Columbus-Norfolk area. WAØHQQ and BFH going 2-meter mobile. 160-meter Wx Net suspended for the summer. Central Nebr. ARC Steak-fry to be held last Sun. in July. Lancaster Co. 2-meter AREC Net QNT 108. Box Butte Co. 2-meter AREC Net QNT 21, QTC 2. Traffic: WAØCJ 62, WØCAU 38, WØSGA 30, WØHOP 28, WØIAY 27, WAØQEX 26, WØCSW 22, WØVYX 22, WØEVS 21, WØFOB 21, WØVEA 21, WØNIK 19, WAØBOK 16, WØLOD 16, WØNBS 12, WAØPCC 11, WAØSCP 11, WAØGHZ 10, WØDJO 9, WØMW 9, WØEFV 8, WAØQX 8, WAØYZ 8, WØDMY 6, WØGKK 6, KØJFN 6, WAØHQQ 5, WAØJKN 5, WØRJA 5, WAØEEI 4, WØHTA 4, WAØLOY 4, KØODF 4, WAØPSN 4, KØSFA 4, WØWKP 4, WØLWS 3, WØZNI 3, WAØGAK 2, WØHBS 2, KØOAL 2, WAØVIT 2, WØYFR 2, WØIRZ 1, KØWPF 1.

NEW ENGLAND DIVISION

CONNECTICUT - SCM, John McNassor, WIGVI - SEC: WIHHR. RM: KIEIR. PAM: KIYGS. VHF PAM: KISXF.

Net	Freq.	Time/Days	Sess.	QNT	QTC
CN	3640	1900 Dy	62	607	340
		2200			
CPN	3965	1800 M-S	31	576	215
		1000 Su			
VHF 2	145.98	2200 M-S	22	61	19
VHF 6	50.6	2100 M-S	22	85	6

High QNT: CN - WIBYW, WIEJI, WAIGFH, WIMPW and WJCTI. CPN - WIMPW, WAINDL, WAIOB, WAIPUL and KISXF. SEC WIHHR had to skip a few club visits because of illness but is now back in business - contact him on CPN or 2 fm. Dir. WIOV suggests all clubs provide membership the opportunity of discussing the wealth of information contained in the ARRL Annual Report. The 20th Annual CN/CPN Net Dinner Meeting was an overwhelming success - thanks to the excellent planning by KIEIR and KIYGS and the many who attended - the company, food and arrangements

CONSIDERABLY SPECIAL CONSIDERING THE SPECS

2 METER FM TRANSCEIVER

Model SRC-146A



Frequency 143-149 MHz
(2MHz spread)
Number of channels 5
Supplied with 146.94 simplex,
146.34 / .94 (same plug in
crystals as SR-C826M)
R.F. output 2 watt minimum
Sensitivity better than 0.4
uv / 20 DB Q.S.
Audio output 500 mw
Meter monitors battery voltage on
Tx, S Meter on Rx
Current drain 620 ma Tx,
15 ma Rx standby
Size 8 $\frac{3}{8}$ " high x 3" wide x 1 $\frac{1}{8}$ " deep
Weight 24 oz., less batteries

Options: *Private channel (CTCSS), external mic, or mic-speaker, stubby flexible antenna, desk top charger, leather case.*

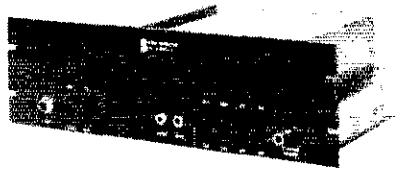
\$289 00

**Suggested
Amateur
Net Price**

NEW 2 METER REPEATER

SCA-RPT-1

All solid state, 2M, 10W, FM REPEATER. Built-in C.O.R., adjustable carrier delay and time out timer.



Write for complete specifications and cost.



Standard
COMMUNICATIONS CORP.

213 / 775-6284 • 639 North Marine Avenue, Wilmington, California 90744

'HAM' UHF 400 MC HIGH POWER TRANSISTORS

3 for \$10. **\$3.95**

By RCA or equal 2N3632, NPN, 28 watts, 3 amps, TO-60 case, with stud mtg. VCEV max 65.



EPOXY FULL WAVE SILICON BRIDGE RECTIFIERS

PIV 2 Amp	6 Amp	
50	\$4.49	\$3.65
100	.79	.99
200	.95	1.25
400	1.15	1.50
600	1.35	1.75
800	1.55	1.95
1000	1.79	2.25

Code: 2 amp TO-5 case
6 Amp 1 1/2 x 1 1/2 x 1/16 in



LED 7-SEGMENT READOUTS MAN-4 EQUALS 3.95

0-9 plus letters. Snaps in 14-pin DIP socket. 1/2" x 1/2" x 3/16". 5V 10ma, with decimal point. Like MAN-1. Socket for above, 50c



Includes SN7490, decade counter, SN7475 latch, SN7441 BCD decoder driver, 10-to-9 Nixie tube, instructions.

COUNTING SYSTEM

\$6.50
3 FOR \$18.

SILICON TUBES

804	\$1.49
804	3.95
866	7.95

HOT MOS FETS

2-MOS FETS, N channel 10K ohms SN128, TO-18, RCA	\$1
2-MOS FETS, DUAL GATE, N chan., 3N187-1, TO-18, \$1	
2-MOS FETS, DUAL GATE, N chan., 3N140-1, TO-18, \$1	

LED-PHOTO-SOLAR 'DOLLAR STRETCHERS'

1 - "LED'S", visible, micro-miniature, axial leads	\$1
2 - "LED'S", visible, round, red, TO-18	\$1
1 - PHOTO TRANSISTOR, with darlington amp base, fen. \$1	
2 - PHOTO TRANSISTORS, with darlington amp, ZN5777 \$1	
4 - PHOTO CELLS, Caltech, pan-ake, 50K-70 ohms	\$1

Lowest prices on LED READOUTS **4.95** Buy 3 Take 10%.
0-9 plus letters, for SN7446 or SN7447. Snaps in 14-pin DIP socket. 2 1/2 x 3/8 x 3/16 characters: 1/4 x 3/16 1/2 V, 20-mils per seg. characters: 1/4 x 3/16 Famous MAN-1 type. Sockets .50 ea.

Lowest Prices Largest Selection TTL IC's

Brand New "DIP" Packages Order by type number! Spec sheets on request "USLY"

Type	Description	Price	Type	Description	Price	Type	Description	Price	
SN7400	30	\$.30	SN7438	.60	SN7481	1.50	SN74145	1.40	
SN7401	.30	SN7440	.30	SN7482	.95	SN74151	1.25	SN74152	1.25
SN7402	.30	SN7441	1.40	SN7483	1.50	SN74153	1.60	SN74154	2.10
SN7403	.30	SN7442	1.25	SN7485	1.41	SN74155	1.55	SN74156	1.55
SN7404	.35	SN7443	1.35	SN7486	1.55	SN74157	1.55	SN74158	1.55
SN7405	.32	SN7444	1.35	SN7489	3.75	SN74159	1.55	SN74160	1.95
SN7406	.35	SN7445	1.65	SN7490	1.50	SN74161	1.95	SN74162	1.95
SN7407	.35	SN7446	1.65	SN7491	1.50	SN74163	1.95	SN74164	3.50
SN7408	.35	SN7447	1.65	SN7492	1.10	SN74165	3.50	SN74166	1.20
SN7409	.35	SN7448	1.65	SN7493	1.10	SN74167	1.95	SN74168	1.95
SN7410	.30	SN7449	1.65	SN7494	1.10	SN74169	1.95	SN74170	1.95
SN7411	.35	SN7450	.35	SN7496	1.10	SN74171	1.95	SN74172	1.95
SN7412	.35	SN7451	.35	SN7497	1.10	SN74173	1.95	SN74174	1.95
SN7413	.35	SN7452	.35	SN7498	1.10	SN74175	1.95	SN74176	1.95
SN7414	.55	SN7453	.35	SN7499	1.10	SN74177	1.95	SN74178	1.95
SN7415	.55	SN7454	.50	SN74100	1.49	SN74101	.55	SN74102	.55
SN7416	.55	SN7455	.35	SN74103	1.25	SN74104	.55	SN74105	.55
SN7417	.55	SN7456	.35	SN74106	1.25	SN74107	.60	SN74108	1.25
SN7418	.55	SN7457	.35	SN74109	.60	SN74110	1.25	SN74111	1.25
SN7419	.30	SN7458	.30	SN74112	1.25	SN74113	1.25	SN74114	1.25
SN7420	.30	SN7459	.30	SN74115	1.25	SN74116	1.25	SN74117	1.25
SN7421	.35	SN7460	.35	SN74118	1.25	SN74119	1.25	SN74120	1.25
SN7422	.35	SN7461	.35	SN74121	1.25	SN74122	.75	SN74123	1.20
SN7423	.37	SN7462	.35	SN74124	.50	SN74125	.50	SN74126	.50
SN7424	.30	SN7463	.30	SN74127	.75	SN74128	1.20	SN74129	.50
SN7425	.30	SN7464	.30	SN74129	.75	SN74130	.50	SN74131	.50
SN7426	.30	SN7465	.30	SN74131	.50	SN74132	.50	SN74133	.50
SN7427	.30	SN7466	.30	SN74133	.50	SN74134	.50	SN74135	.50
SN7428	.30	SN7467	.30	SN74135	.50	SN74136	.50	SN74137	.50
SN7429	.30	SN7468	.30	SN74137	.50	SN74138	.50	SN74139	.50
SN7430	.30	SN7469	.30	SN74139	.50	SN74140	.50	SN74141	.50
SN7431	.30	SN7470	.30	SN74140	.50	SN74141	.50	SN74142	.50
SN7432	.30	SN7471	.30	SN74141	.50	SN74142	.50	SN74143	.50
SN7433	.30	SN7472	.75	SN74142	.50	SN74143	.50	SN74144	.50
SN7434	.30	SN7473	.75	SN74143	.50	SN74144	.50	SN74145	.50
SN7435	.30	SN7474	.65	SN74144	.50	SN74145	.50	SN74146	.50
SN7436	.30	SN7475	1.30	SN74145	.50	SN74146	.50	SN74147	.50
SN7437	.60	SN7476	.75	SN74146	.50	SN74147	.50	SN74148	.50
		SN7477	.95	SN74147	.50	SN74148	.50	SN74149	.50
		SN7478	.75	SN74148	.50	SN74149	.50	SN74150	.50
		SN7479	.75	SN74149	.50	SN74150	.50	SN74151	.50

INTEGRATED CIRCUIT SOCKETS

Buy Any 3 - Take 10% Discount!

14-Pin, dual in line	\$45
16-Pin, dual in line	\$50
T-O-S, 8 or 10 pins	29



WIRE-WRAP INTEGRATED CIRCUIT SOCKETS

14-Pin 79c each
16-Pin 3 for \$2.00

NATIONAL 'OP' AMPS

BUY ANY 3 - TAKE 10%

LM-300	Super 723 V. reg.	\$1.49
LM-302	Hi-performance amp	1.49
LM-304	Voltage follower	1.49
LM-305	Neg. V. reg.	1.49
LM-306	Pos. V. reg.	1.49
LM-307	Super 741	1.49
LM-308	Super gain op amp	.89
LM-309H	SV 200 mil V. reg.	1.80
LM-309L	SV 1-amp V. reg.*	1.80
LM-311	Comparator	2.25
LM-320	Minus 5V 1-amp V.R.*	1.50
LM-320	Minus 15V 1-amp V.R.*	2.95
LM-350	Dual peripheral driver	2.95
LM-370	AGC squelch op amp	.59
LM-371	RF, IF, op amp	1.49
LM-373	AM, FM, SS, I-F strip	.69
LM-380	2-watt audio amplifier	3.75

*TO-3 case, — others TO-5

LINEAR Op Amps

FACTORY TESTED

531	Hi slow rate op-amp (TO-5)	\$2.50
532	Micro power 741 (TO-5)	2.50
533	Micro power 709 (TO-5)	2.50
536	FET input op amp (TO-5)	3.95
537	Precision 741 (TO-5)	2.50
540	OHV swr driver amp (TO-5)	2.04
550	Precision 723 voltage reg. (DIP)	1.17
555	Timer 2 uSeconds to 1-hr (A)	1.00
556	5 Times faster than 741C	2.80
558	Dual 741 (mini DIP)	.88
560	Phase lock loops (DIP)	3.25
561	Phase lock loops (DIP)	3.25
562	Phase lock loops (DIP)	3.25
565	Phase lock loops (A)	3.25
566	Function generator (A)	3.25
567	Tone generator (A)	3.25
595	Four quadrant multiplier	3.10
702C	10V DC amp (TO-5)	.44
703C	RF-IF, amp, 14 ckt (TO-5)	1.00
709C	Operational amp (A)	.44
709CV	Op amp (mini DIP)	.49
710C	Differential amp (A)	.44
711C	Dual diff. comp (A)	.44
722C	Voltage regulator	.44
741C	Freq. comp 709 (A)	.49
741CV	Freq. comp 709 (Mini DIP)	.49
747C	Dual 741C (A)	1.25
748C	Freq. adj. 741C (A)	.44
749C	Freq. adj. 741C (mini DIP)	.44
709-709	Dual 709C (DIP)	1.00
739-739	Dual stereo preamp	1.95
741-741	Dual 741C (A)	1.00
75450	Dual peripheral driver (DIP)	.69

Similar to Mostek 6011. Outperforms Texas Instrument TMS1802. A 40-pin DIP. Adds, multiplies, subtracts, and divides. Use with 7-segment readouts, Nixies, and LEDs. We include schematics, instructions to build calculator.

CT5008 Same with MEMORY **14.95**

NATIONAL EQUALS ON 'DIGITAL CLOCK on a CHIP'

*Money Back Guarantee! Any "Chip" with Spec Sheet! **\$12.88**

Mfrs #	Description	Sale
5311	28-pin, ceramic, any readout, 4-digits: A-B-D	\$12.88
5312	24-pin, ceramic, any readout, 4-digits: C-D	\$12.88
5313	28-pin, ceramic, any readout, 6-digits: A-C	\$12.88
5314	24-pin, plastic, LED and incandescent readouts, 8-digits: A-B	\$12.88

Code: A—Hold Count, C—1 PPS Output, B—Output Strobe, D—BCD

LED MITY DIGITS "DCM'S"

Digital Counting Modules **9.99**

INCLUDES P.C. EDGE CONNECTOR — FREE!

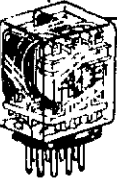
Will outperform any other DCM on the market today, not gaseous, not incandescent, but a device that will READ almost for life. MAN-4, Monsanto equal. Kit includes: 3 x 2" printed ckt board, with fingers top. Side-mounting sockets, MAN-4 resistors, 7448, 7476, 7490, booklet.

Potter & Brumfield KAP RELAYS

Excellent for "HAM" use as antenna switching, latching, transmit, receive, etc., and 100's of commercial or industrial uses. Includes plastic dust-cover with diagram and hookup info, 11-pin plug-in base. Contacts movable gold flashed silver, stationary overlay, with silver cadmium oxide movable. All contacts 10 amp 3PDT. Coil data, 5VAC 225 ohms, 17.5 ma, 12 VDC 21 ma, 18X ohms. Size: 2 1/4" x 1 1/16". Wt. 4 ozs. Center pin missing. Comar Mfg. type equal too. 3PDT

Your choice 3 for \$7.50 **\$2.98**

115 VAC 12 VDC



Term: add postage. Rates: net 30. Phone Orders: Wakefield, Mass. (617) 245-3829. Retail: 16-18 (at) Irl Carmine St., Wakefield, Mass. (off Water Street) C.O.D.'S MAY BE PHONED

15c CATALOG on Fiber Optics, 'IC's, Semi's. Parts

POLY PAKS

P.O. BOX 942M, LYNNFIELD, MASS. 01940



GREGORY ELECTRONICS
Reconditioned & Used
FM 2-WAY RADIO SAVINGS

Partial List—Send for New Catalog

The General Electric

Message Mate

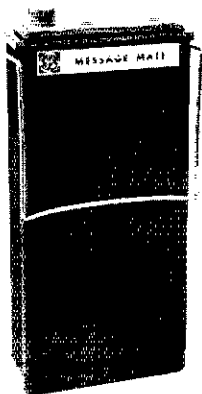
personal pocket
voice receiver
with sel-call

• Fully transistorized, 100% solid state for ultimate in reliability and performance.

• Selective signaling options for individual messages inside & outside of buildings.

Charger inc. with nickel-cadmium model. Ask about low band.

Lots of 5, less 10% . . ea. \$88.20
Lots of 10, less 15% . . ea. \$83.30



150-162 MHz, 162-174 MHz
Specify freq. with order

\$98.

less reeds



GREGORY ELECTRONICS CORP.

245 Rt. 46, Saddle Brook, N.J. 07662
Phone: (201) 489-9000

New hams in Maine are WA1RPN, WN1RSK. Congratulations, fellows. WA1OIT was selected as salutatorian of his Senior class. Traffic: K1IEV 23, K1GUP 13, W1CTR 3, W1AINMW 2.

NEW HAMPSHIRE - SCM, Robert C. Mitchell, W1SWX, SFC: K1RSC, RM: W1UBG. Another much needed OO is W1WQH. Welcome to more new hams: WA1RNQ, WN1RMS, WA1RPP, WN1RPG, WA1RPE, WA1ROT, WA1RSL, WA1RTF, WN1RRW, WA1RSA, WA1RSC and WN1RRU. RM W1UBG, tabulated monthly reports, keeps me well informed as to who's who in the CW Net. K1BCS keeps the BPLs rolling in. K1POV has a new Heath QRP rig and trying for WAS. W4GEQ has been checking into the NHVT Net. WA1FSZ, studying hard at UHH, took time out for the last VHF Contest. WA1JSD needs Wisc., W. Va. and Ky. for 10-meter WAS. W1UBG's report shows 132 check-ins and 93 traffic. Anyone needing a NH QTH with yags on 40 through 10 all above 100-ft., contact W7TML/1 - he will be going back to W7-Land before 1974. WA4CKI who attends Univ. of MIQT, from Squam Lake this summer. W1JSM reports nightly 2 meter activity down. W1SWX worked JY9FOC in Jordan for another 80-meter first. It is sad to report W1JLK is now a Silent Key. WN1RTX, ex-K1IYI is again back on the air. Traffic: W1UBG 119, K1POV 64, WA1MXT 50, WA1QGA 7, W1SWX 4, WA1JSD 3, K1YMH 3, W1DXB 2, W6MZW/1 1.

RHODE ISLAND - SCM, John E. Johnson, KIAAV - PAM: W1TXL. The Newport County RC had W1HDQ as guest speaker during May - topic was on "The World Above 50 MC." The W1AQ Club of Rumford is getting ready for field Day. The mobile generator was put under test by W1WAC and with a few minor adjustments was approved for FD. The W1OP Club of Providence is working on RTTY and FAX projects. WA1QQG recently received his General Class license. He is active on 80-meter cw and phone. He has several projects for his Antenna Farm. WN1POJ has a DX-60B and an SB-303. WN1RTX recently worked HA3GF and LU6EF. W1AM received the call XT2AM while he was in Africa visiting his son and completed over 1000 QSOs. Traffic: WN1POJ 99, WA1QQG 10, W1OP 4, WN1RTX 1.

VERMONT - SCM, James H. Viele, W1BRG - SFC: W1ZCJ.

Net	Freq.	Time (L)/Days	QNT	QTC	Mgr.
VTSH	3909	2200 M-S 1130 Su			W1ZCJ
VTPD	3909	2200 Su	88	43	K1BOB
Carrier	3932	1300 M-S	46	15	W2QWP
Green Mt.	3932	2100 M-S	483	16	W1LLZ
Vt. Phone	3932	1330 Su	82	0	W1KKM

Welcome new amateurs WN1RQP and WA1RTV. W1TFW4 has been on regular schedule with Vt. on 40 while vacationing in Pompano Beach. WA1REL has joined the 450 MHz gang. W1FUQ demonstrated SSTV at Burlington ARC meeting. W1OKH is running regular schedules with KC4AAD at Siple Station in Antarctica for friends and relatives of boys stationed there. Their 20-meter antenna is a sloping V beam 850-ft. on a leg! Traffic: K1BOB 143, WA2DGZ/1 33, WA1OOP/1 32.

WESTERN MASSACHUSETTS - SCM, Percy C. Noble, W1BVR - SFC: WA1DNB. CW RM: W1DVV. 75-Meter PAM: WA1TL. (OH/VHF) PAM: W1KZS. WA1DNB reports the Sun. morning WMEN (8:30 A.M. 3935) held 4 seasons with traffic of 15. Following are the total number attending from each West. Mass. Co.: Berkshire 17; Hampshire 17; Hampden 7; Worcester 3; Franklin 2 (with 15 from out of section). W1DVV reports WMN (7:00 P.M. daily on 3562) had QNT of 174 and traffic 114. WA1TL reports WMPN (4:30 P.M. 3935) had 232 QNT with traffic 27. W1TM is a new ORS. WA1MJE received the Public Service Award from ARRL. CMARA reports speaker of the month was W1HH. WA1FVX is Field Day chmn. R. Demers has donated a Novice rig to the club to be used as a loaner. New Novice licensees: WN1RMP, WN1RMO, WN1RMR, WN1RMU. New member WA1HFJ. HCRA says K1HYL is the instructor in ham radio at the Boy's Club. MARC reports speaker of the month was W4ZDC/1. NOBARC reports new members are K1BGF, K1DGA, W1FGV, WA2AHL, K2BUF, WA2RSP. I would like very much to receive reports of your station activities (you do not have to be a League member). If any of you think that your part of the section is being neglected, stop and think. Have you sent in anything for this column? Traffic: W1BVR 74, W1DVV 71, WA1LNF 66, W1TM 54, W1KK 34, WA1TL 22, W1STR 15, WA1DNB 14, WA1MJE 13, W1ZPB 13.

NORTHWESTERN DIVISION

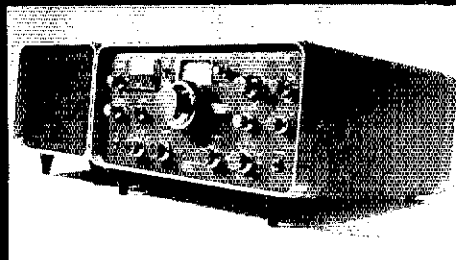
ALASKA - SCM, Kenneth R. Klopfi, K17EVO - 2-Meter repeater activity continues to flourish in Anchorage with re-grouping taking place in Fairbanks. K17CFX's trip to Juneau revealed an interest in a 2-meter repeater at the capital city. Local 2-meter operations are growing and Sitka, Kodiak and Adak enjoy

KW

The KW2000B
the transceiver
with 160 Meters

ELECTRONICS
LIMITED

\$699 with spkr
and AC pwr supply



NOW in the USA

KW Electronics

DIVISION OF SYSTEMS Inc

10 Peru St., Plattsburg, N.Y. 12901

GET TO THE TOP FAST!

NOW YOU CAN CHANGE, ADJUST OR JUST PLAIN WORK ON YOUR ANTENNA AND NEVER LEAVE THE GROUND!

ROHN manufactures towers that are designed and engineered to do specific jobs and that is why we have the FOLD-OVER TOWER . . . designed for the amateur.

When you need to "get at" your antenna just turn the handle and there it is. Like other ROHN big communication towers, they're hot dip galvanized **after** fabrication to provide a maintenance free long lived and attractive installation. ROHN towers are known and used throughout the world . . . for almost a quarter century . . . in most every type of operation. You'll be in good company. Why not check with your distributor today?



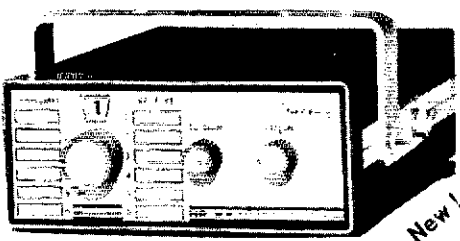
ROHN **MANUFACTURING**

DIVISION OF



P.O. Box 2000 / Peoria, Ill. 61601

SAVE \$50



Regency HR-2A 2m FM w/.94 xtals

Reg. \$229 - Now Only 179*

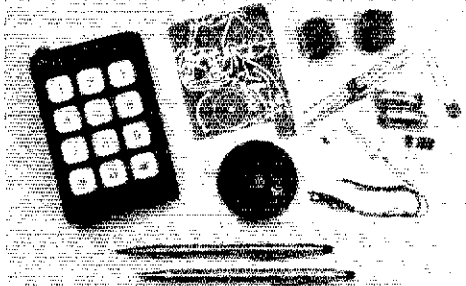
*Terms: Payment in Full with Order—No Trades.
Add \$5 for shipping. Extra xtals \$5 each.
P-109 ac supply \$45. AR-2 Amplifier \$119.

AMATEUR ELECTRONIC SUPPLY

4828 West Fond du Lac Avenue
Milwaukee, Wisconsin 53216
Phone (414) 442-4200

Branch Stores in Cleveland, Ohio
and Orlando, Florida

KEY YOUR REPEATER OR DIAL THROUGH ON A PHONE PATCH FROM YOUR MOBILE RIG



WITH OUR TOUCH TONE* GENERATOR KIT.

- Generates standard Touch Tone* frequencies
- Uses standard 9 V. battery
- Operates through internal speaker, external speaker or wired directly into your microphone circuit
- Only 2-3/4" X 4-1/4" X 1-3/8" - 8 ounces
- Attractive textured molded plastic case
- Assembles in 45 minutes
- Calibrates in 60 seconds (with frequency counter)

\$33.95 KIT \$53.95 ASSEMBLED AND TESTED

Add \$1.00 for postage and handling in U.S.A., \$3.00 foreign.
Allow 2 weeks for delivery.
SEND CHECK OR MONEY ORDER (NO C.O.D.'s) TO:

Interface Technology, Inc.
P.O. Box 24565, St. Louis, Missouri 63141

*Touch Tone is a registered trademark of the Bell System
(Missouri residents add 3% state sales tax)

the activity. 6-Meter usage is increasing in Anchorage and culminates in a repeater. The Anchorage ARC handled the 1981 Rendezvous communications for the Dog Races with more than 30 hams participating. Tragedy nearly shrouded the event when KL7HEK succumbed to CO poisoning shortly after a call for help responded to by KL7s HIU, HAC, GNW, WAØHVA, WA9HJZ and more. SPARK is the acronym of the new Kodiak club and they will provide communication for the King Crab Festival's 50 mile road race from Cape Chiniak to Kodiak City. KL7JDO indicates 7 meters and 2 meters will be used. WL7s HOO, HOP, HON and HIU used 80-meter ORP for their late Mar. Mt. Tusak and Spur Peak ski-mountaineering trip. Looks like more to come in this field with WL7HNP now pres. of the Alpine Club at the Univ. Great new flat will again be represented by Kathy who passed her General. KL7AG has turned out the following successes in his winter class: WL7s HOO, HOP, HON, HPD, HPE, HPJ, HPK, HPM, HPN with more coming. KL7FNM helped WL7HOL into our fraternity as you can hear on 3735 early in the morning. Don't forget to register your nets with ARRL CD so you will get in the directory. Traffic: 1MAY KL7HMU 34. (Feb.) KL7HMU 41.

IDAHO - SCM, Donald A. Crisp, W7ZNN - SEC: WA7EW. The FARM Net meets on 3935 kHz each day at 0200 GMT. The Idaho RACES Net meets on 3990.5 kHz week days at 1515 GMT. The Idaho/Mont. Net meets on 3583 kHz week days at 0230 GMT. W7JE spent 2 months vacationing in Italy. K7NHV, Contest Advisory Committee member, requests suggestions regarding the Sweepstakes Contest and definitions for the Operating Manual. The Lewiston-Clarkston Club is sponsoring a Novice course at Lewiston State College. Participation in the new Idaho-Mont. CW Net remains good but check-ins are needed from several cities. The annual WIM handtest is scheduled for early Aug. and promises to be bigger and better than ever. W7JUG is leading W7GHT in the CW County Hunters Contest and is now in first place in Idaho. IM Net reports 22 sessions, 120 check-ins, 31 traffic handled. IPO Net reports 2 sessions, 128 check-ins, 6 traffic handled. EARM Net reports 2 sessions, 728 check-ins, 31 traffic handled. Traffic: W7GHT 19, WA7BDD 115, WA7AXL 74, W7ZNN 20, W7LY 15, W7FHQ W7FIS 7, WA7FJC 7, K7NHV 5.

MONTANA - SCM, Harry A. Roylance, W7RZY - Asst. SEC: Bertha A. Roylance, K7CHA. SEC: W7TYN. PAM: WA7IZR. Hag note from K7VAT who is in Morocco and operating as CN8BO. I can be found around 14,205 MHz 1700 to 1800 daily and will happy to QSO with the Mont. gang. QSL to his home QT. WA7OBH has been appointed to the Mont. Highway Patrol academy. The Glacier Waterton Hamfest will be held at Sommers Mont. on July 20, 21 and 22. Be sure to attend for a real FB time. The Idaho-Mont.Net held 22 sessions with 120 check-ins and pieces of traffic handled. The Mont. Traffic Net had 1065 check-ins, 22 sessions and 45 pieces of traffic handled. Butte and Helena have been doing work on their repeaters. WA7MUU has been endorsed OBS. Traffic: WA7JOS 66, WA7KMP 22, W7LBK 14, WA7IZR, WA7MUU 2.

OREGON - SCM, Dale T. Justice, K7WWR - SEC: W7HURM: K7GGQ. PAM: K7RQZ. Net reports: WA7NWV reports for Beaver State Net sessions 62, traffic 98, check-ins 1142, contacts 171. W7FFE reports for the Nuclear Net 4 sessions, 31 check-ins. Net times (summer schedule):

BSN	3908 kHz	1900/0030Z
OSN	3585 kHz	0145Z
AREC	3993.5 kHz	0200Z
OEN	3980 kHz	0100/0200Z
Nuclear	82.5 MHz	1630Z
PON	3920 kHz	0130Z

WA7MHP reports his OBS schedule as follows: 2100 Sat. and Sun. and 0415Z Tue. on 3925 kHz. New appointment finds K7JKY Pendleton the EC for N.E. Ore. area. WA7MHP now on slow wave TV. Governor Tom McCall signed a proclamation declaring July 17-23 Amateur Radio Week in Ore. K7WWR, K7YQM, W7HUR, W7TMF, W7OBK and Senate President E.D. Potts were present at the sign-off. WA7OTZ on 2 meters from Madras. K7HSJ is using new JANET Lab. 2-meter converter with good results. Traffic (Mar.): K7ODF 195, K7QFG 194, K7NTS 140, W7ZB 134, K7R110, WA7TXV 99, W7DAN 67, WA7NWV 59, WA7BYP K7WWR 34, WA7MOK 17, W7LIT 13, WA7MHP 6, W7MLJ (Feb.) W7ZB 88, WA7MHP 10.

WASHINGTON - SCM, Arthur Henning, W7PI - SEC: W7UV. RM: K7OZA. PAMs: W7GVC, W7MCW. VHF PAMs: K7BE, K7LRD. New appointment: WA7TLY as EC Skagit Co.

Net	Freq.	Time(Z)	QNI	QTC	Sess.	M.
WSN	3590	0145	354	87	31	K7O
NSN	3700	0200	429	217	31	WA7O
NIN	3970	1840	1336	110	31	W7P

WHICH ANTENNA WINS THE CONTEST ?

In open competition against thousands of commercial and home-brew antennas, WA1JFG won the New England championship with a Gotham beam, by a margin of 5,982 points! WB2JAM won the sectional award for the Sweepstake contest in 1969 and 1970 with a Gotham 4-element 15-meter beam! Hundreds of unsolicited testimonials from grateful hams are our proof that Gotham antennas give you the best design, and the best materials. Forget our low prices — rely on the results of an open, competitive contest. Ask yourself: Why do Gotham antennas win?

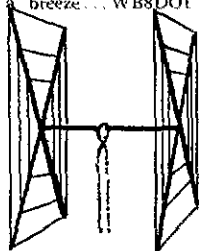
In QST since '53 without missing an issue!

QUADS

Totally satisfied with quad. Worked DK4VJP, SM7DJ, H, XE1AB, DM4SEE, FL8SR, F6AUM, HK7YB in few hours. Instructions a breeze... WB8DOI

CUBICAL QUAD ANTENNAS

— these two element beams have a full wavelength driven element and a reflector (the gain is equal to that of a three element beam and the directivity appears to us to be exceptional! ALL METAL (except the insulators) — absolutely no bamboo. Complete with boom, aluminum alloy spreaders; sturdy, universal-type beam mount; uses single 52 ohm coaxial feed; no stubs or matching devices needed; full instruction for the simple one-man assembly and installation are included; this is a fool-proof beam that always works with exceptional results. The cubical quad is the antenna used by the DX champs, and it will do a wonderful job for you!



10/15/20 CUBICAL QUAD SPECIFICATIONS

Elements: A full wavelength driven element and reflector for each band.

Frequencies: 14-14.4 Mc.; 21-21.45 Mc., 28-29.7 Mc.

Dimensions: About 16' square

Power Rating: 5 KW.

Operation Mode: All.

SWR: 1.05:1 at resonance.

Boom: 10' x 1 1/4" OD, 18 gauge steel, double plated, gold color.

Beam Mount: Square aluminum alloy plate, with four steel U-bolt assemblies. Will support 100 lbs.; universal polarization.

Radiating elements: Aluminum wire, tempered and plated, .064" diameter.

X Frameworks: Two 12' x 1" OD aluminum 'hi-strength' alloy tubing, with telescoping 3/8" OD tubing and dowel insulator. Plated hose clamps on telescoping sections.

Radiator Terminals: Cinch-Jones two-terminal fittings.

Feedline: (not furnished) Single 52 ohm coaxial cable.

Now check these startling prices — note that they are much lower than even the bamboo-type:

10-15-20 CUBICAL QUAD. \$41.00

10-15 CUBICAL QUAD. 36.00

15-20 CUBICAL QUAD. 38.00

TWENTY METER CUBICAL QUAD 31.00

FIFTEEN METER CUBICAL QUAD 30.00

TEN METER CUBICAL QUAD. 29.00

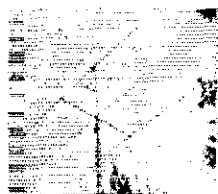
(all use single coax feedline)

BEAMS

"Just a note to let you know that as a Novice, your 3-EI. 15 Beam got me RI Section Winner and New England Division Leader in Novice Round-up. See June QST, p. 57 for picture of ant. (below). Tnx for a fine working piece of gear. 73s, Jay, WA1JFG"

Compare the performance, value, and price of the following beams and you will see that this offer is unprecedented in radio history! Each beam is brand new! full size (36' of tubing for each 20 meter element for instance); absolutely complete including a boom and all hardware; uses a single 52 or 72 ohm coaxial feedline; the SWR is 1:1; easily handles 5 KW; 3/4" and 1" aluminum alloy tubing is employed for maximum strength and low wind loading; all beams are adjustable to any frequency in the band.

- | | |
|----------------------|----------------------|
| 2 EI 20 \$25 | 4 EI 10 \$24 |
| 3 EI 20 31* | 7 EI 10 38* |
| 4 EI 20 38* | 4 EI 6 24 |
| 2 EI 15 21 | 8 EI 6 34* |
| 3 EI 15 25 | 12 EI 2 31* |
| 4 EI 15 31* | *20-ft. boom |
| 5 EI 15 34* | |



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, TI2FGS, 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 KZ51KN, KZ5OWN, HC1LC, PY5ASN, FG7XT, XE2I, KP4-AQL, SM5BGK, G2A0B, YV5CLK, OZ4H, and over a thousand other stations!

- V40 vertical for 40, 20, 15,
10, 6 meters \$18.95
- V80 vertical for 80, 75, 40,
20, 15, 10, 6 meters \$20.95
- V160 vertical for 160, 80, 75,
40, 20, 15, 10, 6 meters . . \$22.95

How to order: Send money order only (bank, store, or United States) in full. We ship immediately by REA Express, charges collect. DEALERS WRITE!

GOTHAM, 1805 Purdy Ave, Miami Beach, Fla. 33139

"CHOICE OF THE DX KINGS"



All models available "WIDE-SPACED"
2 ELEMENT—3 BAND KIT SPECIAL

- CONTENTS ONLY**
- 8 Fiberglass Arms—skyblue color
 - 2 End Spiders (1 pc. castings)
 - 1 Boom/Mast Coupler—h.d. aluminum
 - 16 Wraplock Spreader Arm Clamps
 - 1 CUBEX QUAD Instruction Manual
- \$79.95**
- Mailable APO Add \$8.50 for PPD Frt. Cont. U.S.

2-3-4 or more element Quads available
 Write for FREE BROCHURE and Price List

CUBEX COMPANY

P.O. Box 732, Altadena, California 91001
 Phone: (213) 798-8106

YOU CAN'T SAY "QUAD" BETTER THAN "CUBEX"

AREC 3930 1700(Su) 50 4 4 W7UW
 NWSSB 3945 0130 812 40 31 W7SV

Northwest Slow Speed Net (NSN) had one of its best months in traffic handling. Join in the fun on 3700 daily for cw traffic handling and meet the gang. Wenatchee Hamfest is June 9 and 10. The moment of truth for all the planning and work for Field Day is the week end June 23 and 24. WA7RCR has new crankup tilt tower to help him go places. W7EJU is on 2 meters with new Clegg FM 27B. W7IEU is very QRL setting up curriculum for course in traffic handling, network operation and emergency communications to public service. VIII PAM K7BBO after stay in hospital is again back on VHF and going great with Oscar 6 with 2700 QSOs, 40 States and 15 Countries! Mt. Baker ARC provided communications to March of Dimes Walkout. WA7EDQ while peddling his bicycle is now ready for come-what-may with his 2-meter rig in operation of the rumble seat. Radio Club of Tacoma's Hamfair '73 is Aug. 18 and 19. Boeing BEARS is a member of King County Search and Rescue Assn. with fully operational emergency station ready at all times for a call from the King County Police. The BEARS have been active since 1967 in this worthwhile endeavor. Traffic: (Mar.) W7PI 306, WA7OCV 124, W7APS 98, K7OZA 78, W7GYF 69, K7VAS 66, W7AXT 52, W7PWP 49, K7OKL 41, K7CTP 30, WA7RCR 28, W7BUN 21, W7IFY 20, WA7KNW 20, W7IEU 19, W7AIB 12, WA7SEL 11, W7OCV 9, W7BO 7, W7UWT 6, K7VNI 6, WA7IDC 5, W7YGU 5, WA7LOV 2, WA7GVB 1. (Feb.) WA7GVB 3.

PACIFIC DIVISION

EAST BAY - SCM, Paul J. Parker, WB6DHH - SEC: WB6RPK RMs: W6LPW and WA6DIL. There is a new code class for Novices meeting daily on 3840 kHz at U630 A.M. and runs for half an hour. This is really slow speed stuff and it is advisable for new prospective Novices who have receivers and can wake up that early. K6RAU doing the honors. Congratulations to a new General in the section WA6QFU. WA6CXK has a new R4C74XC and made 520,000 points in the last ARRL DX CW Contest. Congratulations! For the folks in Vallejo, there is a new ham club which meets on the 1st and possibly the 3rd Wed. at 7:30 P.M. local time at the Elms Widenmann School, corner of Whitney and Mint in Vallejo. WA6FDB, pres.; WA6PQC, vice-pres.; WB6BTN, secy-treas. I am thrilled to report I had four (4) club papers sent in this month from Oakland Radio Club, East Bay Radio Club, C.C.R.C., and the Grizzly Peak VHF ARC. I want to thank one and all for this superb effort, it sure does help to see what others are doing. All those interested in emergency communications are urged to get in touch with SEC WB6RPK and find out how you can help in case of an emergency. Traffic: (Mar.) W6LPW 326, WB6VEW 12, WA6CXK 6 (Feb.) WB6VEW 16.

HAWAII - SCM, Lee R. Wical, KH6BZI - SEC: KH6BZF. RM: KH6AD. PAM: KH6GJN. VHF PAM: KH6GRU. SRC: KH6FOJ. OSI Mgr.: KH6DQ.

Net	MHz	Time(Z)/Days
Friendly	7.290	2030 M-1
Confusion (Patches)	21.400	0000 All
Pacific Interland	14.305	0800 All
S.E. Asia	14.320	1230 All
Marine Corps	21.430	1900 All
Hey Bruddah	21.295	2000 S/Su

I regret to report WBNEI/KH6 as a Silent Key. Ex-KC6RS now signing WA6AVS/KG6 and active on Pacific Interland Net. KH6HIZ, QSYs to Hq. Defense Communications Agency, Wash D.C. promoted to Asst. Dep. Director Operations. Best of luck to the new promotion. We'll miss those DXing talks at DCA-PAC. KH6IAC is a new AREC member. WB0EIZ/KH6 active mobiling (2) meters. KH6GCU corrects me that those 116 (now 119) DXCC at 35 zones were all worked with a wire hanging from his balcony at a counterpois on the lanai! Ex-KH6FNV now signing WB9CW wishes to be remembered to all. KH6GJC has QSY'd from Hark Kaneohe to L.A. to represent Collins Radio from the KP4DMZ/KH6 works at Ft. Ops Wheeler AFB and is active on meters. KH6AK reports he's active and well on Molokai. Now that the Fresno DX bash is over all those KH6ers are back at the shack. Send reports to me NLI the 1st each month. Traff KH6BZF/M/KH6 9, KH6CU 1.

NEVADA - SCM, Harold P. Leary, K7ZOK - SEC: WA7BE W7OK is new EC for City of Las Vegas. W6OAE is back in 1 Vegas. Congratulations to YL WA7STD on receiving Advanced CI license. WA7ESM is rehabilitating shack. WA7DSP has new 300-C Las Vegas RAC will have a booth at Youth fair in city demonstration purposes. About 80 persons attended LVRC picnic at Valley of Fire Park on Mar. 18. WA7IYY has General. K7ICV running EME schedules on 220 MHz with VK3ATN. W7HP on working many 2-meter stations in S. Cal. Nev. State RACES Phr Net meets Mon. at 1900 local time. CW Net Mon. at 1930 local 3996.5 and 3504.5 kHz respectively. Welcome to the Las Ve

CQ de W2KUW

WANTED FOR CASH

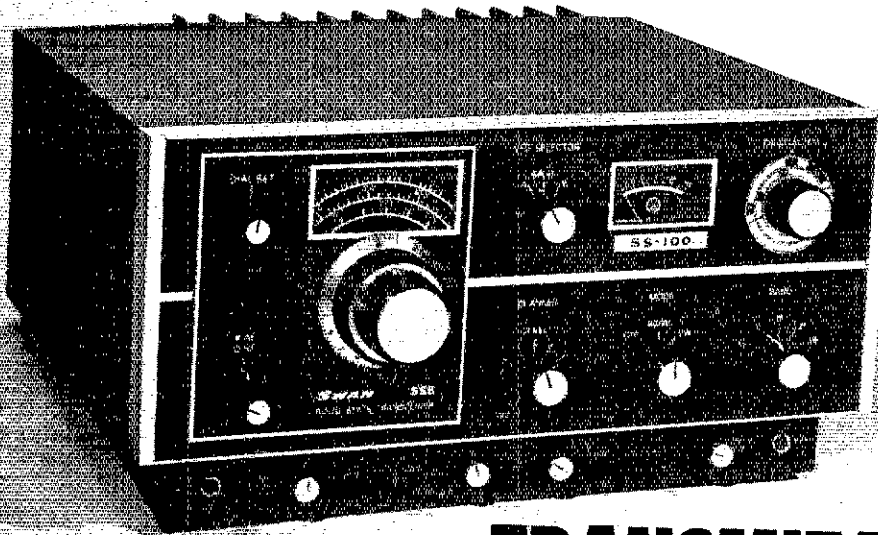
HP612, ARC 51's, Eimac/Varian Tubes 618T3 T/R, 304TL tubes, 490T Antenna Tuners, Collins 51RV 51S1 51V4 51Y4 51Z4 621A 728 860E SG2 479 618M, or any other Collins item.

Spring Specials For Sale

Collins 618T Transceiver	895.00
Tektronics 504	295.00
Tektronics RM 31A/dual trace	395.00
Tektronics CA dual trace plug-in	95.00
Tektronix 551 with power supply	395.00
Tektronix 555 with power supply	495.00
Tektronix 105	45.00
Tektronix 130LC	145.00
Tektronix 181A	65.00
Tektronix 190A	95.00
Tektronix 535A	495.00
Tektronix 545A	645.00
Tektronix 575	495.00
Tektronix 585A	695.00
HP175A	250.00
HP185B with dual trace	250.00
Boonton BRC Q-Meter 190A	350.00
R389	350.00
R390 plain new	395.00
R390A excellent, overhauled	585.00
R390A new	950.00
SP600JK	225.00
Teletype Model 28KSR excellent	250.00

(This is a partial listing of hundreds of test items available. Write for specific requirements)
 We will buy for cash any tube, transceiver, receiver, or test gear at 5% over prevailing market price.

The Ted Dames Company
 308 Hickory Street Arlington, N.J. 07032
 (201) 998-4246 Nites (201) 998-6475



TRANSMIT THE CLEANEST SIGNAL ON THE AIR

... with a New SWAN Fully Solid-State Transceiver!

You'll appreciate the comments about your signal. You'll get outstanding reports on your readability, strength and tone. Be a proud owner of a truly reliable all solid-state rig... at a price you can afford!

SWAN ELECTRONICS offers you superb craftsmanship you can see, feel, and hear. Inside, these units are uniquely designed. Progressive, proven engineering state-of-the-art techniques are enriched by the most practical advanced components available. Externally, Swan has designed these new transceivers to be appreciated by every ham, and the XYL, because it was hams who told us what they wanted. It's all here... up-to-the-minute in styling and convenience... easy to operate.

ENJOY CLEAR, CLEAN TRANSMISSIONS — The finest quality on the air. Signals are strong, stable and easy to read. Select from your choice of 3 models:

**80-10 Meters, SSB, CW,
VOX, NOISE BLANKER and
a whole lot more!!**

- SWAN SS-15 (15 Watts P.E.P.) \$579.00
- SWAN SS-100 (100 Watts P.E.P.) \$699.00
- SWAN SS-200 (200 Watts P.E.P.) \$779.00

ACCESSORIES INCLUDE:

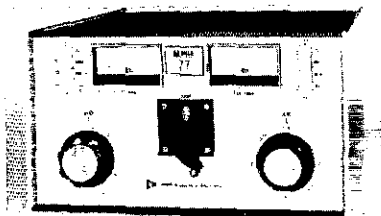
- SWAN PS-10 (115V AC power supply for SS-15/SS-100) \$ 89.00
- SWAN PS-20 (115V AC power supply for SS-200/SS-100/SS-15) \$139.00
- SWAN SS-1200 (1200 Watt P.E.P., tube type, Linear Amplifier) \$299.00
- SWAN SS-208 (External VFO) \$159.00
- SWAN SS-16B (Super Selective Filter) \$ 79.95
- SWAN 610X (Crystal Controlled Oscillator) \$ 53.95

Just 10% down is all that is needed, if you use your Swan Credit Service account, to put an all-solid-state rig in your ham shack. Why wait? Order yours now!!



305 Airport Road • Oceanside, CA 92054 • Phone (714) 757-7525

ALPHA 77



Featuring the new Giant from Eimac, the 8877, with 1500 watts of plate dissipation: \$1495.

Warranty: One Year
Power Supply - Two Years

Phone/write DON PAYNE, K4ID for a brochure, and a King-Size trade on your gear.

Days (615) 384-5573
Nites (615) 384-5643

PAYNE RADIO

Box 525
Springfield, Tenn. 37172

CRYSTAL BARGAINS

Depend on . . .

We supply crystals from 16KHz to 100MHz. Over 6 million crystals in stock.

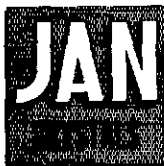
SPECIAL

Crystals for most amateur 2-Meter F.M. Transceivers:

\$3.75 Each

Inquire about quantity prices. Order direct. Send check or money order.

For first class mail add 15¢ per crystal...for airmail add 20¢ ea.



DIVISION OF BOB
WHAN & SON
ELECTRONICS, INC.

2400 Crystal Dr.
Fort Myers
Florida 33901
(813) 936-2397

Send 10¢ for new catalog with oscillator circuits and lists of thousands of frequencies in stock.

SPECIALS! CRYSTALS FOR:

Frequency Standards	
100 KHz (HC13/U)	4.50
1000 KHz (HC8/U)	4.50
Almost All CB Sets, Trans. or Rec. (CB Synthesizer Crystal on request)	2.50
Any Amateur Band in FT-243 (Except 80 meters)	1.50
80 Meter Range in FT-243	4 for 5.00
Color TV 3579.545 KHz (wire leads)	2.50
	1.50
	4 for 5.00

area, W8WWT. Las Vegas Club interested in procuring a box type trader for use in ed work. WA7MKI, WA7GWP and W7GAM teaching code and theory for Novices and others at Nellis AFB. Send reports by 1st. Traffic: W7LX 67.

SACRAMENTO VALLEY - SCM, John F. Minke, III, W6KYA SEC: W6SMU. ECs: WA6PCL, K6QJL. ORS: K6KWN, W6NKR, K6YZU. OCs: K6GGG, W6HLL, WA6JVD. OVS: W6BKO. K6YZU reports the passing of W6JDN on Mar. 31. Hal was former SCM of Sacramento Valley and past Vice-Director under W6HC. New officers of North Hills RC are K6QCV, pres.; WA6IBJ, vice-pres.; W6RWZ, treas.; WA6SNY, secy. W6CWX has been transferred from the Sacramento area to the Canal Zone and will be looking for stateside contacts. K6HTM, pres. of the GFARS up at Chico, was the first W/K to work 151A on ssb on the recent Spratly DXpedition. The Sacramento ARC appears to be the oldest club in the section, being founded in 1915. The call, W6AK, was adopted in 1962, which belonged to Loyal Meaders, who founded the club. W6MDP is working with an on-the-air ministry for Christ. Now here is a positive activity for amateur radio. This is my final report as your SCM after eight years. I have enjoyed being your SCM, and have received a lot of personal growth from it. Thanks to all of you who supported me and invited me to visit your clubs. Please continue to support your SCM, WA6JVD, address page 6 OST. Warmest regards and 73. May God bless you all! Traffic: WA6JVD 62, WN6RDA 33, WN6UFM 12, K6YZU 8.

SAN FRANCISCO - SCM, Tom Gallagher, W6NUT - W6GGR has completed the design and construction of a TTL digital frequency counter. Congratulations to OO W6RQ who again made the Frequency Measuring Test Honor Roll. Al holds the record for Honor Roll listings. In his "spare" time he edits the W6FDT Newsletter of the Geo. Ladd Pioneer Radio Club, WA6BYZ, our SF section traffic whiz, spent many hours at the Nicaraguan Communications Center processing inquiry messages which he later originated on the nets. CW proved particularly useful for the Spanish language texts. Pacific Division Asst. Director and ORS W6BIP received a letter of commendation from the Hon. Joseph Alioto, Mayor of San Francisco, for his liaison work in involving the Bay Area amateurs in the Nicaraguan traffic handling. The recent Fresno DX Convention was almost a League function with former SF SCMs W6BIP and WA6AUD in attendance along with WA6JVD SCM of SV, W6JPU long time SCM of SV, Directors W6ZRJ, W6KW and W1QV and the inimitable W1CIP of Hq. This column is dependent on all members of this section for news. Let us hear from you. Please mail reports for arrival before the 7th of the month. Traffic: W6RNL 74, W6WLV 64.

SAN JOAQUIN VALLEY - SCM, Ralph Saroyan, W6JPU - W6GOSH was injured while working on his farm, digging a hole to bury an old standpipe, suffered a broken hip, and other injuries when the standpipe fell on him. He was carrying his "walkie-talkie" in a hip pocket, radioed for help, and was answered on 34-94 repeater by W6FJJ, W6KIX, WA6PRU, with assists from W6FIR and others, rushed out to the farm and helped dig him out. He owes his life to amateur radio, and for the quick response. The repeater is in operation at all times. W6GOSH also passed his Extra Class license exam. The No. Cal. and So. Cal. DX clubs held their annual DX meeting in Fresno on Apr. 7-8, 1973 with approximately 325 in attendance. K6RPH, W6KOE, W6GRV, W6PSQ, W6OWL, K6OPE, K6KJ, W6ZRJ, W6VZT, W6YQ, W6FAP, W6KUT, W6HYG, W6JPU and others attended. Darlene, HC2YL and her husband HC2OM were also visitors. W6JPS reports his NCX-3 Ser. #48-7451 was stolen. WA6CPP working for his OXCC. New officers for the Kern Co. Amateur Radio Club are: WA6IVC, pres.; K6GHI vice-pres.; WN6LMX, treas.; WA6DLA, secy. Traffic: WA6SCE 107, WA6JDB 33, WN6RXI 2R, WA6CPP 3.

SANTA CLARA VALLEY - SCM, James A. Hauser, WA6LF. SEC: WA6KXB. RMS: W6BYB. W6RFT. W6PAA, report antennas about up. W6MMG reports that WN6FPV now is a new cadet at Pensacola. WA6GGB reports activity in contests. W6FZ reports installing a 432 MHz station at KH6BZF. W6JNN is no Net Control on the Santa Clara Valley Section Net. W6IQU out of hospital but still convalescing. W6BYB reports NCN had 555 QN and 309 messages handled in Mar. W6KZJ will have new linear c the air also is preparing for Field Day. W6BMXI active on NCT. W6G6FJ is RO of recently formed Electronics Museum Radio Club meetings held at 7:30 P.M. of the 3rd Mon. at the Poothill College Electronics Museum. W6OAT reports he operated KV4HW in the c portion of the ARRL DX Contest. SCV Nets: NCN, NTS, 36: kHz, 1900 and 2030 daily; SCV, AREC, 346 MHz, 2000 TU. SPACS AREC, 146 MHz, 1945 Mnn.; Gorilla AREC, K6QO/WB6ZSH repeater, input 146.25 MHz output 146.85. SU Bulletin schedule: W6KHK, Tue, 0700, 7020 kHz; Tue, 073 7155 kHz; Wed., 0700, 3520 kHz. W6ZRJ: Thur., 1930, 3590 at 7129 kHz, 2030, 3815 kHz SSB, 2100, 3615 kHz RTTY. T

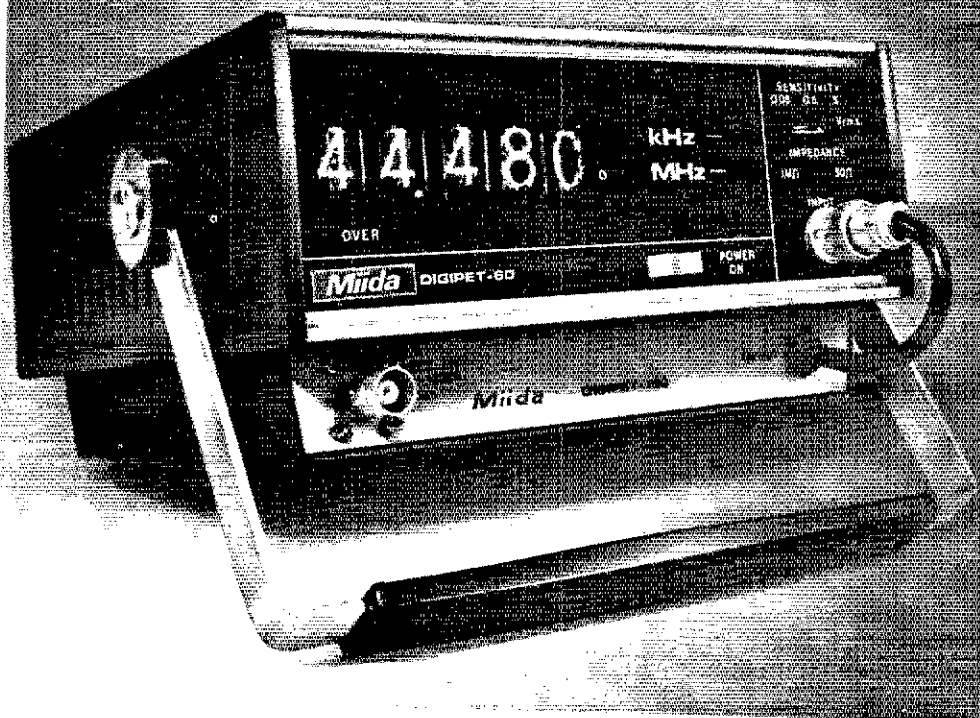
Digipet-60 Frequency Counter 1 KHz-60 MHz

(130-160 MHz with optional converter)

only \$299

A frequency counter with a range of 1 KHz to 60 MHz (or 130-160 MHz when used with our Digipet-160 converter). With a resolution of 1 KHz or 1 Hz (at 1 ms. or 1 s. gate times). It can be operated on either AC or DC, with complete overload protection. Plus a stability aging rate of 1 part in 10^6 / week. And the whole unit is a mere 7" deep by 2 1/2" high! In other words, a fine piece of equipment at a terrific price: \$299. From one of the most respected names in electronics, no less. For further information, contact: Miida Electronics, a division of Marubeni America Corp., 2 Hammarckjold Plaza, New York, N.Y. 10017. Phone: (212) 373-7152.

Miida



400% MORE AVERAGE SSB POWER OUTPUT

USE A **MAGNUM SIX**
THE QUALITY R F SPEECH PROCESSOR



Collins-Heath.....\$139.95
Drake TX-14XB.....\$154.95
Drake TR3/TR4.....\$159.95
Yaesu.....\$139.95
Kenwood.....\$139.95
Add 5% Tax in Washington

- 4 TIMES THE SSB POWER ON ALL BANDS
- ADDED PUNCH FOR FILE-UPS
- EXCELLENT VOICE QUALITY
- SPLATTER FREE, NARROW BAND OUTPUT SIGNAL
- SOLID STATE DESIGN
- PUT YOUR TRANSMITTER TO WORK FOR THE FIRST TIME IN ITS LIFE. POWER UP WITH A MAGNUM SIX FOR MORE ADDED POWER PER \$ THAN ANY OTHER METHOD!

Send for FREE Brochure
Communication Technology Group
31218 Pacific Highway South
Federal Way, Washington 98002



A Division of Bittell Systems Inc.

Pacific Division Convention will be held this year on the 13th & 14th of Oct. at the Dream Inn in Santa Cruz. Please reserve the week end, will see you there. Traffic: W6RSY 420, W6YBV 1, W6KVB 126, W6KZJ 83, W6RFF 69, W6DEF 50, W6GMXI 5, W6AUC 16, W6AHAD 16, W6G6FJ 3, W6OAT 3.

ROANOKE DIVISION

NORTH CAROLINA -- SCM, Chuck Brydges, W4WXZ -- SE W4EYN. PAM: WB4JMG. VHF PAM: K4GHR. RM: WB4ET. WB4VBM. June is FD month and Amateur Radio Week in N.C. the week running into FD. Plan some local activities to publicize the hobby. The Mecklenburg ARS Hamfest in Charlotte approximately 600 and the flea market was busy. W4WCG worked in Daytime NTS and is new OPS. W4VTR on 2-1m and reactivated some hf as well. The Alamance ARC now incorporated with K4J as their call and new officers WB4JPP, pres.; WA4FFW, vice-pres; WB4VHB, secy-treas.; WN4ZLN, club eng. All ECs be sure to see reports to W4EYN for his monthly SEC report to Hq. The Salisbury repeater now WR4AAA under the new repeater licensing criteria and others are filing for new status. The Buncombe County ARS and the Alamance ARC drew up new constitutions. WB4RPG is new General. EC WA4LYB reports the Pasquotank Co. crew active on a new club forming in Tarboro with WA4UQC, ex-SCM and Asst. Dir. a member. New EC for Fayetteville/Cumberland Co. is W4EJ and many thanks to WB4MTG for his past efforts in this area. The Winston-Salem repeater WB4QGE now on 04/64. WA4FFW works both modes of the Jan. CD Party. The Daytime National Traffic System Continental Net is on 14313 kHz at 1830 GMT and D4R (for the fourth district) is on 7235 kHz at 2100 GMT. Contact D4RN Mgr. WB4PNY if you need more details. Traffic: (Mar.) W4EYN 121, WB4OZL/4 92, WA8YDJ/4 79, K4MC 51, W4W 48, W4WCG 40, WB4VVP 35, K4EZH 27, W4OFO 25, K4TTN 1, WB4UOU 13, K4VBC 12, WB4CES 10, WB4JMG 10, WB4HDS 1, W4AJT 6, WA4JCS 6, WB4RHJ 5, W4VTR 5. (Feb.) WB4OXT 1, W4ACY 15, WB4VVP 15, K4GHR 14.

SOUTH CAROLINA -- SCM, Joseph Rubin, WB4CBJ -- SE WA4ECI. PAM: WB4KNE. RM: K4LND. New appointment WA4LPX. WB4SYJ and WB4RTU ECs. Endorsements: W4PED and W4NTO as ORS. More appointments are being processed & mailed.

Net	Freq.	Time(Z)/Days	M.
SCSSB	3915	0000 Dy	WB4K
CN	3873	0000/0300	WB4VBM/WB4E
SCNN	3718	0000 Dy	WN4E

Repeaters: WB4PLN Columbia 146.34/146.94 B1800, WB4Q Greenville 146.34/146.94 B2400, North Augusta-Belvedere RA Club building repeater for 146.13/146.73 COR. ERP will be watts. Attending Mar. 4 joint meeting of the AREC/SCSSB were WA4E, W4PED, K4FRX, K4LND, WB4BZA, WB4C, WB4KNE, WB4KTY, WB4PRO, WB4SYJ, WB4ROI, WB4R, WB4VZN and W4MTK. Discussion of net procedures reviewed presentation of emergency communications by WA4ECI. K4I ordered 9 two meter units for Union County RACES. K4I reports ten meter net going in Spartanburg area using converted rigs. Nice going fellows! Traffic: (Mar.) K4LND 112, W4AKC WB4OBZ 57, W4NTO 44, K4NJS 17, WA4LPX 10. (Feb.) WB4I 19, WA4LPX 6.

VIRGINIA -- SCM, Robert I. Slagle, K4GR -- Asst. SCM: Martin, Jr., W4THV. SEC: WA4PBG. Asst. SEC: WA4JF. F W4HIR, W4SQQ, K0PIV/4. W4SHJ, WB4PNY. PAM: WB4R WB4FDT had a good eyeball session in Norva this month. WB4I appointed Va. Teenager. W4KX still goofing off "hamwise". XY WB4OXD has opinions on where antenna should go. WB4GM mobile. W4TZC lost mobile antenna at car wash. W4DM contested. W5VZ/4 busy on all cw nets. K4JM reports contest activity. W4KAO has 2-meter fm on order, as does K0PI WB4MK says it was a bad month on 40. WB4RDV crystallized on 31/91 and 39/97. WA4YRH and WB4RZW passed Advanced. L of WB4PWP held up for lack of a few parts. Counties: WA4 3045, W4JUN 2832 (in addition Charlie reports almost 600 confirmed?) VSRN QTC 292, QNL 1099. Director W4KFC is contests and busy attending meetings. Begin to get ready for Convention up here in Reston in Sept. WB4YIL looking for ssb think most everybody knows, but just in case -- the hon WA4JF was totally destroyed by fire; fortunately they were at the time. School keeping W4TJN busy. W4YZC recovered flu. Traffic: (Mar.) K4KNP 426, K0PIV/4 194, WB4PNY W4HIR 147, K4IAF 128, W8VDA/4 128, WB4KIT 109, W5V 107, W4KFC 103, W4YZC 72, WB4RZW 71, K4GR 69, K4 52, W4TJN 46, WB4YIL 45, K4KA 42, WA4PBG 40, K4EB WB4RDV 33, W4FOV 32, WB4FDT 25, W4TJC 17, WB4OX W4MK 8, WA4WOG 8, W4KAO 7, WA4OLN 7, WB4GI WB4PWP 4, K4JM 3, W4TE 2, WB4WTK 1. (Feb.) WB4PWP 1.

HAM RADIO CENTER

Announces!



NOW: Call your order in, and we'll pick up the tab for the phone call. (Minimum order \$25.00)
HOW: Place station to station call. When phone bill is received, forward copy along with our invoice covering order phoned in, we'll send refund check. DO NOT CALL COLLECT.

**COMPLETE STOCKS ALL NATIONAL BRANDS
WE BUY-SELL-TRADE USED EQUIPMENT**

Write to Bill Du Bord, W0KF
for Trade-in Quote & Used List

HAM RADIO CENTER, INC.
8342 Olive Bl., St. Louis, Mo. 63132
Phone (314) 993-6060

A New Star In The Sky

The System I Yagi Antenna gives full coverage of 20, 15, and 10 meters.

- Monoband performance over complete 20, 15, and 10 meter bands.
- Phone and CW coverage of all bands without adjustments.
- Constant high gain and low VSWR across each band.
- Single coaxial feedline.
- Maximum legal power rating.
- High-quality, low loss traps.
- Ruggedly constructed for severe weather conditions.
- Easy installation with all necessary hardware.

All of these features and performance in a single antenna at only \$159.95 comes to you from Weinschel Engineering—a worldwide leader in the design and manufacturer of precision microwave components and instruments for over 20 years. It is our expertise in the microwave field that lead to the development of the System 1 "No Compromise" Yagi Antenna.

See QST, December 1972, page 41



WEINSCHTEL ENGINEERING

Gaithersburg, Maryland 20760 • Tel: (301) 948-3434 • TWX: 710-828-9705

Tomorrow's Antenna Technology Today

Gentleman: _____ (Send to: Dept. A)

Please ship one System I antenna (freight collect). Enclosed is a check for \$159.95.

Ship via _____

Please send detailed literature on System I.

Name _____

Address _____

City _____

State _____ Zip _____

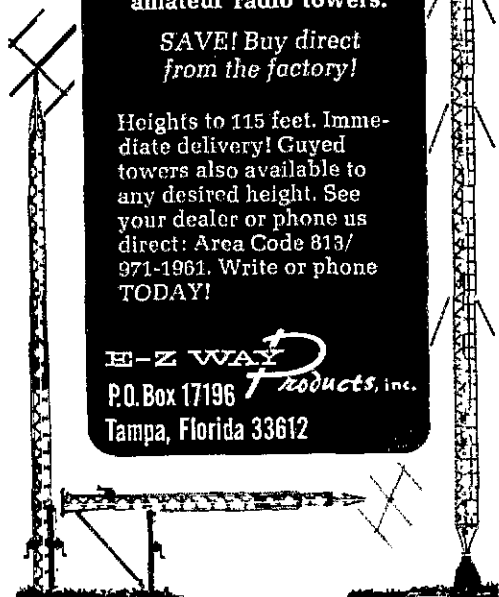
**AMERICA'S FINEST
telescoping, tilt-over
amateur radio towers.**

**SAVE! Buy direct
from the factory!**

Heights to 115 feet. Immediate delivery! Guyed towers also available to any desired height. See your dealer or phone us direct: Area Code 813/971-1961. Write or phone TODAY!

E-Z WAY
P.O. Box 17196
Tampa, Florida 33612

Products, inc.



UPC

Unique

WIRE TUNER

RANDOM WIRE ANTENNA TUNER

All band operation (80-10) with any wire over quarter wavelength. Absolute 1:1 SWR. Full amateur legal power. Turn counting dial on rotary inductor for exact resetability. Ideal for portable or field day operation.

- ALL BAND OPERATION
 - UNITY STANDING WAVE RATIO
 - IDEAL FOR PORTABLE
 - COMPACT, 5" x 6 1/2" x 10"
 - FULL YEAR MONEYBACK GUARANTEE
- SOLD FACTORY DIRECT ONLY — \$69.00
W6's add 5% California sales tax. Send check or money order (\$15.00 deposit on C.O.D.'s)

Price F.O.B. factory.

to: **Unique PRODUCTS COMPANY**

1003 SOUTH FIRCREFT STREET
WEST COVINA, CALIFORNIA 91791
TEL. 213-331-2430

WEST VIRGINIA - SCM, Donald B. Morris, W8JM - SEC, W8BNDY. PAMS: W8DUW, W8IYD, K8CHW. RM: W8BBG. CW Net Mgr.: W8CYB. Phone Net Mgr.: W8BMV. Steelworkers ARC of Weirton, code and theory classes resulted in, W8PAH, W8PAJ, W8PAJ, W8PAK, W8PAL, W8PAM and W8COP attendees for review. Other new Novices are W8PAV and W8PBI. I would like to hear from each of you. Morgantown ARC meets twice a month, with the big project, the new 19-79 repeater. WVN Phon Net in 29 sessions with 354 stations, passed 98 messages. New summer time for the net 6:30 P.M. DST. W8UUY received Phon DXCC and has 15 states and 2 countries through Oscar VI. His father upgraded from Novice to W8LHZ. W8JWX, W8SHI and W8HZA holding the CW Net together and along with W88CY would like to see more stations in the WVN CW Net. Opequeo Radio Society of Martinsburg, with W88FKG, pres. and K8QYC editor publishes newsletter. W8NPY as OD, submits reports regularly. QCWA held spring dinner meeting, Huntington, with W8IT and W8AEB as hosts. Everything ready for the 15th Annual West Va. State ARRL Convention at Jackson's Mill, June 30, July 1. W8DUV, general chmn. Traffic: W8JWX 36, K8QEW 18, W88BM 17, W8JM 14, W8HZA 11, W8YCD 11, W88EK 9, W8GVX 6, W88NDY 6, W8CUL 5, W8AEC 4, W8GDP 4, W8BBG 4, W88HS 2, W8DUV 2, W88KJ 2, W8NTHX 2, W8TWR 2, W8RWCK 2, W8CKX 1, W88DXF 1, W8FRO 1, W8LFU 1, W8LW 1, K8ZDY 1, K8ZPR 1.

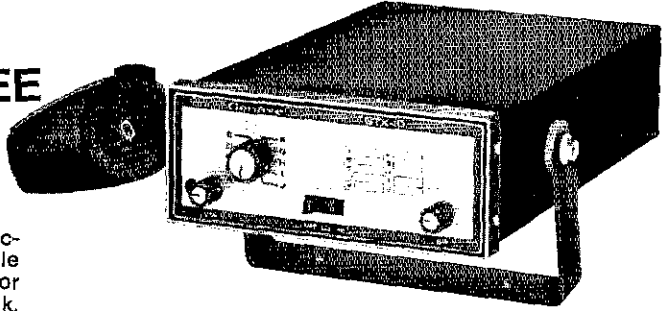
ROCKY MOUNTAIN DIVISION

COLORADO - SCM, Clyde O. Penney, WA0HLQ - SEC, K0FLQ. RM: K0OTH. PAMS: K0CNV, W0LRW, WA0WYP. Congratulations to W0IWLW who, with K0OTH, serviced a message booth at his high school science fair exhibit on Apr. 8. All messages were handled to the NTS. W0NQO reports having 450 QSOs via Oscar VI, including 7 countries, and has received the first Oscar 1000 award in the Colo. section. WA0SZW received his Advance Class license and is working on his Extra Class. W0ISR has just received her license, and now is wrestling with her OM, W0DGI, to use of the rig. In a cooperative effort among local radio clubs including the local CRS organizations, an excellent service operation was rendered by all involved, in providing communications for local "March of Dimes Walkathon", lasting from 7 A.M. to 5 P.M. on Apr. 1, 1973. Net traffic for Mar.: Columbine QNI 1146, QT 207, Informals 70, 24 sessions. CCN QNI 367, OTC 145, 3 sessions. SSN QNI 460, QIC 165, informals 40, 31 sessions, 85 minutes. Traffic: W0WYX 1068, K0ZSO 800, W0AXW 20, W0LQ 151, W0LRN 142, K0OTH 125, W0BSZ 114, W0HCK 8, W0IW 72, W2TPV/0 71, WA0SIG 51, WA0ZPP 30, K0SPR 2, WA0YCI 22, WA0TMA 21, WA0NEO 18, W0NZL 16, W0BY 1, W0HBT 15, W0GAQ 13, W0OY 12, K0JSP 11, W0LAF 1, K0FLO 10, W0IRW 10, W0SIN 10, K0CNV 7, W0NQO 4, K0PH 4, WA0HLQ 3, W0ONK 3. (Feb.) W0WYX 942.

NEW MEXICO - SCM, James R. Prime, WSNUJ - Roadrunner Net 3940 kHz 0100Z 22 sessions, QNI 612, OTC 71, QST 16. K WSUH has re-established the New Mexico Net on 3570 kHz 014 and is doing a fine job. Additional stations are always welcome to participate. EX-WA5TWA now back in Lovington with new call W5ENI. A new SEC is desired who will actively represent the entire section; volunteers and nominations are solicited. Traffic: K5ML 264, W5BHN 191, WSUH 137, W5MYM 97, W5YO 57, W5PH 37, W5DAD 28, W5DMG 19, WA5OH 19, W5BWW 8, W5ASMLY

UTAH - SCM, John H. Sampson, Jr., W7OCX - SEC: W7GK km: K7HLR. BUN daily at 1930 GMT on 7272 kHz had 10 check-ins, 35 messages; UCN daily at 0230Z on 3575 kHz, 3 check-ins, 92 messages. The new Daytime Traffic Net needs check-ins from this section. W7GPN gave a demonstration amateur radio to a group of Eagle Scouts. W7EU conducted demonstration and discussion amateur TV to a state meeting Army MARS. New MARS members are K7ZOF and K7Z W7OCX received the MARS Operator of the Month award. W7 named honorary director of the VHF Society in recognition of work with vhf. W7UTM most active on cw traffic nets. All area state were subjected to the ravages of winter. Heavy snow and wind took down many a ham antenna. W7HKC getting from under it all! A new YL in Cedar City is WA7VIN, XYI WA7GTU. A new ham in Annabella is WN7VFJ. K7TGA bac. Montee. W7NH reports he will again be back on the air in Frem. W7DHJ heard from his Capitol Reef National Park Sleep Rainbow guest ranch. W7HCQ along with his son had a eyeball QSO with K7BNZ in Richfield. W7VXV can be heard on Pack Rat Net from Sigurd. All section nets changed to daylight in late Apr. Traffic: W7UTM 148, W7EM 99, K7HLR 75, W7G 63, WA7OAU 58, K7RNZ 24, W7IQU 24, W7DKB 17, K7CLC WA7MEL 9, WA7HCQ 8, K7PFB 7, W7HKC 5, WA7QAF W7GN 2.

2 Meter FM THE BIG THREE FOR '73!



GTX-10

10 watts output power nom.; accommodates 10 channels; rotatable frequency selector; adaptable for portable operation (with HamPak, below).

\$199.95

(Includes 146.94 MHz)

GTX-2

30 watts output power nom.; accommodates 10 channels; push-button frequency selection; back-lighted for night operation.

\$249.95

(Includes 146.94 MHz)

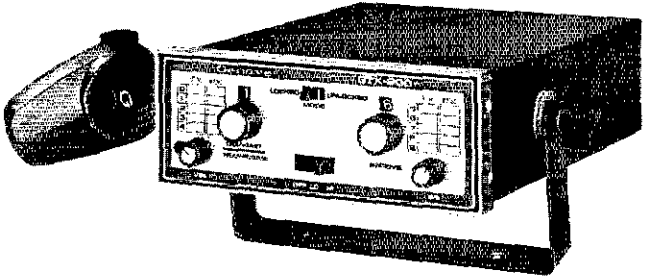


GTX-200

30 watts output power nom.; accommodates 100 channel combinations; features independent selection of transmit and receive frequencies, and switch for pre-selected pairing.

\$259.95

(Includes 146.94 MHz)

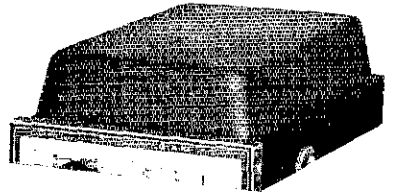


HamPak

Battery pack for GTX-10 portable operation. Uses 10 D cells (not included).

\$39.95

(Includes portable antenna, carrying handle & mike clip)



Made in U.S.A.
In Facilities Inspected by U. S. Gov't.

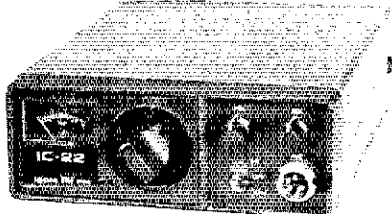
\$6.50
per crystal
Additional Crystals
for Xmit or receive

**VISIT YOUR LOCAL AMATEUR DEALER
AND MEET THE "BIG THREE" IN PERSON!**

General Aviation Electronics, Inc., 4141 Kingman Drive, Indianapolis, Indiana 46226 - Area 317 - 546-1111



INOUE HAS DONE IT AGAIN



New IC-22 - 22 channel, 10 watt mobile 2 meter FM unit.

Ready to go on 146.94 -.94, .34-.94, .16-.76 .76-.76, .52-.52.

Many other outstanding features
Only \$279.00 prepaid C.O.D.

Send your order today to

ADIRONDACK RADIO SUPPLY, INC.
185 West Main Street
Amsterdam, N.Y. 12010
phone 518-842-8350

The BIGGEST Signal

new and improved

GREENE
water tight
BALUN

with or
without
BALUN



Patent No.
D219106

Unconditionally
Guaranteed

KAUFMAN Center Insulator with BALUN \$12.50 postpaid USA
KAUFMAN Center Insulator without BALUN 10.00 postpaid USA
Dragon Fly antenna construction sheet
and drawing 5.00 postpaid USA

KAUFMAN INDUSTRIES
BOX 817
REEDS FERRY, NH 03054

NOVICES

Need Help For Your General?
Recorded Audio-Visual
THEORY INSTRUCTION
EASY - FAST - PROVEN
No Electronics Background Necessary
For Additional Free Information:

AMATEUR LICENSE INSTRUCTION

P. O. Box 6015 Norfolk, VA 23508

ISOLATED - PAD - DRILL - MILL

For circuit boards with no etching, see
QST, May 1973, page 44

Simple - Fast - Safe - Accurate
Sizes: - 0.25, 0.15" Dia. \$6.95 ea.



A F STAHLER Co PO BOX 354
CUPERTINO, CALIF 95014
Calif. Residents add 5%

WYOMING - SCM, Wayne M. Moore, W7COL - SAC: K7NOX.
PAMS: W7TZK, K7YUG. ORNS: K7NOX, W7SDA, WA7FHA,
K7YUG. Nets: Pony Express Sun. at 0800 on 3920; YO daily at
1830 on 3597; Jackalope Mon. through Sat. at 1215 on 7260 (alt.
3920); Wx Net Mon. through Sat. at 0630 on 3920; PO Net 1900
Mon. through Fri. on 3950. WA7DKZ stopped in and got his
Advanced Class license while vacationing in Tex. W7TVK on
vacation in Tex. W7RLI and K7KMT have designed and built a very
professional tone access board for the Casper repeater - many hours
- but a job well done. K7SJM has a new beam and tower. The
Hamfest and Convention planning are progressing nicely - don't
miss either one of these very nice events. Traffic: W7SDA 234,
W7TZK 206, K7VWA 183, K7ITH 125, W7HNI 75, W7BHH 59,
W7YWW 42, K7BNT 6.

SOUTHEASTERN DIVISION

ALABAMA - SCM, James A. Brashear, Jr., WB4EKJ - SEC:
W4DGH. PAM: WB4WAL. RM: W4HFU. WB4YAK participated in
the DX Contest Feb. 3-4, scored 171 points. Congratulations to
WN4BHO who passed the General and Advanced Class exams.
WB4ICH maintains a list of ham gear - both wanted and for sale.
WB4YAK operated at the Fairgrounds in Birmingham in connection
with the Scout Exposition. The QRM Club (Huntsville) recently
sponsored a dinner for their club and the QM. The Huntsville ARFC
sponsored a swapfest at the North Ala. State Fairgrounds. Member
of the Decatur, Huntsville and Birmingham ARCs joined with the
Gov't. agencies to provide communications during recent floods.
WB4WUS reports AFNO activity low. The section cw nets (AENI
and AENB) could use more participation and traffic. WB4SVH has
been checking in on the Continental DNTS on 20 meters. The
Tuscaloosa sponsored repeater (221.82) is now in operation on top
of Druid City Hospital using the call WB4KZH/4. The Univ. of Ala.
Huntsville ARA elected WB4EOW, pres.; WB4SFV, vice-pres.
WB4BUT, secy.-treas.; WB4KSL, act. mgr. K4IKR has a new HK-2
mobile. DK1DD recently gave an interesting talk to the Huntsville
ARC on ham radio - DK style. He also presented HARC with
framed emblem of and from the German Radio Amateur Club. F
is getting close - hope you are ready! Welcome to the following
new hams: WA4s CCL, CFK, COY and CYA. WB4s CCH, CEN,
CUX, CWE, CWH, CWI and DDE. WN4s CCA, CCL, CEX, CFI,
CHR, CMM, CMT, CMV, CNH, COM, COA, COJ, CSE, CTJ, CUI,
CVP, CWC, CXB, CXK, CXD, CXE, CXF, CXG, CZV, CZW, DAG,
DAH, DAK, DBN, DBR and DCA. Endorsed WB4SON as OR.
WA4OCM and WB4LTD as ECS. Appointed W4LNN as OR.
WA4NPL as FL. Traffic: WB4EKJ 145, WB4SVH 81, K4AOZ 6,
WB4JMH 32, WB4KSL 21, WB4WUS 10, WN4ZOE 5, K4HJM 2.

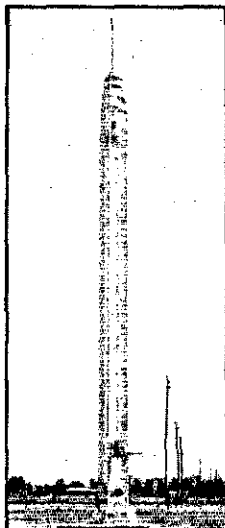
GEORGIA - SCM, A.J. Garrison, WA4WQU - Asst. SCM: Joe
T. Laney, III, K4BAI. SEC: WA4VWV.

Net	Freq.	Time(Z)	QNT	QTC	M
GSN	3595	0200/1050/2300			WR4RU
Ga. SSB	3975	0000			K4VNV
GRN	3718	2200			WR4SP

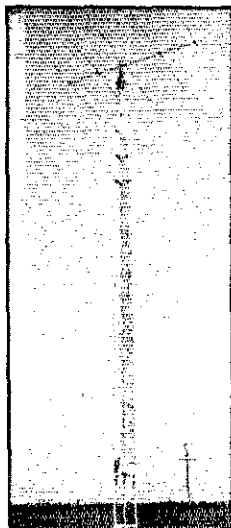
May I take this opportunity to say it's been a privilege and
pleasure serving the Ga. section the past three years as SCM. Your
dedication to the fraternity of amateur radio, your loyal support
the section traffic nets and your taking time out each month
report the activities of your station and your club has made
possible for me to do my job. So to each of you I am eterna
grateful. It's time to say "congratulations" to A. Ray LaR
WB4YGI, our new SCM. I urge each of you to give Ray the sa
splendid support and help make it possible for him to do a good
at a most difficult task. Traffic: W4EEP 119, WN4CTL 1
WB4RHA 88, WB4UHH 86, WB4WXX 78, WA4RAV 57, K4OSL
W4RNL 50, W4PIM 35, W4AMB 33, W4CZN 24, K4BAI 17, W4
14, WA4BAA 12, WA4VWV 12, K4NM 7.

NORTHERN FLORIDA - SCM, Frank M. Butler, Jr., W4R
- Jacksonville: WA4QIM earned a FAST Net Certificate, he is a
active on OFN. WB4VYU has a new home brew 20-meter hea
W4SZ, Math Prof. at I.U., was recently honored by the scho
Daytona Beach: QTC on VEN was up to 48 this month; QNI 2
QNI 145.8 at 0001 GMT. WA4WIW is looking for more QNI an
NCS on FATT Net, 3620 at 2330 GMT. Ocala: K4FCZ
appointed OBS and OO. New Port Richey: WA4AGX elected p
of the Tampa Bay Repeater Assn. Tallahassee: WN4BSP
WN4UPJ received Gator Net certificates. WB4ZGC on SSB w
TR-3. WB4PNI chasing DX, but also added 2-meter fm to sha
Panama City: WA8QJW4 departed area for new assignm
WA4NRP back on the air; also joined QCWA. Ft. Walton Bea
The annual Swapfest provided occasion for meetings of the N.
Phone Net and Gulf Coast FM repeater operators. K4THA,
Division Vice-Dir., hosted the ARRL meeting. WB4KOK has a
call - K4UHH. New officers of PARC are WB4MHG, pres.; W4M

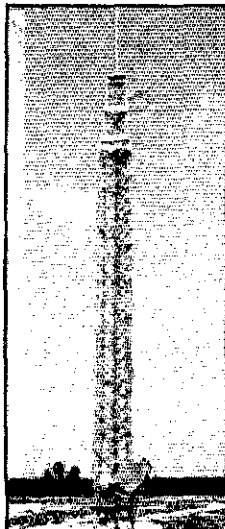
NOW.
Top-of-the-Line
Tri-Ex Towers
for HAM operators
at basic prices!



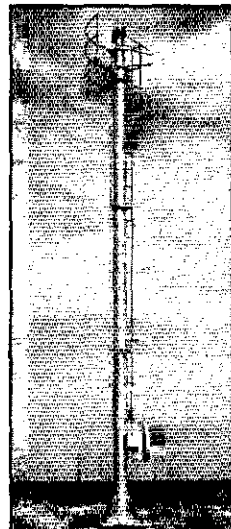
W-51



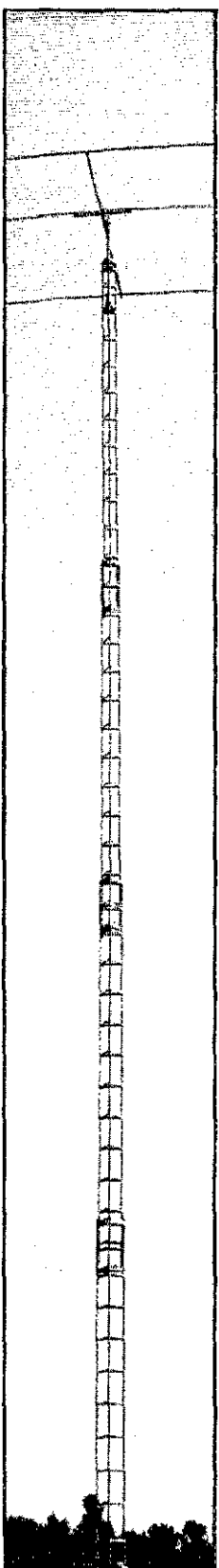
MW-65



LM-470D



TM-370



THD-471

Now you can afford the best! Free-standing or guyed, Tri-Ex Towers stress quality. All towers are hot dipped galvanized after fabrication for longer life. Each series is specifically engineered to HAM operator requirements.

W Series

An aerodynamic tower designed to hold 9 square feet in a 50 mph wind. Six models at different heights.

MW Series

Self-supporting when attached at first section — will hold normal Tri-Band beam. Six models.

LM Series

A 'W' brace motorized tower. Holds large antenna loads up to 70 feet high. Super buy.

TM Series

Features tubular construction for really big antenna loads. Up to 100 feet. Free-standing, with motors to raise and lower.

THD Series

Very popular. Low Cost. Holds Tri-Band antennas. Eight models — all support 7 square feet of antenna at full height in 70 mph winds. Guyed.

Start with Top-of-the-Line Tri-Ex Towers. At basic prices. Write today, for your best buy.

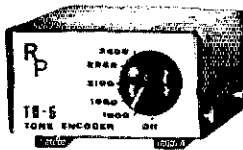


Tri-Ex[®]
TOWER CORPORATION

2182 Rasmussen Ave

NEW from **RP** TONE BURST ENCODERS

- UP to 5 fixed tones (factory set)
- ADJUSTABLE:
 - Duration
 - Output
- NO BATTERIES needed.
- FULLY ADAPTABLE
- EASY INSTALLATION
- CONTINUOUS TONE POSSIBLE
- FULL 1 YEAR RP Warranty



PRICES:

TB-5 5 tone std. encoder \$37.50
(1800, 1950, 2100, 2250, 2400 Hz.)

ST-2 Single tone decoder \$37.50
(Specify 1800, 1950, 2100, 2250, or 2400 Hz.)

Special tones — Inquire
Add \$1.80/unit for shipping (Ill. residents add 5% tax)

FREE SPEC SHEETS
NOW AVAILABLE

ORDER DIRECT OR FROM
AUTHORIZED DEALERS

RP Electronics

BOX 12010
CHAMPAIGN, ILL.
61820

QTC de W2KUUW

WANTED FOR CASH, 618T Transceivers,
490T load coils.

The Ted Dames Company
308 Hickory St. Arlington, N.J. 07032
(201) 998-4246 Nites (201) 998-6475
phone collect

F.C.C. EXAM MANUAL

PASS IN 3 EXAMS! Memorize, study
—1978 "Facts-Answers" for FCC First
and Second class Radio-telephone li-
censes. Newly revised multiple-choice
questions and diagrams cover all areas
tested in FCC exams—plus—"Self-
Study Ability Test." \$9.95 postpaid.



COMMAND PRODUCTIONS
RADIO ENGINEERING DIVISION

P.O. BOX 26348-T
SAN FRANCISCO, CALIF. 94126



- For Dipoles—Yagis—inverted V—Doublet
 - Puts Power in Antenna
 - Full Legal Power 3-40 MC.
 - Small—Light—Weather-proof
 - 1:1 Impedance Ratio—Coax Fitting
 - Takes Place of Center Insulator
 - Built-in Lightning Arrestor
 - Helps Eliminate TVI
 - Fully guaranteed
- VANGORDEN ENGINEERING**
Box 513, Briarcliff, N.J. 07830

\$9.95 PPD
U.S.A.

WB4SFU, K4UBR and W4BVE. WA9QVT/4 appointed OR
WB4NHH renewed ORS. K1s MFZ, MOE and QEA from Rhode
Island spent two weeks at Eglin AFB. WA9GIS/4, W0YJN/4 at
WB4DLW are new to the area; DLW is Dean at OWJC. W3ZBW,
won Section ARRL Phone SS award. Milton: K4QOI is new EC for
Santa Rosa Co. Pennsylvania: New officers of the EFARA are
WA4IZM, pres.; WB4ZPC, WA4CAD and W4NOG. WA4JGN
Silent Key this month. WB4ZPC and W4MS are looking for 43
MHz rigs to use with ATV. Traffic: (Mar.) W4SDR 222, WB4OM
152, WB4WHK 145, K4VYF 134, WA9QVT/4 126, K0BAD
1116, WB4QAA 106, WA4WBM 93, WB4NJJ 88, W4YSO 8
K4BSS 63, W4LSR 47, W4RGCW/4 44, K4GJ 43, WA4FYU 4
WB4ZQC 35, WA4VCK 34, WA4EJA 25, K4CFS 24, K4EZE 2
W4NGR 24, WB9FUZ/4 24, W4IA 23, WA4BXT 21, W4GUJ 2
W4RKH 20, WB4VYM 17, W4DFP 16, K4FCZ 16, WB4SKJ 1
WB4ADL 14, W4DTV 12, W4DFY 11, K4QER 10, WB4JSE
WB4HPR 7, W4IKR 7, WA4WIW 7, WA4VZF 5, WB4BYJ
K4FLV 1. (Feb.) K4VYF 143.

SOUTHERN FLORIDA — SCM, John F. Porter. W4KGI — SE
W4IYT. Asst. SEC: WASMK. RMs: K4FAC CW, K4EBE RTT
PAM: W4OGX, W3CUL, W3VR and WB4AIW made BPL. WB4UN
and WB4PNG made PSHR. WB4HKP qualified for FAST Net
Certificate. WB4TUP has new 2-meter walkie talkie and has signed
up plenty of new AREC members since taking over as EC for
Hillsborough Co. W4OZF worked 46 countries on 80 in ARRL C
DX Contest. That new 80/40 V must be doing OK. Bob. So long Al
and Mae Burke. See Ya'll next winter. K4NE had a nice visit wit
KH6BZF, KH6JJ and KH6AX on his vacation to Hawaii. WB4TU
is new OPS/OVS. The new Dade Emergency Net now meets ea
Wed. at 8 P.M. on 146.940. We regret to report the following Sil
Keys of Fla.: WB4FR, W4LSK, W4FOZ, WA4JGN. Fla. OSL Par
reported good even with the competition from CD Party. The S
Lucie Repeater Assn. is growing fast. Some additions are W4NF
W4TZ and WA4VWY. The FMTN on Mar. 30 assisted in a
emergency during their regular Net session. K4PGY/M north
Gainesville needed an ambulance to meet plane on runway
Gainesville airport. W4DFP accomplished this through FAA and
Medical Center. W4LSR acted as relay between W4GDK NCS at
the mobile. New EC for Monroe Co. is WB4DTE. All you guys dov
in the Keys contact him for info and assignments. The W. Pal
Beach AREC (EC WB4RLU) turned in an excellent SET report
operations from the Palm Beach Red Cross Chapter. Hollywo
ARC operated club station WB4TON at the Shopping Mall wit
outstanding results. Operation was spearheaded by WB4LA
Reports are now due on the 5th — new regulations from H
Traffic: (Mar.) W3CUL/4 7023, W3VR/4 612, WB4AIW 52
K4SCL 421, K4FAC 384, WB4GHD 270, WA4SCK 201, WA4L
174, WB4HKP 108, W8BZY/4 98, W4IYT 60, WA4NBT 5
K4WKY 57, W4BM 50, WB4HIW 49, WB4AID 48, WB4UNV 4
W4GDK 40, K4BLM 39, W4EH 39, WB4PNG 39, WA4HDH 3
WB4WYX 38, W4DVO 33, K4NE 32, W4FF 31, K4QG 3
W4DQS 28, W4WRZ 23, K4EBE 18, W4SMK 18, W4ZAK 1
W4KGI 15, W4DDW 11, W4TJM 11, W4NTS 10, W4OGX 1
W4MML 9, K4SJH 9, W4BCZ 7, WB4QID 6, W4TUP 6, K4FMA
WN4ZZB 5, W4LK 3, WB4ALF 1, WA4ALE 1, WB4DUP 1. (Fe
K4NE 32, K4GFW 8.

WEST INDIES — SCM, Pedro J. Piza, Jr., KP4AS1 — C
gratulations to the PRARC on a nice Hamfest. KP4CK bough
regency at the hamfest and now is on 2 meters. KP4DQZ is heard
2-meter mobile on his way from home to college every week e
KV4EY will soon be on RTTY. KV4HW getting ready for 1
meters. KP4EX bought KP4AJK's TR22. KV4FZ was invited spe
speak about 160 meters at the Fresno Convention. KP4AEK
soon be on 2 meters. KP4BOL is active on the general portion of
meters; we need more activity in that portion of the band, list
especially on Wed. evenings. Traffic: KP4WT 166.

SOUTHWESTERN DIVISION

ARIZONA — SCM, Gary M. Hamman, W7CAF — RM, K7N
PAM: WA7JCK. The annual Phoenix-Tucson softball game in
Grande was won by Phoenix with a score of 19 to 1. Field Da
June 23, 24. Plan to join in the fun with your club or as
at individual station. The Ft. Tuthill Hamfest is July 27-28
Flagstaff. WIICP spoke at a special meeting of the AKA regar
repeater licensing and regulations. Another retired Hz. d
member, W1HDQ, spoke at several club meetings in Ariz. du
Apr. The AARC held a 75-meter transmitter hunt with W4TI
hiding in Papago Park. K7UIV reports the Eye Bank Networks
helped in the passing of 6,404 eyes. Congratulations to WN7I
and WN7TRS on passing General Class exam. W7AMM is oper
from Iran as EP2EJ. K7MLE and W7CAF with their XYLs h
great time on a Caribbean cruise Mar. 17-24. WA7CNP has 1

When you want the best...

Hy-gain

the antennas to buy!

6-Element Super Thunderbird DX Superior Performance TriBand Beam.
TH6DXX **\$179.95**

Improved Hy-Q traps for each band. SWR less than 1.5:1 on all bands. Takes maximum legal power.

Popular 3-element Thunderbird.
TH3Mk3 **\$144.95**

Improved Hy-Q traps. Takes maximum legal power.

The Best Vertical!
18 HT **\$199.95**

80 thru 10 meters. Outstanding omni-directional performance. Automatic band switching. Completely self-supporting.

Most Popular Vertical!
18AVT/WB **\$69.95**

Automatic switching. Top loading coil. True 1/4 wave resonance. Low angle of radiation.

Economical 3-element Thunderbird.
TH3JR **\$99.95**

Takes up to 300 watts AM, 600 watts PEP. Rotates with heavy duty TV rotator.



MULTI-BAND DOUBLET
5BDQ 80-10 meters **\$69.95**
2BDQ 40 and 80 meters **\$39.95**
2BDT Traps only 40 and 80 meters **\$26.95**



Hobby
Industry

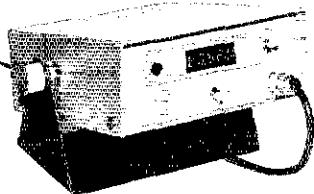


Let me quote on your HAM needs...you'll save!
 Al McMillan WØJJK
 Call: Tues.-Sat. Noon-5 PM 712/323-0142
 Box 864, Council Bluffs, IA 51501



ELECTRONICS

P.O. BOX 1672
VISTA, CA. 92083
714-726-1313



Model "A" Frequency Counter
10 Hz to 80 Mhz ($\pm 10\text{Hz}$) Direct Count Guaranteed (1Hz to cover 100Mhz Typical)
Read Out: 5 digit LED + Over range.
Sensitivity: 100 millivolts
Either 120VAC or 12VDC power required
Small Size: 2.34"x5.68"x8.18"
Price: \$250.00 FOB Vista, Ca.

Model "AS" Frequency Counter
EXACTLY AS ABOVE PLUS AN INTERNAL SCALER ($\pm 10\text{Hz}$) 70 Mhz to over 250MHz DIRECT COUNT
ONE BNC CONNECTOR FOR BOTH RANGES
INTRODUCTORY PRICE until 1 SEPT. 1973
\$325.00 FOB Vista, Ca.
(CA residents add sales tax).

Y & C ELECTRONICS

P. O. Box 1672, Vista, CA. 92083, 714-726-1313

QUADS! QUADS! QUADS!

From \$79.95 up. 2, 3, 4 elements; All quads are complete-Predrilled, Pre-cut, Pre-tuned.

Free literature upon request.

Special deal on E. Z. Way Towers, crank down, tilt over.

(813) 988-4213

406 Bon Air Ave.

SKYLANE PRODUCTS Temple Terrace, Fla. 33617



New! BALUN

- 1:1 for dipole or inverted Vee.
- 1:7 to 30 MHz. Full KW power.
- Sealed - weatherproof.
- \$12.95 PPD USA. 5% tax in Calif.
- Order direct. Free brochure.

PALOMAR ENGINEERS

BOX 455, ESCONDIDO, CA 92025

ENJOY HIGHEST NOISE-FREE QTH IN THE COUNTRY this summer. 4-wheel-drive tours, Denver to trails atop 12,000 ft. Continental Divide. All bands, vertical and long-wire antennas, 260 watts. Booking reservations now. Private, \$60 or \$15 each, 4 min., 8 max. The Mountain Men, K0SGS, 2300 Crabtree Drive, Littleton, Colorado 80121. The XYL will love the scenery!

appointed OBS. Section awards were earned by WA7CNP, K5FPO, K7GLA, WA7HIT, WA7KQE, WA7NHO, K7NTG, WA7TZO, W7UQO and K7UYW. PSHR: K7UYW 35, WA7CNP 31. Traffic: K7NHL 281, K7NTG 186, K7MTZ 99, W7UQO 51, WA7CNP 39, K7KRU 38, W7PG 30, K7UYW 20, WA7JCK 14, WA7TZO 11, K7NMQ 7, K7ZMA 5, K7GLA 3, WA7KQE 3, W7JXX 2, WA7NHO 2.

LOS ANGELES - SCM, Edgene H. Violino, W61NH - Asst. SCM: Leigh S. Jones, WB6OLD. SEC: WA6OZY. RM: W6LYY. It is with pride that we Los Angeles section hams can point to K6SVL, WA6TSK who interrupted their DXing to help a stricken boy in TG-Land. These gentlemen with the help of W91.VT/6 gave of their time and efforts to help this stricken lad. It was published in the L.A. Times as headlines, which I am sure helped our public relations in the local community. Thanks to these fine gentlemen. The United Radio Amateur Club of San Pedro had a talk by EC Skip Blomer on AREC, also W6SZH gave a talk on homebrew. He has a wonderful program at the Carson Adult School which includes building transmitter, power supply and linear. Those interested contact W6SZH or K6LGO for more information. WB6ROY out of hospital after a bout with heart trouble and flu. The SGVRC will have their installation banquet in June at the Santa Fe Inn. WB6YVP is the proud owner of a husky 2 1/2 kw generator. WA6OZC using Drake R-4 and NPR receivers for I.F. for the UHF converters. By the time you read this I will be starting a new term as your SCM. Thanks for your help in the past two years and please continue de W61NH. WA6ORJ reports he has moved to the Orange section, would like his friends to contact him at new QTH. K6EA finally back from Minn., with SAROC on the way, with new car. Army has been checking scores for OOTC QSO party with W6CL. W6YMX says that he has another hobby - baking pies when not on the air. W6USY has requested a leave from SCN for a month while on jury duty. WA6EXM is attempting to get a station going on a naval ship. The Mayor and Councilmen of San Fernando aided WA6AIJ during the recent SET operation. W6OAW has been doing a bang up job recruiting members for the new Day Time Traffic Net on 14 MHz. W6NLE waiting for new Heathkit SB-220 linear to get on Day Time Traffic Net. WA6IDN getting help from Hq. on converting his rig to semi-break-in operation, also teaching radio to men at Chino. K6UYK new member of MARS radio system and active with traffic on SCN with new dipole. WB6OYN recovering after surgery, drop him a QSL. Let me remind everyone that we now have a Day Time National Traffic Net on 14313 kHz 1830 GMT daily. Antelope VRC has a workshop available to locals. Traffic: K6UYK 275, W61NH 161, W6LYY 144, W6OAE 124, W6ZKI 58, WB6KJI 55, WB6KKG 39, WB6ZVC 39, W6OEO 38, WB6KXC 10, W6IVC 7, W6OAW 7, W6UGH 6, WA6IDN 5, WB6TPO 3, K6ASK 2, K6CL 2.

ORANGE - SCM, William L. Weisse, W6CPB - Asst. SCM: Richard Birbeck, K6CID. SEC: WA6TVA. PAM: K6YCL. RMs: WB6AKR, W6NBX. Dust off the generator, ready your tent Field Day is just around the corner. Play it safe, no exposed wires and watch out for the snakes. W6HAW/6 won first place for Orange section in recent Ark. QSO Party. Congrats! K5DDM/6 is new ORS in Riverside. NEN Novice Training Net on 7125 kHz Sat. 0900 PST going great. Had four sessions in Mar. with average check-ins 8. Novices should check in when possible for this good training. K6EF back in San Dimas convalescent home. Cards and visits would help cheer up George. W6CPB, K6CID and WA6TVA were guest speakers at Sun City Radio Club Mar. 8. A very active club with an excellent TVI committee. WB6YTK reports he is on night shift. Hope you are back on SCN soon. If you want to keep abreast of current happenings in the Southwestern Div. league officials should check in on the Officials Net each Wed. at 9 P.M. local on 3905 kHz. If I did not list your traffic perhaps it did not arrive prior to my reporting deadline which is the 7th of the month. Getting your reports in early will help me in making my report. The Citrus Belt Amateur Radio Club has assumed sponsorship of the WA6ALV repeater. The club is planning great things for the repeater users. Tune in. PSHR: WB6AKR 34, WA6TVA 46. Traffic: K6GMI 134, WA6TVA 59, WB6AKR 43, W6WRJ 27, W6CPR 14, WA6YWS 11, K5BMB/6 9, K6GGS 8, W6QBD 5.

SAN DIEGO - SCM, Paul C. Thompson, W6SRS - Asst. SCM: Art Smith, W61NI. SEC: W6GBF. RMs: W6LRU, W6BGF. With Spring here Summer just around the corner Field Day is the yearly event that we all eagerly await to match wits with the Great Murphy. Whether you are participating with one of the local clubs or two or three in a small group the challenge of FD and the training in operating under less than ideal conditions does much to sharpen your future emergency procedures. Active participation with AREC will also provide that training. Join us on 75, 10, 6 and 2 meters. There is a time and frequency for everyone. SOBARs attended the Electronics Lab at Southwestern College. IVARA held their Ladic Nite. El Cajon North Shores and Palomar held their annual

DRAKE TR-4C

The ultimate in SIDEBAND TRANSCEIVER performance



\$599⁹⁵

34-PNB Plug-in
Noise Blanker . . . \$100.00
RV-4C Remote
VFO for TR-4C . . \$110.00

GENERAL: • All amateur bands 10 thru 80 meters in seven 600 kHz ranges (5 supplied)
• Solid State VFO, 1 kHz dial divisions
• Modes SSB Upper and Lower, CW and AM
• Built-In Sidetone and automatic T/R switching on CW • 30 tubes and semi-conductors • Size: 5½" H, 10¾" W, 14⅞" D (13.9 x 27.3 x 36.5 cm). Wt.: 16 lbs. (35.2 Kg).

TRANSMIT: • VOX or PTT on SSB or AM • Input Power: SSB, 300 watts P.E.P.; AM, 260 watts P.E.P. controlled carrier compatible with SSB linears; CW, 260 watts • Adjustable pi-network.

RECEIVE: • Sensitivity Better than ½ uV for 10 db S/N • I.F. Selectivity 2.1 kHz @ 6 dB, 3.6 kHz @ 60 dB. • AGC full on receive modes, variable with RF gain control, fast attack and slow release with noise pulse suppression • Diode Detector for AM reception.

R. L. DRAKE COMPANY



DRAKE

540 Richard St., Miamisburg, Ohio 45342
Phone: (513) 866-2421 • Telex: 288-017

ADD PUNCH AND CLARITY TO YOUR SIGNAL!



- Instantaneous Limiting Action
- No Appreciable Distortion
- Completely Compatible with SSB
- Talk Power Gain at Least 10 db
- Optimum Frequency Response
- Installs In Microphone Lead
- All Solid State Printed Circuitry

NEW! COMDEL SPEECH PROCESSOR MODEL CSP-11

A prototype of the CSP-11 has proved itself an effective communication aid on the amateur bands over several years. Its prominent feature is the instantaneous limiting action without the harmonic distortion which often makes the use of conventional speech clippers marginal, particularly with SSB transmitters. Designed for relatively insensitive high impedance microphones—a gain control is provided—the unit will enhance the intelligibility of voice signals considerably under difficult conditions. "MIL" design and construction is employed throughout for high reliability and long life. Power is obtained from internal batteries (6 "D" cells—life exceeds 300 hours) or external source.

Free brochure will be sent on request

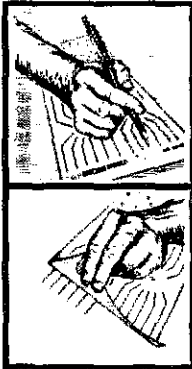
COMDEL ELECTRONICS Beverly Airport, Beverly, MA 01915 (617) 927-3144

Hey!

Hams, Engineers, Hobbyists

MARK LIKE

MAGIC



Any surface can be marked with DATAK'S DRY TRANSFER films and symbols. The results are professional, it looks like the finest printing!

Write for your FREE SAMPLE and Catalog. Listing hundreds of letter sheets and symbol sets.

Order from your distributor or directly from:

THE DATAK CORPORATION

* From #K-64 1/2" letters and numerals... \$1.50 Also available 2 1/2" professional size set for electronic equipment... \$5.55

85 Highland Ave. / Passaic, New Jersey 07055

Auctions. SANDRA held their meeting around fm equipment with some borderline pre-radio. New club forming is NEL Radio Club. SDCARC is in need of a chairman for the 1974 Southwestern Division Convention to replace WB6ODR who was acting as chmn. New Novices are WN6VMT, WN6VMZ, WN6VNA, WN6VNB. Look for them on the Novice Net 3725 kHz 0830 Sun. WB6VKV is NCS for the AREC Net on 3770 kHz 1030 Sun., 15 wpm. K6OJP was coordinator for Glider Meet Apr. 14 and 15. PSHR: W6LRU 45, WB6GF 44, WB6VKV 34. Traffic: W6BSF 429, W6LRU 246, WB6KVF 168, W6DEY 36, W6FMZ 6, W6BKK 1.

SANTA BARBARA - SCM, D. Paul Gagnon, WA6DEI - SEC: W6FIA, RM: W6UJ, PAM: K6EVO. The first annual Section Picnic sponsored by TRICAR is planned for July 22 at Orcutt Hill Park near Santa Maria. Contact your club delegate for advanced tickets. OBS WA6IDQ is sending bulletins at 0300Z Mon. on 146.94, 0400Z Wed. on 3935, 0330Z Wed. on 3625 RTTY. WB6UMV recently returned from the USS Hope, his son WN6TGY is busy working JA stations. Another father/son team of WN6TGV/WN6UJZ are using an HW-7 QRP rig and working lots of DX. CP5FZS back in Ventura after a trip to Bolivia. W6MUL has a new 450 rig. WN6MGK is getting a *crash* general license course from W6MHK prior to a missionary tour in Liberia. WN6RPU has designed and built a digital counter for the Hueneke High physics lab. WA6UEO and WB6TNL are working on 220 gear. WA6TMQ took a trip to Japan visiting many friends including JA2AJA, QSL Mgr. for W6MHK. K6VIE and WB6ANI installed automatic emergency power on repeater WA6SIN. The Mike and Key Radio Club code class graduated 8 Novices. WB6PGK has joined the Society of Wireless Pioneers and is also active on the new DNTS. WA6PFF had a surprise visit from the pres. of the Antique Wireless Assn. K2WW. FC W6CDN held an emergency drill of the Morro Bay AREC in Mar. WB6FLI completed repairs on 2-meter walkie talkie. WB6DHW building a 50-ft crank-up tower. MTN roundup will be held in Arnold on June 17. Send activity reports the 1st of the month. Lets have a good contest for the TRICAR Field Day Trophy. Contact your nearest club and help them win. PSHR: WA6DEI. Traffic: (Mar.) WA6DHI 123, WB6PGK 101, WA6WYD 24, WA6PFF 8, WB6DHW 6, WN6MLJ 5, K6YLO 5. (Jan.) WB6MXM 17.

WEST GULF DIVISION

NORTHERN TEXAS - SCM, L.E. Harrison, W5LR - Asst. SCM: Frank A. Sewell, W5IZU, SEC: K5QKM, Asst. SEC: WASKHE, RM: WSQU. Again thanks for your reports. Please remember in case your "remarks" are not shown this issue just wait I'm only allowed 37 lines to tell your story. Annual SEC report notice. Navy EastTexMARS picnic Tyler State Park was May 12-13. Suggest members read Minute Nos. 5, 8, 12, 20, (re-foam han expansion) also minute 40 (clubs please take note). WSNO an W5NT represented SCM at Midland swapfest. Attendance over 55! Galaxy 550-A and HR2MS won by W5SVN's XYL. Levellan Swapfest set for Aug. 41st West Gulf Division Convention was held Apr. 27-29, keynote speaker W2TUK plus WINJM, SCM N/L in mail to L/A, W5IZU Asst. SCM, W5CNO, K5CHS, W5GPE mad Midland. They met W5BE, W5ALI, W5AJ, W5HT, W5IPE, W5ATW, W5CWE, W5FA and W5OL. Tornado hit Hubbard, Tex Mar. 10 and complete report submitted to Hq. by SEC K5QKA. Congrats to W5KRZ, K5QVI and WA5QQY. WASKHE volunteers to assist SCM in paperwork dept. State MARS meeting Santone he May 19, 20. It is with deep regret we announce the passing of ex-SZC, Frank M. Corlett, Sr., ARRL Dir. (W.Gulf) for approximately 18 years, also organizer of DARC Dallas. ARRL D Contest now history per RWK. Kilocycle Club Ft. Worth report showing new ARRL film for Apr. meeting. Arlington ARC vote change membership dues. Dallas ARC now meets at Wyatt Mockingbird and Abrams Rd. W5THW reports illness in fami therefore no OO reports. Temple ARC reports Apr. meet: featured EC WA5QQY as speaker. New "Fuzz-buzz" Irving ARC p Dallas CRW. SCM thanks chmn. NTEXEMGCY Net for invitation attend week end meeting Oak Grove Airport. Did you notice th Motion No. 24 presented to '73 Board passed. Congratulations your Director. Traffic: (Mar.) W5TI 218, K5QKM 32, W55BFW 1, W5SHN 15, W5LR 6, W5SEBC 3. (Feb.) K5QKM 11.

OKLAHOMA - SCM, Cecil C. Cash, W5PML - Asst. SCM/SE Leonard Hollar, WASENN, RM: W5RB, PAMS: W5MFX, W5SCV and K5DLE. Here it is way into spring and the ground is cover with snow. Spring here usually brings thunderstorms and tornado and this spring is no exception. Burnet, Tex. and Newark, O. recently had theirs, and lots of welfare traffic out of both tow The Ford Club are putting in a portable repeater. The new chapter of the QCWA is the Central Oklahoma Chapter of Ok City with 52 charter members. The Oklahoma City American f

LOW PRICES ON POPULAR COMPONENTS IF FILTERS

- Monolithic crystal and ceramic filters at popular frequencies
• 500W power transistors by 2TU - Varian
• J and MOS FETs - Linear I.C.'s - Bipolar RR and AF INDUCTORS
• Molded chokes and coil forms with adjustable cores CAPACITORS
• Popular ceramic and mica variable types
QUALITY COMPONENTS AT GREAT PRICES
• No seconds or surplus - name brands, fully guaranteed
• Price breaks at low quantities - below large mail-order houses

WRITE FOR CATALOG 173



P.O. Box 624 Marion, Iowa 52302 (319) 377-7927 or (319) 377-2658

WORLD TIME-TELLER



GREAT for DX OP

A turn of knob and 2-color drum dial shows time your QTH and corresponding local time in all zones-also GMT. Fast-visual-great for sked making.

Map 2-color enamel on aluminum. Cabinet assembly of polished acrylic. List: \$18.50 complete-plus postage. Kit: Complete \$14.75, or less cabinet and knobs (cab. dwgs. inc.) \$11.75

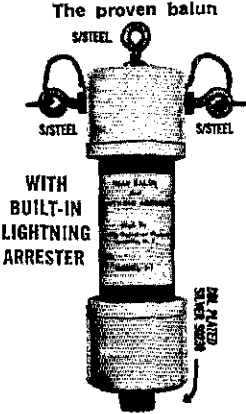
U-J Industries

6605 Shoal Creek Blvd. Austin, Texas 78757

THE BIG SIGNAL

THE APPROVED LEADING HAM AND COMMERCIAL BALUN IN THE WORLD TODAY.

"W2AU" BALUN \$12.95



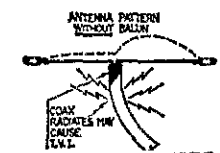
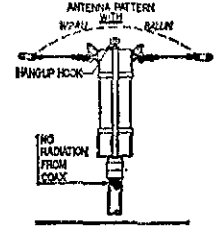
1. HANDLES FULL 2 KW PEP AND THEN SOME. Broad-Banded 3 to 40 Mc.
2. HELPS TVI PROBLEMS By Reducing Coax Line Radiation
3. NOW ALL STAINLESS STEEL HARDWARE. SO239 Double Silver Plated
4. IMPROVES F/B RATIO By Reducing Coax Line Pick-Up
5. REPLACES CENTER INSULATOR. Withstands Antenna Pull of Over 600 Lbs.
6. BUILT-IN LIGHTNING ARRESTER, Protects Balun — Could Also Save Your Valuable Gear
7. BUILT-IN HANG-UP HOOK. Ideal For Inverted Vees, Multi-Band Antennas, Dipoles, Beam and Quads

NOW BEING USED EXTENSIVELY BY ALL BRANCHES OF THE U.S. ARMED FORCES, FAA, RCA, CIA, CANADIAN DEFENSE DEPT. PLUS THOUSANDS OF HAMS THE WORLD OVER

BIG SIGNALS DON'T JUST HAPPEN—GIVE YOUR ANTENNA A BREAK

Comes in 2 models. 1:1 matches 50 or 75 ohm unbalanced (coax line) to 50 or 75 ohm balanced load. 4:1 model matches 50 or 75 ohm unbalanced (coax line) to 200 or 300 ohm balanced load.

AVAILABLE AT ALL LEADING DEALERS. IF NOT, ORDER DIRECT



We'll GUARANTEE
no other balun, at any price, has all these features.

UNADILLA RADIATION PRODUCTS

MFRS. OF BALUNS
Tel: 607-369-2985

RD 1

UNADILLA, N.Y. 13849

MORGAIN

EXCLUSIVE 66 FOOT

75 THRU 10 METER DIPOLE

NO TRAPS — NO COILS — NO STUBS — NO CAPACITORS

Fully Air Tested — Thousands Already in Use

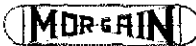


IS BACK

#16 40% Copper Weld wire annealed so it handles like soft Copper wire—Rated for better than full legal power AM/CW or SSB-Coaxial or Balanced 50 to 75 ohm feed line—VSWR under 1.5 to 1 at most heights—Stainless Steel hardware—Drop Proof Insulators—Terrific Performance—No coils or traps to break down or change under weather conditions—Completely Assembled ready to put up—Guaranteed 1 year—ONE DESIGN DOES IT ALL; 75-10HD—ONLY \$12.00 A BAND!

Model 75-10HD ... \$60.00 ... 66 Ft. ... 75 Thru 10 Meters	Model 75-40HD ... \$40.00 ... 66 Ft. ... 75 Thru 40 Meters
Model 75-20HD ... \$50.00 ... 66 Ft. ... 75 Thru 20 Meters	Model 40-20HD ... \$33.00 ... 35 Ft. ... 40 Thru 20 Meters
Model 80-40HD ... \$42.00 ... 69 Ft. ... 80-40-15 Meter (CW)	

ORDER DIRECT OR WRITE FOR FULL INFORMATION

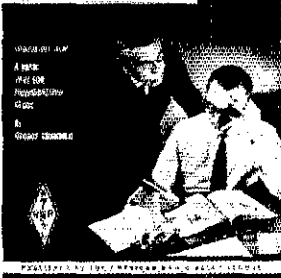


300 Shawnee
Leavenworth, Kansas 66048

OR THRU YOUR FAVORITE DISTRIBUTOR

A COURSE IN RADIO FUNDAMENTALS

#2000



Complete text for home study or classroom use. The twenty-six chapters include such topics as the electric charge, energy in electric and magnetic fields, reactance, impedance, resonant circuits, filters, transmission lines, vacuum tubes, semiconductors, fundamentals of amplification, feedback, and amplifier circuits. Questions and problems at the end of each chapter test the reader's comprehension of the chapter material. Answers are presented in the back of the book.

Fifth Edition

\$2.00 Postpaid

The American Radio Relay League

Newington, Connecticut 06111

QST

ADVERTISERS

Advertising is accepted only from firms who, in the publisher's opinion, are of established integrity and whose products secure the approval of the technical staff of the American Radio Relay League."

Quoted from QST's advertising rate card.

Amateurs and Electronic Engineers: Practically everything you need can be supplied by the advertisers in QST. And you will know the product has the approval of the League's technical staff

Cross has set aside a room as an emergency radio room, will have rigs and setups with antennas for five bands. May 3rd was the start of code and theory classes with room for 80 to 100 students. EC WASJGD, Okla. Co. working with ARC emergency director Jack Muse on this project. Watch your "S" meter for KSLAD who has just finished a 4-1000 Two Gallon Linear. Belated congrats to Extra Class WBSFWH. Congrats to two new Generals WBSGWB and WBSHLR. Sure had a nice hamfest at Woodward Mar. 31 and Apr. 1. Remember FD, get your club organized or at least get a small group and take part in Field Day. Traffic: K5TFY 567, W5RB 70, W2FIK/5 36, W5MEX 19, WASZOO 19, W5PML 16, WBSAZS 13, WASOUV 13, W5FKL 12, W5SUG 11, K5LUJ 9, WBSSEY 7, K5ZDB 7, WBSFK 5, W5ASN 5, W5TWM 1.

SOUTHERN TEXAS - SCM, Arthur R. Ross, W5KR - SEC: WASYXS. HARC elected W5FEM, pres.; W5AIR, vice-pres.; W5DWC, treas.; WASWYD, secy.; W5LSE, membership; K5SOH, pro. WASZBJ passed Extra Class exam. WBS1MA is new EC for Williamson Co. W5TFW ready for the hurricane season. W5ABO in hospital briefly. Jerry reports response good for donations to keep TEX Net Bulletin going. K5CWS has new Rohn tower, 48-ft, self-supporting for nine-element Yagi; he reports 444 MHz activity rising with WA2CGG/5 coming on with Motorola T44. WASZBK says band getting bad for late NTS sessions; has had good luck with ORP, getting in on TEX 2 sessions with 2 Watts! - worked WASZFM, 95 miles, with 200 mw! W5KLV busy with STFN work and preparing for convention. W7WAH/5 says he received his Extra Class ticket 3 days after end of DX test; working on VFO and mixer required to put 20A exciter on all bands; says sxb is something new and exciting for him. WASVBM says her busted rig did not slow down her activities for helping those in need; she was herself helped, as W5FR made necessary repairs. TEX Slo Speed Net active on 3748 kHz, 8 P.M. Central, W5DRK says, "Come on in! the water is fine!" TSARC gave communications demonstration for Civil Defense and law enforcement officials Apr. 18; main feature was the 34/94 repeater, but HF capability was also displayed; this part of three-county hurricane preparedness test for the edification of all concerned. W5ICL endorsed as EC for Orange Co. W5TKR is new EC for Grimes Co. Director W5EYB urges all hands to prepare for hurricane season. K5SBR long-wire survived three ice storms but lost bout with sailboat on trailer! Traffic: WBSCUR 163, W7WAH/5 162, WASYEA 115, WASVBM 98, WBSRWV 97, W5ABO 91, WBSAMN 81, WASZBK 64, W5YAX 61, WASYXS 46, K5EJL 41, W5TFW 35, W51J1 35, W51YR/5 30, WBSFDS 25, WASZBJ 25, WBSFMA 22, WBSDBK 21, W5JFZ 21, K5ROZ 21, W5TOP 19, W5QO 18, K5FFH 16, W5LNV 15, W5HWY 14, WBS1MA 13, K5RVF 12, W5EYB 11, K5HVI 9, K5HUA 6, W5KLV 6, W5C8RT 1.

CANADIAN DIVISION

ALBERTA - SCM, Don Sutherland, VE6FK - Asst. SCM: Mrs. Dorez Booth, VE6YL. SEC: VE6XC. During Mar. poor conditions affected all bands. The APSN had trouble but managed to keep going. The following amateurs are out of hospital and back in harness - Asst. Dir. VE6FO, SFX VE6XC, OSL Mgr. VE6FK and NCS VE6VF. EC VE6FM has taken over repeater VE6RPT and is busy with its relocation. FA VE6AGZ reports that the Vulcan County Amateur Club will again perform communications for the Light Horse Assn. endurance test. VE6OY moved to Kamloops. When preparing your summer plans don't forget the International Ham Fest in Summers, near Katispell, Mont., July 21 and 22. Contact WA7JQS, 102 West Sussex, Missoula, Mont. 59801, for information. VE6CS/6 with 1 watt on cw did a nice job for the Alpine Assn. Congratulations to VE6MI on his appointment as OBS. Traffic: VE6FS 30, VE6FK 22, VE6YW 10, VE6AGZ 6, VE6ALO 6, VE6AXH 6, VE6PL 6, VE6AD 5, VE6CE 4, VE6WN 4, VE6EV 3, VE6AEA 2, VE6JK 2, VE6AVV 1, VE6CS/6 1.

BRITISH COLUMBIA - SCM, H.E. Savage, VE7FB - VE7LL and VE7BGJ has been faithfully making the hospital rounds of those reported last month. VE7CN and VE7QT have been in and out of hospital. VE7QT is BC Emergency Measures Communications PR for the amateurs. A very active seminar called by the EMO and attended by VE7s from all districts in the EMO's network. The Forty Meter System Net on 7194 kHz Sat. and Sun. at 1830 GMT, NCS VE7RXD, is improving. This is the old Aurora Net. Vancouver Island Picnic in June is progressing date to be announced soon. Okanagan International Hamfest, July 27, 28. Hamcon '73 in Parksville, Oct. 19, 20, 21. Last Kootenay had a visit by the RI and several made it in the age group of 55 down to 14 years. In closing this month's report I wish to say thanks for allowing me to be your SCM for another two years. Thanks for your support and depending on it for another two years. Traffic: VE7LL 82, VE7CCJ 40,

ENJOY THIS SUMMER'S E-LAYER OPENINGS
WITH THE THRILL OF SSB ON 6 METERS
WITH THE NEW SBE "SIDEBANDER 6"

<p>20 Watts SSB</p> <p>8 Watts AM</p> <p>"S" Meter</p> <p>"Super Shape" SSB Filter</p> <p>Solid State</p>		<p>Synthesized Frequency Selection</p> <p>12v. Operation</p> <p>Compact Size</p> <p>RIT Receive</p> <p>Only \$339.95</p>
<p>Charge It</p> 	<p>SPECTROSONICS, INC.</p> <p>North: 10349-59 S. Western Ave. Chicago, Ill. 60643 (312) 233-8094</p> <p>South: 106 E. Washington St. Mokenca, Ill. 60954 (815) 472-6610</p>	<p>Send For Free Catalogue Now!</p>

Convenient...
... Complete

Mobile? Your log-keeping needs can be met by the ARRL MINILOG. Convenient, pocket-size, it contains proper headings for all necessary entries. MINILOG will help you comply with FCC regs, provide a lasting record of the many pleasant QSOs you'll enjoy the year round. *Spiral bound, 4" x 6".....50¢*
USA, 60¢ elsewhere



At Home? If so, you may prefer more detailed station records, and the ARRL Log Book with ruled 8½ x 11 sheets (also spiral bound to lie flat when open), will make record-keeping a pleasure. Useful also for portable or mobile as well as fixed station operation!... 75¢
USA, \$1.00 elsewhere

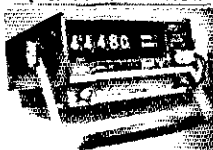
These are available in loose-leaf form (punched for 3-ring binders), 100 sheets.....\$2.00

The AMERICAN RADIO RELAY LEAGUE, INC.
NEWINGTON, CONNECTICUT 06111

DIGIPET-60

Digipet-60
Frequency
Counter
1 KHz-60 MHz
(130-160 MHz with
optional converter)
Reg. \$299

See Nov. '72 CQ and
April '73 QST Reviews



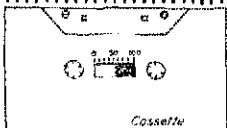
A frequency counter with a range of kHz to 60 MHz (or 130-160 MHz when used with our Digipet-160 converter). With a resolution of 1 kHz or 1 Hz (at 1 ms or 1 s gate times). It can be operated on either ac or dc, with complete overload protection. Plus a stability aging rate of 1 part in 10⁶ week. And the whole unit is a mere 7" deep by 2 1/2" high! Superb precision quality at LESS THAN KIT PRICES. Call or write for literature and trade in or our LOW INTRODUCTORY PRICE. 1 year warranty. Also MIIDA PRECISION AUTORANGING DIGITAL VOLT-METERS (reg. #319) LESS THAN KIT PRICES. Compare before you buy! 1 YEAR WARRANTY.

No one anywhere beats our deal!



AMATEUR-WHOLESALE ELECTRONICS
5817 S.W. 129 Terrace, Miami, FL 33156
Days (505) 233-3431
Nights-Weekends 13057 866-1347

QSOs
EN
ESPAÑOL



QSOs
AUF
DEUTSCH

Courses in Spanish, German, and Japanese designed for amateurs. Enables hams to exchange greeting and signal reports and to chat with foreign hams. Each course has many typical QSOs, technical terms, and slang. Narrated by native speakers.

Spanish course: 75 minutes Spanish dialogue with English-Spanish manual taped on 7" reel 3 3/4 IPS for \$11.95, on C-90 Cassette \$10.95, on 5" reel \$9.95. For German course running 90 mins. add \$2 to above prices. Japanese course 30 mins. same prices as Spanish course. Dual language manuals alone \$2.50. Mailed 3rd class in U.S. PP. Send checks to:

FOREIGN LANGUAGE QSOs, Box 53, Acton, Mass. 01720.

GIVE...
so more
will live
**HEART
FUND**

**WANTS TO BUY**

All types of military electronics equipment and parts. Call collect for cash offer.

SPACE ELECTRONICS division of
MILITARY ELECTRONICS CORP.

76 Brookside Drive, Upper Saddle River
New Jersey 07458 / (201) 327-7640.

MANITOBA - SCM, Steve Fink, VE4FO - RM: VE4LG, PAM: VE4FO. The new Winnipeg IC is VE4IH, please give him your support. VE4VA gave an interesting talk at the Apr. WARC meeting on his homebrew rig. MTN is maintaining its highest representation to Tenth Region Net in years. Newcomers to the net are VE4TY, VE4DR and VE4OW. VE4CR reports MEPN QNI down due to conditions but QTC staying up there, and VE4FO has arranged an alternate-NCS system for the net. Winnipeg Repeater VE4XK frequency is 146.46/146.94, not as previously listed. MTN: 30 sessions, 147 QNI, 69 QTC. MEPN: 31 sessions, 940 QNI, 43 QTC. Let's all take part in Field Day! Traffic: VE4RO 74, VE4LG 73, VE4CR 28, VE4PG 20, VE4DR 18, VE4FA 13, VE4YC 10, VE4FO 6, VE4LU 6, VE4NE 6, VE4DS 2, VE4RV 2, VE4WT 2, VE4HA 1, VE4NW 1, VE4OP 1, VE4OW 1, VE4PA 1, VE4SE 1.

MARITIME - SCM, W.D. Jones, VE1AMR - PAMs: VE1YO, VO1FX, RMs: VO1CA, VE1RO. Congratulations go to CIARB and CH1UA on winning the cw and phone portions of the VE1 Contest respectively. The Nfld. Ham-En-Any will be held on July 27-29, 5 miles west of Gander on Trans-Canada-highway, camping on site and a letter to VO1CA should get you reservations in Gander. For further details write ARCON P.O. Box 266 Gander, Nfld. Yes, there is going to be a Convention in the Maritimes this year. Charlottetown will be the site and Sept. 1-3 the dates. Details write P.O. Box 1232, Charlottetown, P.E.I. APN reports QNI 117, QTC 63, sessions 30. Traffic: VO1CA 113, VE1AMR 69, CIARB 55, VE1ZH 26, VE1AYJ 14, VO1KE 2, VE1AMB 1.

ONTARIO - SCM, Holland H. Shepherd, VE3DV. This is the first opportunity I have had to thank Asst. SCM VE3EWD for keeping things moving while I took a two month holiday in Spain during Feb. and Mar. Field Day '73 will soon be exciting history. The RSO Annual Convention slated for Aug. 17-19 in Kingston which is celebrating it's tercentennial. Get your registrations in now to avoid disappointment. Welcome to two new cw acts operating in Ont. The Pot Lid Net operates on 3620 kHz Sun. immediately on completion of the long running Pot Hole Net on 3760 kHz. VE3GX is NCS and chief instigator of the PLN whose main objective is to allow participants to refresh their cw procedures and at the same time some send and receive practice. The other net is the Ont. Daytime Net (ODN) with sessions on 3645 kHz at 1600 GMT and on 7100 kHz at 2100Z Mon. through Fri. VE3FOZ is acting RM and takes on NCS for the 1600 GMT sessions with VE3FRG looking after the 2100 GMT sessions. The ODN is a slow speed net catering especially to Whitecaners, Handicapped and retired persons in the hope that it would provide instructions in net procedures and message handling, as well as code practice for beginners. Again I would call to your attention to the Continental Traffic Net of the Daylight NTS. CTS operates on 14.313 MHz at 1830 GMT daily. The SCM would appreciate receiving comments from Ont. stations that check in to the CTN. VE3ONT, the Toronto VHF Society, is active in recruiting HF oriented amateurs for participation in June VHF QSO Party and VHF DXing. VE3EMS and VE3DSS are two of the very active QVS appointment holders. Traffic: VE3SB 191, VE3FQZ 139, VE3DPO 115, VE3EHH 101, VE3GFN 99, VE3FRG 70, VE3AWE 67, VE3GT 66, VE3GJG 59, VE3CYR52 VE3DVE 46, VE3FAS 42, VE3DOC 38, VE3GBR 28, VE3ATR 27, VE3NGV 28, VE3DU 11.

QUEBEC - SCM, Joe Unsworth, VE2ALE SEC: VE2BDM. VE2AKM new-vhf mobile unit VE2KT moves to VE3-Land. RAQI met with VE2MO members and VE2AOL maintains VE2AT. VE2DLT on vacation from VE0MAD and VE2AUH active on 20 and 80 meters. VE2UN a new Drake TR4C, four new antennas and Mono band beam. Don't forget Quebec Radio Net will meet 3.775 MHz from 2330 to 0030 at the change of time. VE2LV now VE3. Ex SCM VE2GL visiting Spain and ex-SCM VE2DR was in hospital for a few days. VE2MH and XYL moving to west coast. VE2BB and XYL on trip to Germany. VE2GI now VE3HE. VE2NJ and VE2OS on trip to Trinidad in Apr. VE2-Land had a visit from Ben former VE2DUC and operated on the vhf circuit with 424JS/portable VE2. A repeater forum was held in Montreal area on Mar. 24 and W2ODC was in attendance. HF conditions were not very good for past few weeks. VE3YZ (many call signs) moves back to VE1-Land. VE2s of Que. please try and take a more active participation in the VE/VF contest this year. Contact VE2IS for logs and information. VE2BB is now a member of the proress2LV now VE3GOO at Morrisburg. IUC officials at MARC meeting in Mar. and answered questions from the floor. VE2AVP visited Montreal. VE2ADZ changed jobs. VE2BG another birthday. Repeater VE2ZO may change frequency from 146.46-147.060 to 146.28-146.88 about June 9, 1973. Traffic: (Mar.) VE2DR 77, VE2FC 56, VE2BP 34, VE2AJD 11, VE2ALE 11, VE2DLG 2, (Feb.) VE2UN 16.

**NEW
from
NRI**

Home training in **AMATEUR RADIO**

NRI, leader in Communications, Television, Electronics and TV-Radio home training, now offers the first in Amateur Radio courses, designed to prepare you for the FCC Amateur License you want or need.

Don't lose your favorite frequency

The FCC has said "either-or" on licensing, but to pass Advanced and Extra Class exams, you need the technical guidance as offered by NRI. NRI Advanced Amateur Radio is for the ham who already has a General, Conditional or Tech Class ticket. Basic Amateur Radio is for the beginner and includes transmitter, 3-band receiver, code practice equipment. Three training plans offered. Get all the facts. Mail coupon. No obligation. No salesman will call on you. **NATIONAL RADIO INSTITUTE**, Washington, D.C. 20016.



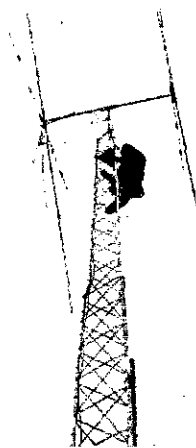
MAIL NOW

.....
: **NATIONAL RADIO INSTITUTE** 50-043
: Washington, D.C. 20016
: Please send me information on Amateur Radio
: training.
: Name _____ Age _____
: Address _____
: City _____ State _____ Zip _____
: **ACCREDITED MEMBER NATIONAL HOME STUDY COUNCIL**
:

UNIVERSAL TOWERS

FREE STANDING ALUMINUM TOWER

**MOST
POPULAR
HAM TOWER
EVER MADE!**
—
**REQUEST
NEW CATALOG
OF
TOWERS &
ANTENNAS**



Midwest Ham Headquarters

For Over 34 Years
HAMSI Write For Free Catalog and Wholesale Prices!

ELECTRONIC DISTRIBUTORS, INC.

1960 Peck Muskegon, MI 49441
Tel: 616-726-3196

Yes!



I would like to become a member of ARRL and help support its many services to amateurs and amateur radio. Here's my \$7.50 (\$8.50 in Canada, \$9.00 elsewhere). Sign me up for a year's membership and twelve big issues of QST! Additional family members at the same U. S. or Canadian address, memberships only (no QST) \$2.00.

My name Call.....
Street
City State..... Zip.....

(Please see the other side of this page for a list of available League publications.)

THE AMERICAN RADIO RELAY LEAGUE, INC., NEWINGTON, CONN. 06111

QS6-73

Invest in us. We're always paying off.



the
good
neighbor.

The American Red Cross

advertising contributed for the public good



CW Filter

MODEL CWF2
10'S PUR SUPER HIGH PERFORMANCE

\$1.95 kit
\$14.95 wired, tested, guaranteed

SPECIFICATIONS

BANDWIDTH: 30 Hz. to 100 Hz. (switch selectable)

SKIRT REJECTION: At least 40 db down 1 octave from
center frequency for 90 db band-
width

CARRIER FREQUENCY: 700 Kc.

INSERTION LOSS: None. Typical gain 1.2 at 100 Hz
0.6-1.5 at 170 to 190 Hz, 2.4 at 80 Hz
D.W.

POWER REQUIRED: ANY positive voltage from 6 volts
to 200 V to 30 units (2 max.)

COMPONENTS: 4 1/2 operational amplifiers, (ideal 741's);
hand matched polystyrene capacitors
and carbon resistors; 4 potentiometers.

DIMENSIONS: 2 inch X 3 inch printed circuit board.

Other Active Filters Available

1000 Hz (100 V)

400 Hz

\$1.95 kit

\$14.95 wired

Low Pass Filter

\$14.95 kit

\$14.95 wired

Please enclose 5¢ cents
 postage on all orders.

WRITE FOR
FREE BROCHURES

MFJ ENTERPRISES

P.O. Box 4940, Mississippi State, MS 39762

SAFETY BELTS—Towee climbing—leather or nylon cotton. Priced from \$37.50 to \$21.00. **LEATHER LINESMAN S.B. CORSET**—Nylon web harness/2 straps (crotch) adj. size (38-48) \$47.50. **NYLON/COTTON WEB S/B** (new)—Nylon rope (anyard/11 mesh (crotch), adj. size (38-50) \$21.50. **FREQUENCY METERS**—Classical out and operating—80-100 MHz 2.00; 1.75 (100 kHz) Cal. RR. Best. Mount \$30.95 case/spare \$39.95. 10-10 MHz 2.00; 2000-5000 Hz 30. 914-30. sim. to H1920B. Excellent read! \$199.00. **PLUG-IN FOR ABOVE HIF-225A**, 10-100 MHz. H1920B. Excellent read! \$165.00. **MOTOROLA HANDITALKI** on 146.94, H23, 1-W out, 2 uv sen.—\$50.00. **MOTOROLA HANDITALKI P23**, 5-W out, 1 uv sen. (vared not supplied) \$165.00. **MOTOROLA BASE STATION 30 W**, 1-uv sen on 146.94. 110 Vdc. Exc. read! \$150.00. **SIGNAL GEN. H1908B**, cal. and checked, 10-400 MHz. Max. freq. 447 MHz—\$200.00.

SEND NAME FOR INFORMATION, Shipping FOB
LINK 1000 Monroe Tpk., Monroe, CT 06468 (203) 261-2219

WORLD QSL BUREAU

5200 PANAMA AVE. RICHMOND CA 94804 USA

THE ONLY QSL BUREAU to handle all of
your QSLs to anywhere; next door, the next
state, the next country, the whole world. Just
bundle them up (please arrange alphabetically)
and send them to us with payment of 5 cents
each.

I would like the following League publications shipped to me postpaid. I am
enclosing payment of \$..... (These prices apply only to the USA.)

Ship to this address:

NAME CALL

STREET

CITY STATE ZIP

- ARRL HANDBOOK** \$4.50
The standard comprehensive manual of amateur radiocommunication
- UNDERSTANDING AMATEUR RADIO** \$2.50
Written for the beginner—theory and how-to-build it.
- VHF MANUAL** \$2.50
A new and thorough treatment of the amateur v.h.f. field
- LICENSE MANUAL** \$1.00
Complete text of amateur regs, plus Q&A for amateur exams
- HOW TO BECOME A RADIO AMATEUR** \$1.00
All about amateur radio and how to get started

- A COURSE IN RADIO FUNDAMENTALS** \$2.00
For home study or classroom use.
- ANTENNA BOOK** \$2.50
Theory and construction of antennas
- SINGLE SIDEBAND FOR THE RADIO AMATEUR** \$3.00
The best s.s.b. articles from QST
- FM AND REPEATERS FOR THE RADIO AMATEUR** \$3.00
For the fm buff.
- HINTS AND KINKS** \$1.00
300 practical ideas for your hamshack
- OPERATING MANUAL** \$1.50
The techniques of operating your amateur station—DXing, ragchewing, traffic, emergencies, etc.

(Please see the other side of this page for an application for membership in ARRL and 12 issues of QST)

THE AMERICAN RADIO RELAY LEAGUE, INC., NEWINGTON, CONN. 06111

QS6-73

NEW COAXIAL ANTENNA CHANGEOVER RELAY



Barker & Williamson Model 377 Coaxial Antenna Changeover Relay is a compact unit providing an efficient and economical method for switching antenna to receive. Receiver connector automatically grounded when in the transmit position.

VSWR 1.15:1
 Frequency Range 0.5 to 150 MHz
 Power Rating 1 KW-2 KW PEP
 PRICE \$11.95

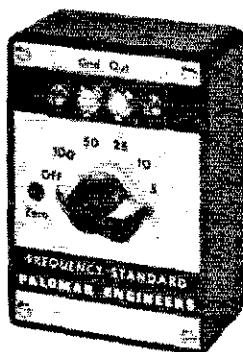
See your dealer or write:

Barker & Williamson, Inc.



Canal Street, Bristol, Pa. 19007

FREQUENCY STANDARD



Only
\$32.50
 (less batteries)
 POSTPAID USA

- Precision crystal
- Fully guaranteed

- Markers at 100, 50, 25, 10 or 5 kHz selected by front panel switch.
- Zero adjust sets to WWV. Exclusive circuit suppresses unwanted markers.
- Compact rugged design. Attractive, completely self contained.
- Send for free brochure.

BUILD YOUR OWN SPACE-AGE TV CAMERA



ONLY KNOWN SOLID-STATE CAMERA KIT! Ideal for experimenters, hobby, education, industry, etc. * High quality * Backed by over six years of lab & field testing * Fully Guaranteed * Converts to any TV set without modification * Simply plug construction manual * Model #J-LA, Series D complete with video \$79.50 postpaid any-where in USA & Canada (less video tube \$116.95pp)

PHONE or WRITE for CATALOG.
 DIAL 402-867-3721

Many other kits, parts and plans available including starter kits, focus-sets, coils, viduor tubes, const. plans, audio subcarrier kit, etc.

BOX 453-QD

ATV Research

DAKOTA CITY, NEBR. 68731

All types of Machines, Supplies & Gear

Send for New Picture CATALOG

10¢

VAN'S
W2DLF
 ELECTRONICS

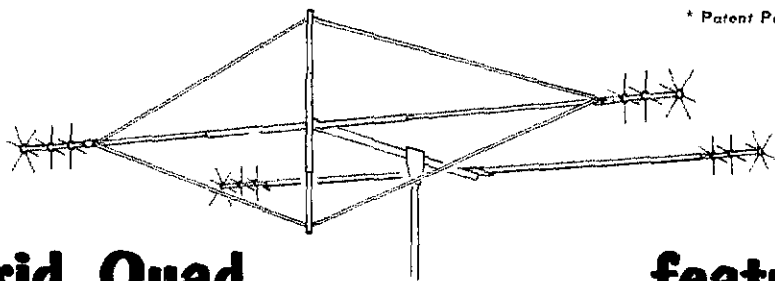
fax too!

3022 PASSAIC AVE
 CLIFTON, NJ 07011
 201-333-3333

PALOMAR ENGINEERS

BOX 455, ESCONDIDO, CA 92025

Hotter than a firecracker!



* Patent Pending

the Hybrid Quad

.... featuring

A BRAND NEW IDEA FOR SUPERIOR REFLECTOR OPERATION. A HIGH Q QUAD REFLECTOR ELEMENT USING MINI-PRODUCTS NEW MULTIBAND HIGH POT LOADING * PROPERLY PHASED WITH A LINEAR DRIVEN ELEMENT FOR MAXIMUM GAIN AND MAXIMUM FRONT TO BACK RATIO. HERE IN ONE SMALL PACKAGE IS PERFORMANCE NEVER BEFORE THOUGHT POSSIBLE WITH MINIATURE ANTENNAS.

- FOUR BANDS - 6, 10, 15, 20 METERS
- HIGHER GAIN
- HIGHER FRONT TO BACK
- MORE BANDWIDTH
- TURNING RADIUS - 74 INCHES
- LIGHTWEIGHT - 15 LBS.
- WIND SURVIVAL - 75 M.P.H.
- 50 OHM FEEDLINE
- 1200 WATTS P.E.P.
- PACKAGED FOR FPO SHIPMENT

model HQ-1 _____ \$7995 am. net

AVAILABLE AT LEADING DISTRIBUTORS

WRITE FOR ADDITIONAL DATE AND CATALOG TO:
 MINI-PRODUCTS, INC., 1001 W 18th ST., ERIE, PA. 16502

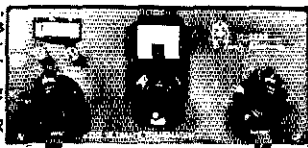


NOW FROM MURCH ELECTRONICS

THE ULTIMATE TRANSMATCH

See Lew McCoy's article July 1970 QST, also 1972 Handbook

- Use with any coax or end fed random wire antenna, ideal for apartment dwellers
- 2 KW P.E.P. (1 KW continuous) 1:1 SWR to transmitter
- 10-80 continuous, including MARS
- Built-in Monomatch SWR indicator
- Heavy duty throughout (4000 volt capacitors)
- Rotary Inductor with turns counter and logging area



12" w 12" d x 5 1/2" h, 8 1/2 lbs
 MODEL UT-2000

MULTIBAND ANTENNA 10 - 80 M

- Field Proven 4 years
- Sealed center insulator, 102 ft. copperweld antenna wire, 30 feet heavy duty twin lead
- Coax fitting to connect twin lead to 52 ohm transmission line (68 feet or more, not included)
- Ready to use. Great on all bands without a transmatch. Even better with the Ultimate Transmatch



MODEL 68A, 2000 w P.E.P.
 MODEL 68B, 1000 w P.E.P.

\$34.50 p.p.
 \$26.50 p.p.

MURCH ELECTRONICS, INC. Box 35 Franklin Maine 04634 207-565-3312

LRL-66 ANTENNA

66' LONG. 80 THRU 10M

Power rating 2 Kw, P.E.P. or over on 80, 40, 15
 On 20 and 10 1 Kw, P.E.P. Transmitter input



Price
 \$45.00
 in Cont.
 USA p.pd.

OPERATES ON 5 BANDS AUTOMATICALLY

1. Loading coils for 80 & 40M doublet operation
2. Adjustable ends to set 80 meter resonance
- 3, 4. Decoupling stubs for 20 & 10 meters

5. Center insulator with female coax connector to take PL-259 plug
6. Fittings on insulators to tie on rope

LATTIN RADIO LABORATORIES

Box 44

Owensboro, Kentucky 42301



Mail your orders direct to us for speedy personal service. On Drake, Hallicrafters, SBE, Pearce/Simpson, Ten-Tec., Mosley & Hy-Gain.

VAN SICKLE RADIO SUPPLY CO.
 Gene Van Sickle, W9KJF Owner
 4131 N. Keystone Ave.
 On the northeast side of
 Indianapolis, Indiana 46205

POINT YOUR ANTENNA ACCURATELY!

Send SASE for information on how to obtain bearing and distance information to over 500 world wide locations. This custom service data is calculated specifically from your own location. Send to: W6WAH,

Dean C. Hildebrand,
 1461 Coronel Ave., Vallejo, CA 94590

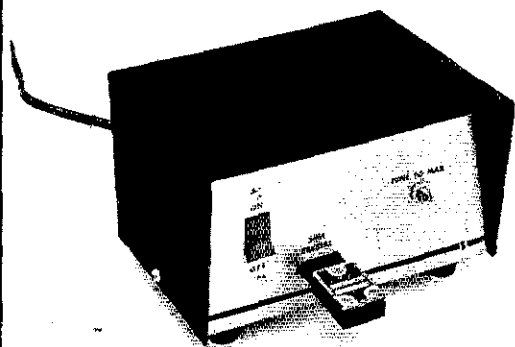


Fig. 1 — Front view of the two-watt solid-state transmitter. The crystal may be used to estimate the relative size of the box.

IN THE 1973 HANDBOOK!

This QRP rig is just one of the many fine construction projects you will find in the 50th Edition of the RADIO AMATEUR'S HANDBOOK. \$4.50 U.S.A. and Possessions, \$5.00 Canada, \$6.00 elsewhere. Clothbound Edition, \$7.50 U.S.A., Possessions and Canada, \$8.00 Elsewhere. Postpaid.

THE AMERICAN RADIO RELAY LEAGUE, INC., NEWINGTON, CONN. 06111

HAM-ADS

(1) Advertising shall pertain to products and services which are related to amateur radio.

(2) No display of any character will be accepted, nor can any special typographical arrangement, such as all or part capital letters, be used which would tend to make one advertisement stand out from the others. No Box Reply Service can be maintained in these columns nor may commercial type copy be signed solely with amateur call letters. Ham-ads signed only with a post office box or telephone number without identifying signature cannot be accepted.

(3) The Ham-Ad rate is 50 cents per word, except as noted in paragraph (6) below.

(4) Remittance in full must accompany copy, since Ham-Ads are not carried on our books. No cash or contract discount or agency commission will be allowed.

(5) Closing date for Ham-Ads is the 20th of the second month preceding publication date.

(6) A special rate of 13 cents per word will apply to advertising which, in our judgement, is obviously non-commercial in nature. Thus, advertising of bona fide surplus equipment owned, used and for sale by an individual or apparatus offered for exchange or advertising inquiring for special equipment, takes the 15-cent rate. Address and signatures are charged for, except there is no charge for zipcode, which is essential you furnish. An attempt to deal in apparatus in quantity for profit, even if by an individual, is commercial and all advertising so classified takes the 50-cent rate. Provisions of paragraphs (1), (2) and (5) apply to all advertising in this column regardless of which rate may apply.

(7) Because error is more easily avoided, it is requested copy, signature and address be printed plainly on one side of paper only. Typewritten copy preferred but handwritten signature must accompany all authorized insertions. No checking copies can be supplied.

(8) No advertiser may use more than 100 words in any one advertisement, nor more than one ad in one issue.

(9) Due to the tightness of production schedules, cancellation of a Ham-Ad already accepted cannot be guaranteed beyond the deadline noted in paragraph (5) above.

Having made no investigation of the advertisers in the classified columns except those obviously commercial in character, the publishers of QSL are unable to vouch for their integrity or for the grade or character of the products or services advertised.

QCWA Quarter Century Wireless Association is an international non-profit organization founded 1947. Any Amateur Radio Operator licensed 25 or more years is eligible for membership. Members receive a membership call book and quarterly news. Write for information. Q.C.W.A. Inc., Box 394, Mamaroneck NY 10543.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't, police, etc. invited to join Society of Wireless Pioneers - W7GAQ/6 Box 530, Santa Rosa CA 95402.

FREE sample copy Long Island DX Assn. bulletin. Latest DX news. Business size s.a.s.e. to the L.I. DX Assn., P.O. Box 73, Coram NY 11727.

EDITING a club paper? Need public relations help? You should belong to Amateur Radio News Service. For information contact Rose Ellen Bills, WA2FGB, Secretary, 17 Craig Pl., Pennsville NJ 08070

WAREN Hamfest, largest family style hamfest in east. Sunday August 19th, @ famous Yankee Lake Park. Giant flea market, swimming, picnicking, all free. QSL W8VTD, Box 809, Warren OH 44482.

AN INVITATION NYC area hams and SWLs are invited to attend NY Radio Club meetings - 2nd Monday of every month, Williams Club, 24 E. 39th St. near Madison Ave. at 8 PM - New members welcome. Interesting programs.

HAMFEST: June 3rd. Save this date for the annual Starved Rock Radio Club Hamfest at Ottawa, Illinois. Write George E. Keith, W9QLZ/W9MKS RFD1, Box 171, Oglesby, IL 61343 for details, or see May QST Hamfest Calendar.

CAPE Cod's fabulous Hyannis! N.E. ARRL Convention September 29 and 30. Flea market, seminars, fun. SSTV, NEDXCC, AMSat, V.L. trips, 2 pools, golf, beaches, sailing. Early bird registration \$3. W1ZQQ, 17 Barnes Ave., East Boston, MA 02128.

MIX pleasure with pleasure. 1973 Hamburg international hamfest on Sept. 15 only 45 minutes from fabulous Niagara Falls. RV parking for weekend only \$2.50 with hook-up. Details: Valerie Orgera K2KQC, 187 Main, Hamburg NY 14075.

HAMFEST: July 1st. Harrisburg Radio Amateurs Club. Indian Echo Caverns between Harrisburg and Hershey off Route 422-322. Registration 10 AM #2 at the door. For info W3JKQ, 624 N. Front St., Womelsburg PA 17043.

DELMARVA Hamfest, August 19, 1973, Harrington Fairgrounds. Registration fee \$2 advance, \$3 at the gate. For information write Delmarva Hamfest, Inc., Route 2 Box 90, Laurel DE 19955.

ROANOKE Division Convention - September 14-16, 1973, Reston VA (near Dulles Airport). Unusual wide interest programs and sessions. Write K4MD, Box 7388, Warrenton, VA 22185.

FOUNDATION for Amateur Radio annual hamfest Sunday 21 October 1973 at Gaithersburg Maryland Fairgrounds.

ANTIQUÉ Wireless Association Annual Historical Radio Conference with programming for old time operators, historians and collectors. Sept. 8, Cananadigua NY. Write W2QY or K2WW.

JACKSONVILLE Illinois Area Hamfest, July 8. Morgan County Fairgrounds. Tickets - \$1.50 or 4 for \$5. WB9CEB, Box 571, Jacksonville IL 62650.

200 two color QSLs - \$5.20, stamp for samples. Mark, WB6NKO, 2534 El Tomas Way, Carmichael CA 95608.

QSL cards?? Samples 35c. Deluxe 50c. Religious 35c. (Deductable). Sakers WBDED, Box 218, Holland MI 49423.

TRAVEL-PAK QSL Kit - Send call and 25c; receive your call sample kit in return. Samco, Box 203, Wynantskill NY 12198

PICTURE QSL cards of your shack, etc. from your photograph. 500, \$12.50. 1000, \$16.25. Also unusual non-picture designs. Generous sample pack 30c Half pound of samples 60c. Raums, 4154 Fifth St. Philadelphia PA 19140.

QSLs, samples 10c. Fred Leyden WINZJ 454 Proctor Av. Revere MA 02151.

CREATIVE QSL cards. Personal attention. Imaginative new designs. Send 25c. Receive catalog, samples and refund coupon. Wilkins Printing Box 787-1, Atascadero CA 93422.

SAMPLES 20c. Harry Sims, 3227 Missouri Ave. St. Louis MO. 63118.

QSLs 300 for \$4.65, samples dime, W9SKR, Ingleside IL 60041

QSLs "Brownie" W3CJH, 3111 Lehigh, Allentown PA 18103. Samples 10c. Catalog 25c.

DELUXE QSLs, Petty, W2HAZ, PO Box 5237, Trenton NJ D8638. Samples 10c.

COMPLETE QSL catalog, 300 cuts, 10 report forms, ink and stock samples, plus ten sample QSLs, 25c. Cornelson's Quality QSLs, 321 Warren St., N. Babylon, NY 11704

3-D QSLs - Hallmark of discriminating operators. Samples 25c (refundable). 3-D QSL Co., Monson 2, Mass. 01057.

DON'T buy QSL cards until you see my free samples. Fast service, economical prices. Bolles, Little Print Shop, Box 9848, Austin TX 78757.

QSL, SWL, WPE cards. Samples 25c. Log books, file cards, decals. Malgo Press, Box 375, Toledo OH 43691.

QSLs, SWLs, WPE samples 15c. Nicholas & Son Printery, PO Box 11184, Phoenix AZ 85017

FRAME Display, and protect your QSLs with 20 pocket plastic holders. 2 for \$1, 7 for \$3, prepaid and guaranteed. Tepabco Box 198T Gallatin TN 37066.

QSLs, multicolor gloss; choose Globe, Eagle or straight key. Report form on back. 100 - \$5.50, QSL cards not personalized. 100 - \$2. Rusprint, Box 1575, North Kansas City MO 64116

QSLs, Second to none. Same day service. Samples 25c. Ray, K7HLR, Box 331, Clearfield UT 84015.

QSL's 300 for \$4.95! Samples 15c. Colourcard Box 326 Topanga CA 90290

QSLs - Dime or your present card brings samples. Airprint, Box 3494, Scottsdale AZ 85257.

RUBBER stamps, \$1.75 includes postage. NJ residents add tax. Clinis Radio, W2UDO, 32 Cumberland Ave. Verona NJ 07044.

QSLs - Custom QSLs, brochure 25c. WFLX QSL Designs, 20 Britton St., Pittsfield MA 01201.

QSLs - Free samples, fast service, good designs. W7IIZ Press, Box 2387, Eugene OR 97402.

PICTURE QSLs made from your photo. 250 - \$8.50. Full color \$35 1,000 Picture cards, Box 5471, Amarillo TX 79107.

CANADIANS free surplus parts catalog. Etco, Box 741, Montreal.

WANTED: Used Drake SPR-4 general coverage receiver. Must be in good condition. Please reply to Jack Hoepfner, Box 1105, Altona, Manitoba, Canada.

CASH paid for your unused tubes and good ham and commercial equipment. Send list to Barry, W2LNI, Barry Electronics, 512 Broadway, NY NY 10012.

CALL Toll-free: (800) 327-7799. Ask for Bob Hoffman (Jaro Electronics Corp.). We buy all types of tubes. Top prices paid for Varian, Eimac, Amperex. Address: 412 27th Street, Orlando FL 32806. In Florida call collect (305) 843-9551.

WANTED: An opportunity to quote your ham needs. 34 years a ham gear dealer. Collins, Drake, Galaxy, Tempo, Kenwood, Ten-Tec, Hy-Gain, and all others. Also \$25,000 inventory used gear. Request list. Chuck, W8UCG, Electronic Distributors, Inc. 1960 Peck St., Muskegon MI 49441. Tel: 616-726-3198

SPIDERS for boomless quads. Hellarc welded aluminum. Al's Antenna, 1339 So. Washington St., Kennewick WA 99336

VERY inter-esting! Next 6 big issues \$1. "The Ham Trader," Sycamore IL 60178

HAM ticket - Amateur radio license course for Novice, General, Advanced, Extra Class. Write for information, Clayton Radio Co. 220 Mira Mar Ave. Long Beach CA 90803.

TRANSFORMERS rewound, Jess Price, W4CLJ, 507 Raehn, Orlando FL 32806

WANT wireless (early) magazines and equipment for W4AA historical library. Wayne Nelson, Concord NC 28025

KLEINSCHMIDT Manuals, Mite KSR, Teletypewriter supplies, gears, parts, Lroids, SASE list, Pyretronics, Box 8873, Ft. Lauderdale FL 33310, W4NYF. Teleprintronics, manuals bought.

NOVICES: Need help for General ticket? Complete recorded audio-visual theory instruction. Easy on electronic background necessary. Write for free information. Amateur License, PO Box 6015, Norfolk VA 23508.

DAH-DITTER Electronic Keyer. Self completing ac supply, sidetone oscillator, speaker, 5 to 40 wpm, many other features. Wired \$44.95. M & M Electronics, 6835 Sunnybrook, NE, Atlanta GA 30328.

WANTED: tubes, transistors, equipment, what have you? Bernard Goldstein, W2MNP, Box 257, Canal Station, New York NY 10013

PREPARE for ham exams! Use Post-Check. Original, expertly devised, multiple-choice questions and diagrams covering all areas tested in FCC exams. Keyed answers, explanations, IBM sheets for self-testing. Newly revised and updated. General Class \$4.25, Advanced Class \$4.50, Extra Class \$4.75. Each applies to its own class only. First class mailing included. Add 25c per copy for air mail. Send check or money order to Post-Check, P.O. Box 3564, Urbandale, Des Moines IA 50322

WANTED C6200E, HQ180AX, state condition and your lowest price. John Waskowitz, 35-30 73 St., Jackson Hts NY 11372.

WIRELESS sets, parts, catalogs, bought, traded. Lavery, 2815 Geneva St., RDI, Egg Harbor NJ 08215.

GREENE Cent Insulators, with or without Balun - A tough number to beat. Eric Dier, Kaufman Industries, Box 817Q, Reeds Ferry, NH 03064.

TOROIDS 88 or 44 mhy, five for \$2.50 postpaid. M. L. Buchanan PO Box 74, Soquel CA 95073.

NEWS: Free sample copy of "World Radio," Amateur Radio's Newspaper. 2609 A Donner Way, Sacramento CA 95818.

WANTED: Straight keys and bugs for collection. Give make, model, condition, price. John Elwood, WTGAQ/6, Box 1243, Lancaster CA 93534.

WANTED for personal collection pre 1930 wireless and wire telegraph and telephone equipment, manuals, books, magazines, pamphlets, etc. Will Nangle, 761 N. 29th St. Milwaukee WI 53208.

SOUPY GROVES, W5NW, celebrates fiftieth anniversary on the 4th June 18 1973 (001-2400 GMT) with a 24-hour operation, 80 through 10, depending on propagation. 30 kHz inside low end of cw and phone bands, concentrating operation on the hour and half hour. Would especially enjoy renewing old contacts and making new ones. 1406 W. 12th, Odessa TX 79763.

HALLICRAFTERS: SX101A, HT32A, absolute mint cond., with manuals, must sell pair \$350. Jim WABZP, 118 Palisade Rd., Elizabeth NJ 07208. (201) 965-0424.

JEHOVAH'S Witnesses who are amateurs write Box Ellis WA4UQQ, 160 Lagoon Rd SE, Winter Haven FL 33880 or call (813) 293-3595.

SPEECH amplifier for Heath SB400 and SB401 plug in module. No wiring necessary - just plugs in - easy to install. Model AU3. \$14.50 plus postage. American Sales Company, 5358 Morita Drive, Swartz Creek MI 48473.

DXers: Tri-ex TM370 Sky needle (70 ft) complete w/work platform, rotor, cage assembly, ladder and tilting gin pole \$1275. Wilson M340, 3-element full size 40M beam \$190. Hy-gain Rotobrake w/control head \$135. Spare Hy-gain rotobrake w/o control head \$85. Alan Kogerup W9HOG, 4508 S. Knoll Top, Union IL 60180. Tel: (815) 923-4455.

TEXAS hams, the Texas slow speed cw traffic net is now operating every Saturday and Sunday evening at 0200 GMT, 3748 kHz. The net is for all Texas hams who wish to familiarize themselves with cw net procedures at a moderate to slow cw rate. QNI and join the net. Jim McCarthy WB5DBK, Temp. Net Manager.

DRAKE ML2 transceiver, mike, au/dc power cords, mobile bracket, 6 receive and transmit crystals. Very good condition - \$233; Drake 2NT xmt, wmt - \$80. Both with manuals, original shipping containers. FOB, WA6MWP, P.O. 825, Capitola CA 95010.

WANTED: Ameco PT pre-amp cash or trade for Novice gear box 3352, Savannah GA 31402.

GLADDING 25 2 m. fm, latest model with xtals, ac supply - \$180. Bill Nelson, WA7SN, 4414A Larch, Mountain Home AFB ID 83648.

SELL: SB-34 transceiver, Atal calibrator, Shure mike, Webster Bandspring antenna - \$225; Heathkit ssb linear amplifier HA-14 with ac power supply HP-24 - \$125, excellent condition - little used because of military service. Cost over \$600, will sell package for \$300. Contact Staff Sergeant Michael Jordan, 8624 Walnut Circle, Alexandria VA 22309.

HEATH linear amplifier HA10 - \$125; HP13 power supply - \$35; Hustler antenna with 75 meter resonator - \$14. W2EDR, 153 Hylian Blvd., Staten Island NY 10305.

SELL: Hewlett Packard, 394A attenuator, like new - \$300. R. Smith, 88 Homestead Blvd., Mill Valley CA 94941.

BEAM, tower spring saddle: Triex W51 - \$386; MW50 - \$250; MW65 - \$331.50; Ham-M - \$99; TR44 - \$59.95; AR22R - \$31.95; HyGain TH6DXX - \$139; 204RA - \$129; TH3MK3 - \$114; Mosley CL36 - \$149; CL33 - \$124; TA33 - \$114; MCQ38 - \$91; S402 - \$143; R214 RGH foam Belden 174 ft; S448 R wire rotor cable 104/14; S216" cable clamps 1kg; Mallory 2.5A/1000 PIV Fuses, 400e 294; Polygon fiberglass spreader - \$7.50; V 6 V600 mA transformer - \$1.95; KV65 IBER - \$5.95; write Quote Clegg FM27B; Hallcrafters FPM300 A; Drake TR72; B & W; SBE; Standard; Eimar; Collins; CDE replacement parts; prices FOB Houston. Warranty guaranteed. Mastercharge, BAC. Write list, Madison Electronics, 1608 McKinney, Houston TX 77002. (713) 224-2668.

NATIONAL NC57 - \$25; DR23 Preselector - \$25; Johnson 275-watt Matchbox with SWR meter - \$60; Ranger I needs pwr xmt - \$30. John G. Tate, W3FW, 9 Diane Dr., Malvern PA 19355.

HEATH GC-1A general coverage receiver, mint condition; Heath ID-101 electronic switch; Heath IM-30 lab transistor tester. Send our telephone number, we'll hassle price! WA2LJK, Box 85, Union NJ 07083.

FOR SALE: Clegg Thor 6, with ac/modulator supply - \$100; Heath MT-1 and MT-1, part with dc supply, \$60; Lampkin 105-B frequency meter and JII crystal calibrator \$150. Frank McJannet, 11557 Evanston North, Seattle WA 98133.

COMPLETE station: 75A-1, HT-37; TA-33 beam, homebrew Novice transmitter, National NCN-R receiver, manuals, SWR meter, phone patch, mike, relay, coax etc. - \$350 takes all. Bob, W2NCGZ, (212) 114-4928, 137-85 75th Road, Flushing NY 11367.

SELL Knight KG635 'Scope, Hallcrafters SX-111 hamband receiver, HP211A square wave generator, all excellent condition. Dana Geiger, 420 West End Avenue, NYC NY 10024. (212) 789-8745, evenings.

DRAKE R-4B (serial 160338) - \$360; like new, only five months old. John Frohlich, 100 E. Middlefield Rd., Mountain View CA 94040. (415) 967-8978.

FOR SALE: Motorola S1067A transistorized audio oscillator with SLN-8214A matching transformer, 110 volt power transformer and test leads - \$175. W. J. Rudyra, 49 Gull Ct., Whitesville MA 01588.

FM Progress line (two) type ME36N, vibrator p/s - \$120 takes both or best offer. PENNAAC, WA3RCA. (215) 886-1859.

NOVICES: HW-16, ready to operate - \$75. George Rossetti, 1515 Hopmewood St., Simsbury CT 06070.

WANTED: R-388 or similar receiver in usable condition. R3HCZ, George Gnebe, 3384 South Gerald, Rochester MI 48063.

EICO 718 "Space Ranger" like new - \$35; Adventurer or DX-40, choice - \$30; Tecraft 6 m with p/s - \$30; HQ-100 - \$69, manuals. A. Smith, Box 132, Oak Ridge TN 37830.

SELL: Drake R4B receiver, five months old, excellent condition - \$350. Norman Moore, 606 East First, Aberdeen WA 98520. Cashiers' check or money order.

R-390A, sell or trade for fm gear. WB6RLF, 1036 Carol, Lafayette CA 94549.

JOHNSON Electronics Sales, your one-stop source for the finest hi amateur equipment. Featuring Clegg Agency, Genoa Hallcrafters, SBE, New-Frontiers, Cush-Craft, Ten-Tec, (Gladding plus a full line of accessories. Write or phone today to get money-saving deal. P. O. Box 332 Gntfinn GA 30223. (404) 228-3831.

HARE books: Ohm to Fleming, large sale and 25¢. WB0DAT.

HAMFEST May 20, 1973 9 AM-5PM, Lakeland Community College, South-190, Exit RL 306, Check-in call WA8SBC, 94 simplex fm, 50.6 m, we will tune band. Information Write LCC, c/o Frank Susel, W8PTE, Mentor, D. 44050, or call Steve Clegg, WB8LD (216) 948-3873, Chuck Kirkpatrick, WB6JQR (216) 255-4173.

FOR SALE: Collins 3253, 312B4, 75S2, 4-1000A, homebrew ground-gnd amplifier, Jennings vacuum ant. push-to-talk. All in excellent working order - \$1600. Other things too. Fred W. Fischer, R.M. 2, Dallas Lake, Wolcottville IN 46795.

SELL: 15W-2 with noise blaker, 516F2, ac supply perfect - \$725; 312B4, new - \$130; 390A rvt perfect - \$493; TR1-EX W-51 tower with Ham-M rotor Cush-Craft 3 el. beam - \$325; DX150A rvt - \$80; EV664 mike - \$30; Astatic 10-D mike & stand - \$25. J. J. Perry, 177 Fans Road, New Hartford NY 13413. (315) 724-5374.

SELL: Hallcrafters HA2, HA6, power supply, six and two-meter transmitters, best offer over \$160; Hallcrafters SX101A ham band receiver, best offer over \$100; Johnson Viking Ranger 1, best offer over \$50. Floyd Chowning, K5CWS, 5637 Prince Edward Ave., El Paso TX 79944.

FOR SALE: Drake TR3, five-band transceiver, recently factory rebuilt, including new power supply and speaker, complete with manual, less antenna and mike - \$450, cash. FOB, W8LMI, 4830 Mays Ave., Dayton OH 45439.

FOR SALE: Hallcrafters SX101A rvt - \$130; Heathkit DX-60B xmt - \$60, with key, xtls SWR meter - 1 day shipping. WN6NPK, (213) 763-6905. Y. Wise, 5444 Ben Av., N. Hollywood CA 91607.

MEMORY Keyer: sell data engineering Memory-Matic, 500B with 8-bit re-programmable memory - \$175. Tom Gallagher, W6NUT, Box 31365, San Francisco CA 94131.

COMPLETE station including mist Collins 75S3B 32S3 30L1 516F2, WB2WDR.

SELLING out extra equipment, Novice and VHF. S.a.s.e. for list. Sydnam, RD 2, Warwick NY 10990.

SELL: Hallcrafters SX-11 - \$135; HT-37 - \$150, both - \$250. Five operating condition. Gary Ferdinand, WA2PJJ, Sunset Trail, Clinton Corners NY 12514. (914) 266-5398.

WANTED: Will pay - \$25 plus postage for Heath "twoer," Beckstrom, Route No. 2, Old Hellgate Village, Missoula MT 59801.

SRF34 w/manual, excellent condition - \$250. WQNM, 1956 Bookbinder Dr., Creve Coeur MO 63141.

YAESU FVDX400 VFO 8400 kHz to 8900 kHz, perfect - \$49. W6RQM.

HEATH HP-23A power supply, carefully assembled and checked, never used, - \$50; GST binders, (2) new, (4) used, with extra wear labels, all (6) for - \$13; Johnson 114-320 key - \$5. WA9UDW, P.O. Box 103, Wautoma WI 54982.

CX7A new in sealed carton latest model - \$2195, used good working condition CX-7 - \$1495; Collins mobile rack for KW42 - \$75; NC200 sbs with ac supply - \$200; Heathkit HR10-B with speaker & calibrator \$70; HEP-170 diodes Motorola, 2.5 A 1000 V, 10 for \$2.90 and 40 for \$19.95; Ham-M rotators, new - \$99.95, limited quantity, hurry! Douglas Electronics, 1118 South Staples, Corpus Christi TX 78404.

SELL: FR-4 frequency meter w/case, 100 kc to 20 Mcs, excellent cond., in shipping case. Will ship collect 100 - \$79.50. E. K. Fussell, 7602 Oak Vista, Houston TX 77017.

SWAN 500, 117 xc ac/pss - \$350; 510X MARKS adapter - \$30; Drake 2-C, 2-AC - \$220; Galaxy 2010+ linear - \$200. All in fine condition with manuals. F.O.B. R. K. Martin, WB9CQJ, 800 Rangeview Drive, Littleton CO 80120. (303) 798-5441.

HEATH 10-14 Scope DCTO 8 MHz, Allied DC2100, Scope DCTO 5 MHz. Will sell or trade for 1296 MHz, transmitter or amplifier. WB9EJF, Buxton ND 58218.

SELL: two RC640 2-meter a-m transmitters, operating; two RC639 2-meter receivers p/w operating. For best offer: R. J. Henriksen, K0KOY, 431 Frank Ave., SE Huron SD 57350. (605) 352-9267.

SELL HR2 with Vanguard preamp, 6 sets crystals & Varitronics, 50-watt amplifier BBLT-143 Huster manuals - \$375, or trade for TR-4. Cliff Brown, WA3GB7, Kane PA 16637. (814) 837-9683.

COLLINS KWM-1, excellent condition with 516F-1 ac supply and manual - \$225, plus shipping. WB4ORH, 3007 Brandemere, Tallahassee FL 32303. (904) 385-3281.

SWAP: New Heath HW-7, factory checked and aligned for new condition. Unique wire tuner, Frazier, Box 132, Standish ME 04084.

SELL: Drake TR-3, AC-3, MS-4 - \$350, you pay shipping. WA7QYG, 375 Orchard Ave., American Fork UT 84003.

FOR SALE: IGC-170C, manual, carton, very good condition - \$155. Wanted: Director for TA33, Michael Lombardo, W3FAE, (301) 848-5188.

WANTED: 4X250B and 4D32 tubes. Tom Gunther, 716 So 8th St., Alhambra CA 91801. (213) 282-3327.

CRYSTALS Airmated: General purpose, MARS; Novice, active FT-243, all frequencies, minimum five 40 m, 15 m, 10 m - 99¢ each, 80 m - \$1.59, cover bands inexpensively - rock solid. Less than five 80 m - \$1.75 other \$1.50. Novice - four band, eight crystal, edge limit and QSO - package \$9.95. 40 - 160 m special FT-243 base \$1.90, five \$1.75 each. GP: FT-243 01% 32 ft. 3500 - 3600 \$1.90 each, (ave \$1.75), (nets, ten same \$1.45), 1700 - 3499, 8601 - 13000 fundamentals, 10,000 - 30,000 overtones \$2.95. Add 50¢ each for .005% .75¢ for HC-6/u above 2000. Airmail 15¢/crystal, 1st cl. 10¢. Free order-listing. Bob Woods, W0LPS, "Since 1933," G-W Crystals, Marshfield MO 65706.

ELENSCHMIDT teletype machines all kinds. Inquire for prices. Andy Electronics, Inc., 6431 Springer, Houston TX 77017.

SELL: Collins KWM-2, matching a/c supply. One year old. Few hours on air - \$1000 firm. No trades. Ted Balan, K8JFX, 5677 Waterbury Ave., Maple Hills OH 44137.

QUAD kit - \$12, kit contains boomless spider mount, precut, tuned wire elements for 15 meters and instructions. Spider mount alone \$9. WAS, 404 Sanders Rd., SW, Huntsville AL 35802.

TR-22, 50 watt dycomon, gain ant., extra xtals. May separate - \$15, or trade. Dave Leonard, WA7VKC, 4296 SW Sunset Dr., Lake Oswego OR 97034. Tel. (503) 636-2379.

HOME for sale: beach, marina on I.L. Sound, 60' lower, beam, radio room, split lvl, 4 bdrms, 2-1/2 baths, rec rm, bsmt, 4 appliances, wet bar, patio, control a/c, gas heat, humidifier, rugs, drapes, dbl garage, elec. owners, fireplace, center hall, sprinkler syst, landscaped, beaut. area, 2 mi. NYC. The house with everything - \$85,000, W2AS1, call for appt. New Rochelle NY. (914) NE3-7077.

HEATHKIT DX-60B; HR-10B; HRA-10-1; HG-10B - \$130 or sell separately. Ben Lamp, 107 Yorkshire Dr., Pittsburgh PA 15238.

HW-16, professionally built, SO-239 ant. connector, spare tubes, like new - \$90. WA6TFW/S, 1728 Pulliam St., Apt. 35, San Angelo TX 76901.

WANTED: SB200 in good working order. Offers to Jon Goodson, PA4DSR, 7 Hessian Way, Cherry Hill NJ 08003. (609) 429-4479.

MAGNUM Six, rf speech processor for Heathkit models, excellent condition, used one month - \$90. Will Orman, WB4MRI, 4405 Guinea Rd., Annandale VA 22003.

SELL: Drake TR4 AC4 RV4 MS4, perfect mint condition - \$540. Kimmels, 1156 45th St., Blynn NY 11219.

SX-115 - \$250; Apache/ISB-10 - \$150; Heath keyer - \$30; Low pass filter - \$8. W5DZA, Box 788, Santa Fe NM 87501.

QUALITY stainless, other, threaded, washer, hardware! Guying Accessories! Insulators! Walk, WB8LR, 29716 Briarband, Southfield MI 48075.

WANTED: Manual for Globe linear LA1. WB6DWH, 526 Poplar Ave., San Bruno CA 94066.

HT44, SX117, PS150 - \$400; HA1 - \$40; DB23 - \$40; 250 W Matchbox - \$20; Darrion KW - \$125; Hustler Whip KW15/20 coils - \$40. K5MWZ, (817) 292-5764.

SELL: Gonset SSB2 - \$195; P&H linear - \$99; Robyn 500 - \$495; CE-10A - \$48; Hallcrafters FMP300 - \$548; Millen Grd Dp 90651 - \$65. W8EPJ, 419-332-6132, Fremont OH 43420.

SELL: Transformers, chokes and miscellaneous items no longer in use here. Good clean items at low prices. S.a.s.e. for list. W3KB, 1061 Beverley Road, Jenkintown PA 19046.

VIDEO tape recorder Philips EL3403A, unopened prize, retail - \$150. Best offer over \$600 or trade for ham gear equivalent retail value. P. Hendricks, Box 6114, Burbank CA 91505.

MICRODOT Model 2435C-4 400-550 MHz, xmtr, original cost - \$19,500. Malfunctioning, so sacrifice for \$300, 118 page manual included. WA6ENF, 214 Jackarand, Vandenberg AFB CA 93437.

SWAN 270B, all band transceiver, 260 W PEP, mint condition, with Turner mike - \$329; Johnson Viking Adventurer, 50 W cw transmitter, works fine - \$25. Chris Conery, WB2BSC, 110 Glenwood, Jersey City NJ 07306.

HALLICRAFTERS SR-400 transceiver 2-1/2 years old, ac/dc supplies included - \$550; SB-144 2-meter fm mobile, includes 9 channels Senter xtals, 2 months old - \$265, all superb mint. Harry, WA1JXL, RFD 2, Ledyard CT 06339. (203) 536-2521.

HEATH-All brand new, never used, professionally wired and tested; SB-610 Monitor Scope - \$85; HM-102 Wattmeter - \$30; HD-10 Solid-State keyer - \$35. Also brand new condition, little usage, HDP-91A desk mike - \$20. WB8HRQ, 32548 Holden Dr., Warren MI 48092.

SELL: Heath gear, professionally wired, mint condition; SB-220 - \$320; SB401 - \$260; SB-303 with cw filter - \$275; SB-610 - \$50; SB-21A mike - \$20; HD-10 keyer - \$30; SB-600 - \$15; HD-15 patch - \$15; Hy-Gain rotor-brake - \$150. FOB W7AVS, 7818 E. Oak St., Scottsdale AZ 85257. (602) 946-3144.

ROSS and white or Kyokuto Denshi 2-meter fm, 10 watt transceiver. Internal tone burst with 4 tones. Crystals for 52/52, 76/76, 94/94, 04/64, 16/75, 22/82, 34/94, 37/97. See 73 magazine 4/73 - \$225, 8 hour battery and charger - \$25; heavy duty leather case for radio and battery - \$15. Tiny Tone Touch Tone kit - \$30. K6ESC, 20650, Lomita, Saratoga CA 95070. (408) 867-3912.

SIGNAL/One: Mint CSTA - \$1295; new - \$1895, full warranty, trade, Payne Radio, Box 525, Springfield TN 37172. (615) 34405573, nights (615) 384-5643.

"HOSS trader Ed Moory" says he will not be undersold on cash deals. Shop around for your best price and then call or write the "HOSS" before you buy! New Regency HR-2A, two meter fm transceiver, 15 watts, regular - \$229; cash - \$179; new Drake TR-4 - \$495; new demo L-4 - \$599; new Gonset 2 kW linear, regular - \$660; cash - \$359; new Kohn 50 ft. heavy duty foldover tower, prepaid - \$225; new Mosley CL-33 and demo Ham-M rotor - \$215; used equipment: Demo Ham-M - \$79; TR-4 - \$329; L-4 - \$319; TR-4 - \$379; Mint KWM-2 \$595; 325-3 - \$649; Moory Electronics Co., P.O. Box 506, DeWitt AR 72042. Tel. (501) 946-2820.

FT-101 Yaesu sbs, a-m, cw transceiver, like new, 260 watts PEP with built in 110/220 volt ac and 20 volt dc power supply. Complete with power cables, microphone, and manual. Cw filter and fan. \$555. Schedler, W3GQS, 14322 Heatherfield, Houston TX 77024.

HT-32 Hallcrafters sbs transmitter. Turner 454 mike, 2 new 6148B, coax relay; good condition - \$175. No shipping. Will deliver 100 miles. Howard Ball, WB8HZS, 227-1/2 S. Bingham, Lansing MI 48912. (517) 485-3509.

Ham-M rotor, 2 element rt hander, 10, 15, 20, and 3-element 20 m monobander, Hy-Gain - \$145. WA2REQ, (212) 763-8726.

REGENCY HR2, crystals for 28/88, 34/94, 22/82, 01/61, 94/94, and other directx, with ac supply. 12 frequency board, and FT-101 power, \$200; HW-16 and G102 - \$100; HG-70C - \$165. W5BOP/S, 8360 Park Place No. 26, Houston TX 77017.

FOR SALE: DX-60B - \$60; HG-10B VFO fb construction - \$30. Randy Connett, 2471 Lunada Lane, Walnut Creek CA 94595.

LIST of gear for sale: Ranger II - \$95; kW pwr supply, ARC-5's. K2VOC, H. Meiseles, 1523 45th Street, Brooklyn NY 11219.

AMATEUR vacation, Livingstone Lodge, Mascota Lake NH 03748. Cozy cabin for two weekly - \$55; swimming, fishing, boats, sports, ham radio, showers, fireplaces, housekeeping, children's camp sites, literature. Q. Livingstone, W2LA.

BADLY needed for school science project: RAK-6, 7, or 8; RBL; broadcast band ARC-5 receiver, maybe even AN-URM-6B; large amounts of tape for Rustrak recorder; Rustrak recorder. Write Dr. Bob Ajmonis, 411 Keith, Missoula MT 59801. Or call evenings collect: (406) 543-5359.

CONNET GSB No. 100 - \$85; Vik 2 VFO - \$60. Signal diodes 1000 for \$10. K2JSO, 2043 E. 52 St., Blynn NY 11234.

COLLINS 75A4, 3 filters, speaker, excellent condition - \$350. William Power, WB2OAD, 35 Sunset Ave., (609) 882-7956.

WANT: WB-200, WB610 in mint condition. Also Johnson kW Matchbox, No. coupler. W7IUJ, 89190.

HEATH tower & 12 V dc mobile power supply, receiver, excellent, unit needs work. Two manuals, cables, meter & crystal - \$25. A. J. Cappeto, WA2PRQ, P.O. Box 173, Union NJ 07083.

HW16 transceiver - \$90; Heath 2cr, complete - \$35; Clegg 22er 2 m - \$145; Drake 2C, 2CS, like new - \$185; Hallcrafters SR160 w/ps 150 - \$185; CE20A w/458 VFO, mint - \$68; W2FNT, 18 Hillcrest Ter., Linden NJ 07036. (201) 486-8917.

HALLCRAFTERS HA-4 solid-state electronic lever, excellent condition - \$50; Millen grid-dip meter model 906B1, excellent condition - \$60. W2HC, (516) 333-1079.

MUST sell - college bound - Heath SB610 - \$65; Heath HD10 (with external relay driver) - \$30; Ten-Tec PM3A - \$55; Drake TR-22 (yds for 2 channels) - \$150, all excellent condition. Stated prices or make offer. T. Rodgers, WB2NMH, 911 Park Avenue, New York City NY 10021.

SELL or deal: New assembled Eico power supply, A-OK - \$50; complete, current C.I.E. FCC first class course - \$35; Heath Iwoer, A-OK - \$25; Heath GR-54 communications receiver - \$65; HiB fast scan TV camera, new video, works good - \$75. Nick Swan, WB8RN, Ludington MI 49431.

SELL: TA-33 JB - \$50; Hy-Gain balun - \$5; Tymeter 24 lawn clock - \$5. You pay shipping. W5BWA, 5812 Hiawatha, Alexandria LA 71301.

WANTED: 65 to 85-foot Heights crank-up tower or equivalent for six or more square feet of antenna free standing. Write Bob Sands, WA0RDM, 1656 University Blvd. W., Silver Spring MD 20902.

WANTED: working SB-10, reasonable. WA2ECI, 11 ft. George Hill, NYC NY 10040. (212) W12-5818.

FOR SALE: Swan 270 (ac/dc), perfect - \$310. Near Washington DC, (703) 347-6727.

WANTED to buy earl, wireless gear, state price and condition. Richard Becker, 1021 Chestnut, Waukegan IL 60085.

SELL: Henry 2K-2 console linear, perfect condition - \$500. Must take away yourself. M. Lieberman, 53 East 38th St., Paterson NJ 07514.

SELL: 1972 Signal/one CX7A, with operating manual, used six months, mint condition - \$1700. 1st ship; Mosley TA33 - \$40; Heath HDP-21A mike with jack for CX7A - \$19; Vibroplex keyer paddle - \$18. Joe Giovenco, WA9WPM, 3052 Willardshure Road, Joliet IL 60435.

GALAXY FM210 fm transceiver with ac power supply - \$125; Drake MN4 - \$60; Heathkit HW12A - \$75; Heathkit HW17A, 2 meter am transceiver - \$75. All in very good condition. John O'Rourke, WA5WRC, 4142 East 36 Place, Tulsa OK 74135.

WANTED: Collins noise blanker for KWM-1, Frank McJannet, 11557 Evanston N., Seattle WA 98133.

EXCELLENT SX-111 receiver - \$100. I ship. WB4FJO.

SELL: 48' height aluminum self-supporting tower - \$75; Mosley 2-element 3-band quad - \$50; Mosley 80' & 40-meter trapped inverted V with Hy-Gain BN-86 balun - \$25; CD TR-44 antenna rotor with 200' B/C cable - \$40; 300' RG-58 coax cable - \$25; misc. ham gear listed on request. FOR, Evansville, Indiana. John G. Mathias, 721 South Meadow Road, Evansville IN 47715.

WANTED: Cabinets for DeForest D-17 Radiola IV; chassis for Radiola II and Sleeper regardless of condition, other old radios and misc. parts. Horvath, 522 Third St., San Rafael CA 94901.

FOR SALE: Several unused Squires-Sanders Model BSSG-1, spectrum generators, originally \$600 ea., will sacrifice at \$69.95 ea. Send for data. W2EJ, 1903 Sunset Ave., Wanamassa NJ 07712.

FOR SALE: Eico 722 variable frequency oscillator, perfect condition 3 1/2 - 30 Mcgs. Make offer. L. Marko, 70 Beech Terrace NJ 07470.

SELL: Heath SB-610, R-390 receiver; CV-157 sbb adapter. Best offer or trade for? Can pack and ship. K9HJU, (312) 349-9002.

SELL: Eico 753 transceiver with ac supply, transistor VFO, good cond. - \$120. WA2GTR, 91-21, 222 St., Queens Village NY 11428.

STANDARD 146A, still in factory carton with warranty card - \$245. WA0AQ, Box 17222, Nashville TN 37217. (615) 834-8999.

WANTED: sbb transceiver, tri-band beam, good condition and priced right. K4GVW, Box 482, Brewton AL 36426.

HOOSIER Electronics - your ham headquarters in the heart of the Midwest where only the finest amateur equipment is sold. Individual, personal service by experienced and active hams. Factory-authorized dealers for Drake, Regency, Standard, Clegg, Ten-Tec, Galaxy, Hy-Gain, Cushcraft, Mosley, Ham-M, Hustler, electronic pocket calculators, plus many more. Orders for in-stock merchandise shipped the same day. Write or call today for our quote and try our personal, friendly Hoosier service. Hoosier Electronics, R.R. 25, Box 403, Terre Haute IN 47802. (312) 894-2397.

WANTED: T4X, T4XB, AC, spr 4, SR160, NCX 3 or other cheap transceiver; KWM2, FT 101, Cygnat, WA5AAO, Box 335, La Grange TX 78945.

SELL: Heath HW-16, HG10-B-VFO, ex. cond. VFO never used - \$125. WB6MKA, 615 E. Walnut, Glendora CA 91740.

REWARD \$1,000, reward \$1,000, reward \$1,000 - to anyone having or locating information of my 1942 licensing that will be accepted by FCC examination taken at Nashville, Tennessee, November 20th 1942 at age 12. Received only operators license due to war. Federal Records Center has charge card indicating 1942 license, but FCC claims error. Possibly someone understanding files could locate license. If you know anything that could help it would be appreciated. Herbert Louis Ripp, WB6QH/WBDE, 2755 Susanna Drive, Cincinnati OH 45229. Phone (513) 385-8027. Acceptable information gained from more than one source, reward divided equally. Reward \$1,000, reward \$1,000, reward \$1,000.

SUPER-T-Enna, designed by Mike Ercolina of Telvex for K4GHE. One price takes all, engineering drawings, cables, antenna, rotor and factory manuals for both. Antenna, Telvex 20 Mtr. 646 wide-spread beam; F wd Gain 1.4 dB. F. B. Ratio 28 dB. Motor Telvex 477-DR-15 with 1/4 Hz motor, System cost under \$1,500. First check for \$650 takes all. M. R. Burger, 1811 Grant Street, Elkhart IN 46514. (219) 264-7250.

ONE Tempo FMP with all accessories and four sets of crystals for two-hundred dollars (\$200); Drake FET converter with power supply for eighty dollars (\$80). Thomas S. Jacobsen, 3371 Decatur Ave., Bronx NY 10467.

GREATER Washington DC area Foundation for Amateur Radio offers an information/hospitality service. Special consideration is given to visiting foreign amateurs and a volunteer staff of linguists is available. Contact Hospitality Chairman, Bill Parrott, WA9RL, 8548 Georgetown Pike, McLean VA 22101. Phone (703) 893-8383 between 8 a.m. and 8 p.m.

DRAKE 2-C, 2CQ, 2AC, 2NB and 2NT complete station must sell \$395. 6176749162, Fred Bopp, 1 Shaw Street, Fall River MA 02724.

ANTENNA systems - De VE2AES/W6 - \$65, homemade steel mast/tower with 20 M Telvex 342E; Hy-Gain Duo-Bander 10/15 3 elements, prop-pitch rotor with supplies, Selsyns, map indicator, guy wires, etc. - \$350; De WB6JWY, similar tower and accessories but with homemade copy of 20 m Telvex - \$525; 3-element 15 m Hy-Gain - \$275. Both where is, us is, you must take down, will help, not ship. Tel (714) 541-9407.

HT32 - \$150; HQ111 - \$100; TX10, new - \$45; Lamkin 205A fm, mod meter - \$180. WA5OHF 805 E. Aztec, Gallup NM 87301. (505) 863-6277.

MOTOROLA 6 m HT, 53/52.525 duplex/simplex - \$55; Heath Seneca, 6-2 m trans. - \$95; Eico 753 sbb xcvr w/751 ac ps - \$140; modulation scope - \$15; VLF receiver w/variable ac ps - \$25; 8 Knight slope VFO - \$45; 12 FT-22m crystals, 25 kHz steps, etching-grinding kit - \$55; crystal marker oscillator 80-374 M, 100 kHz, 1 MHz, 5 crystals - \$19 w/above - \$68; tape recorder - \$10; 20 k ft tape - \$13; resistor rack for 52 standard values w/120 resistors - \$20; BNC connectors 25¢; test gear. WA9JNC, 1336 Corona Apt. 4, Denver CO 80218.

QUITTING ham radio. Have NCX 1000, recently factory overhauled, HW100 and HP23 power supply, Drake 2NT, 2C, 2CQ. All good condition. Sell for best offer, you pay freight. M. Alexander, 2114 Caton Ave., Brooklyn NY 11226.

WIWQC selling out: Telvex 15 m 317B; Telvex 20 m 446, 90 ft. Rohn 25 tower; Ham M rotor; 160 m inverted V; 40 m inverted V; 2 75 meter slope VFO. Contact Steve Layman, Mierow Road, Coventry CT 06238. Telephone (203) 742-6220.

TUBES wanted highest \$\$\$ paid. Add 10% bonus to any offer you receive for the types we require. (Free bargain catalog) CEO, 2115 Avenue X, Brooklyn NY 11235. (212) 646-6300, anytime.

PROTECT your equipment with new solid-state keyless auto alarm. Automatic alarm cutoff and reset. Not current triggered. Little wiring required. Made in USA. Kenmore Electronics, Box 715, Forest Hills NY 11375.

TAKE your pick from this wide selection of sbb transceivers, all fully reconditioned with 90-day guarantee: Drake TR-3 - \$399; TR-4 - \$419; Eico 753 with both ac/dc - \$155; Galaxy GT-550A (ac) - \$400/8C - \$550 A - \$449; Kenwood TS-511S/PS-511S - \$429; SBE SB-34 - \$269; Swan 175 with both ac/dc - \$129; 240/117/ac - \$219; 250/117XC - \$249; 350C - \$279; 500/117XC - \$419; WRL Duo-Bander 84 with ac or dc - \$129. More arriving daily. Write: Burghardt Amateur Center, Box 73 Q, Watertown SD 57201.

SALE: Hallcrafters model 33A, linear amplifier, full gallon - \$225; National 2000 excv, w/power supply and spkr - \$225; Johnson 275-watt Matchbox - \$35; Heathkit DX40 - \$20. All in fine shape, all in cash. James Little, WA9PGN, 516 Harding Court, Culver IN 46511.

WANTED: Ten-Tec PM3. WB0BJP, Paul Juon, Frazee MN 56544.

SELL: SB10. Best offer. K2ODZ, Audubon NJ 08106.

FOR SALE: Collins KWM2, 312B-5, 516F2, 351D2 and 516F-2 - \$1000. W6SWK, 560 Fair Oaks, Santa Maria CA 93454. (805) W67-1433.

FOR SALE: HW-32A, HP13A, mike, mobile ant., like new - \$125. Dave Thomas, 81 Rosewood Terrace, Lakeview NY 14855.

VLF receiver comparator, wanted Fluke 208, Tracor 598K h.p. 17 A; also want Tracor 527A freq. difference meter. Sell HP 608 - \$200. Bill Smitherman, WA4YFI, East Bend NC 27018.

WANTED: 1945 CQ magazines, have QST, CQ, Radio, etc., trade or sell. Carl Hvambal, W0LV, 5447 Chicago Ave., Minneapolis MN 55417.

CONTACT us for new or reconditioned Kenwood, Tempo-One, Drake, Collins, Hy-Gain, Mosley, Henry linear, towers, antennas, rotators, other equipment. We try to meet any deal and to give you the best service, best price, best terms, top trade-in. Write for price lists. Try us, Henry Radio, Butler MO 64730.

MOBILE ops - completely shielded ignition system kits available for most U.S. cars 1965-72. Alternator, generator, and regulator filters, feed-thru capacitors, copper braid in stock. Write Summit Enterprises, 36 Winchip Road, Summit NJ 07901.

SHACK for sale: Hammarlund HQ-110C receiver - \$110; Johnson Viking II, 180 watts - \$99 w/VFO. Both excellent. Heath HR-10B - \$40 as is. WA1NPS, 19 Wilden Rd., Wellesley MA 02181.

HEATH rig SB-102 xcvr., SB-200 linear, HP-23A pwr. sply., and SB-600 spkr. All in brand new condition, less than eleven hours usage on each component. Each professionally wired and tested. Make offer. WB8HRQ, 32548 Holden Dr., Warren MI 48092.

SELL: Vesto 33' tower - \$95; HG-10 VFO - \$30; kW lowpass filter - \$5; typing reper. receive - \$15; various meters and amtg tubex, stamp for list. W8KV, FOB 4, Chiffcothe OH 45601.

SELLING WB6ARC estate. Complete station, antenna, tower, transmitter, receiver, test gear, ham and TV. Separate or intact. Write for list. Ray Madsen, WA6ZON, 914 Sandra Court, Brea CA 92621.

TRADE or sale: Mosley classic beam. Want 2-meter gear. WB5DCE, 2202 So. 43, Temple TX 76501. (817) 778-1253.

COMPLETE station: HT32, Drake 2B Mod. 15 teletype w/base and tone boards, TR44 rotor, plus many accessories - \$500 takes all. D. Turfaster, 6 Pin Oak Lane, White Plains NY 10606.

SELL Johnson \$40 hand-held fm transceiver (see June, 1971 QST). Telescoping and dinger antennas, Crystals for 28-88, 34/94-94, 31-91. Two-channel conversion kit - \$175, postpaid. W1RU phone evenings (203) 658-7307.

COLLINS 62S1 with 4CX250B, all cables - \$435; PM-2 portable supply - \$65; Heath SB-303 with all filters SB600 speaker - \$225, postpaid. Anywhere in U.S.A. KH6HSW, 91-926 Akaholo St., Ewa Beach HI 96706.

FOR SALE: Motorola HT-200, Nicad, 94/94, 34/94 - \$225; new Collins KWM-2 12 V dc power supply - \$50. WB6KCN, 12030 Washington Bl., Los Angeles CA 90066. (213) 398-0680.

CUBEX quad SX glass arms, two end spider castings, boom mast \$45, 300 feet RGRU coax 11 cents foot. W6UCJ. (213) 342-5654.

FOR SALE: FTDX660, A1 condition - \$350. WB2LTS, 133 N. 19 St., Wyandanch NY. (516) 643-2412.

WANTED: manual Heath AT1 transmitter. Carlton M. Ozias, 463 Delmar St., Philadelphia PA 19128.

DRAKE 2-C - \$190; HT-37, excellent - \$175; HT41 linear mint - \$200; HW22-A, new, excellent - \$95. Mike Boger, 2413 N. Star, Stillwater OK 74074.

GONSET Communicator III, 2 meters - \$100; Gonset 3063 2-meter power amplifier - \$75, package - \$150; Motorola SB32AC with Nicad 94/94, 34/94 - \$125; Heath HY-20 - \$110; HR-20 - \$25; HP-10 - \$35; Hustler 80-10 mobile antennas mast mount - \$35; package - \$245; you pay shipping. W5PNY, 2506-A 35th St., Los Alamos NM 87544.

FOR SALE: QST June 1946 complete until December 1972 except for Jan '52, Dec '61, Feb. '63, Jan. '66, Nov. '67. Highest bidder to order or pay transportation. James Martin, 95 High St., Shrewsbury MA 01545.

SELL Sideband Engineers SB-36 with ac supply and many extras - \$750. R. Gould, KH6HLE/1, RFD No. 4, Colchester CT 06415. (203) 537-2847.

WANTED: SRE-34 transceiver or similar ssb rig. Frank, WA4VLL, Box 566, Clarkton NC 28433.

WANTED: 2 kW PEP linear. K6HER, 575 Grand Ave., Colton CA 92324.

DRAKE T4XB xmtr, R4B rcvr, MS4 with power supply, MW-4 Matchbox, Genlec Dummy, misc purchased Nov. 72, logged one year of QST. Offer valid to conquer. Best over \$800. WB8JLW, call collect 614-866-4323, Charley Hummel, Rt. 3, Orient OH 43146.

SELL: Homebrew 2 kW PP4-400A's/ps - \$185. TH6ODXX new/unrated - \$150. W2UGM 66 Columbus Ave., Closter NJ 07624. (201) 768-1884.

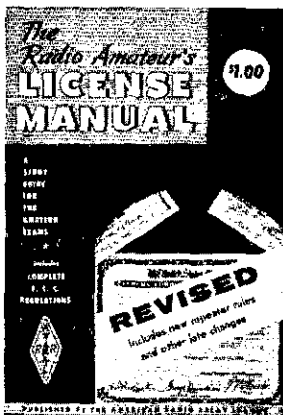
NOVICES! Complete beginning cw set-up. Lafayette HA350 rx, DX-60 HD-10 keyer. All absolutely mint condition. Package please - \$200. Ex-WN0VYK, 2222 Vine, Apt. 208, Lincoln NE 68503 or (402) 475-8124.

ALL Automatic N7 Indicator No. 74, variable input - \$175; HP Signal generator and test gear, swap for ham equipment. List s.a.s.e. W4AFI, Box 4093, Arlington VA 22204.

METERS, parts, catalog. Box 393 QST, Bethpage NY 11714.

DC power supply, HP-12B, new assembled - \$75; two 4R500's, 100 hours, - \$30 or trade. Dave Powell, WA4BR1, A-111 Cooperstown Lexington KY 40508.

RECEIVER: Selling Mosley CM-1, ham bands only, just aligned, manual, perfect - \$100, plus shipping. Fox, W1GNZ, 46 Guilford, Harwich MA 02645.



69th EDITION

Regulations change from time to time, and every amateur should be aware of the latest changes. The best source for the latest information is the current *LICENSE MANUAL*.

Complete FCC Regulations - in addition to sample questions for Novice, Technician, General, Advanced and the Extra Class examinations.

\$1.00
POSTPAID

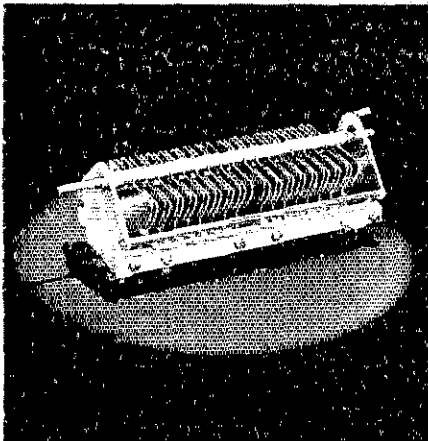
The AMERICAN RADIO
RELAY LEAGUE INC.

NEWINGTON, CONN. 06111

Designed for



Application



16000 Series

Transmitting Condensers

A new member of the "Designed for Application" series of transmitting variable air capacitors is the 16000 series with peak voltage ratings of 3000, 6000, and 9000 volts. Sturdy construction, thick, round-edged, polished aluminum plates with 1 3/4" radius. Constant impedance, heavy current, multiple finger rotor contactor of new design. Available in all normal capacities in single and double sections.

**JAMES MILLEN
MFG. CO., INC.**

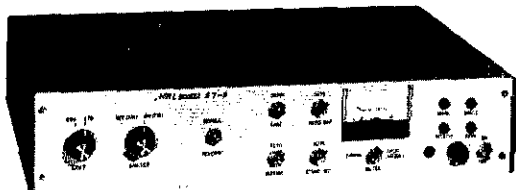
MAIN OFFICE AND FACTORY
**MALDEN
MASSACHUSETTS**



Index of Advertisers

Adirondack Radio Supply	122, 124, 132,
Amateur Electronic Supply	
Amateur License Instruction	
Amateur Wholesale Electronics	
American Radio Relay League	
Antenna Book	
Course Book	
Handbook	
License Manual	
Log Book	
Membership	
Policy	
Publications	
UAR	
World Map	
Amtech	
Antenna Specialists Co.	
AIV Research	
Barker & Williamson	
Bitell	
Clegg Division of ISC	
Cleveland Institute of Electronics	
Comdel Electronics	
Command Productions	
Cubex Company	
Cush Craft	
Dames, Ied	154
Datak Corp.	
Drake, R. L.	
Dyrborn	
Eamac	154
Electronic Distributors	
E. S. Enterprises	
E-Z Way	
Foreign Language QSOs	
General Aviation	
Gotham	
Gregory Electronics	
Hal Communications	
Hallcrafters Co.	
Ham Radio Center	
Harrison Radio	
Heath Co.	
Herry Radio	Cor., II Coy.
Hildebrand, Dean C.	
Hobby Industries	
Hy-Gain	
Icum	
Interface Tech	
International Crystal Mfg.	
Jan Crystals	
Kaitman Industries	
K. W. Electronics	
Lattin Radio	
Link, John	
M. F. I. Enterprises	
Milda Electronics	
Military Electronics	
Millen Mfg., James	
Mini-Products	
Mor-Gain Inc.	
Mountain Men, The	
Murch Electronics	
National Radio Institute	140,
Palomar Engineers	166,
Payne Radio	
Poly Paks	
Radio Amateur Collbook	
Raytheon	
R. F. Communications	
Robot Research	
Rohn Mfg.	
R. P. Electronics	
Savoy Electronics, Inc.	
Skylane Products	
Spectrosomics, Inc.	
Stabler, A. J.	
Standard Communications	
Swan Electronics	119, 117,
Telex Comm. Division	
Ten Tec Inc.	128,
Tri-Ex Tower	
Trigger Electronics	
U-I Industries	
Unidilla Radiation Products	
Unique Products	
Van Gordon Engineering	
Van Sickle	
Van's W2DLT	
Vintage Radio	
Weinschel Engineering Co., The	
World QSL Bureau	
Yaesu Mosen USA, Inc.	
Y & C Electronics	

CW or RTTY, whichever way you go,
**HAL HAS TOP QUALITY
 YOU CAN AFFORD!**



TOP QUALITY RTTY... WITH THE HAL MAINLINE ST-6 TU. Only 7 HAL circuit boards (drilled G10 glass) for all features, plug-in IC sockets, and custom Thordarson transformer for both supplies, 115/230 V, 50-60 Hz. Kit without cabinet, only \$135.00; screened, punched cabinet with pre-drilled connector rails, \$35.00; boards and complete manual, \$19.50; wired and tested units, only \$280.00 (with AK-1, \$320.00).*



TOP QUALITY... WITH THE HAL 1550 ELECTRONIC KEYER. Designed for easy operation; perfectly timed CW with optional automatic ID for sending call letters, great for DX and RTTY; TTL circuitry, transistor switching for grid block, cathode keying. Handsome rugged crackle cabinet with brushed aluminum panel. With ID, only \$90.00; without ID, \$65.00.*

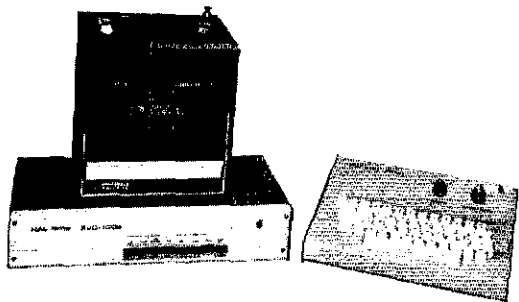
OTHER HAL PRODUCTS INCLUDE:

- ID-1 Repeater Identifier (wired circuit board) . . . \$ 75.00*
- ID-1 (completely assembled in 1 1/2" rack cabinet) . . . \$115.00*
- HAL ARRL FM Transmitter Kit . . . \$ 50.00*
- W3FFG SSTV Converter Kit . . . \$ 55.00*
- Mainline ST-5 TU Kit . . . \$ 50.00*
- Mainline AK-1 AFSK Kit . . . \$ 27.50*



TOP QUALITY... WITH THE HAL MKB-1 MORSE KEYBOARD.

As easy as typing a letter—you get automatic CW with variable speed and weight, internal audio oscillator with volume and tone controls, internal speaker, and audio output jack. Smooth operation; completely solid-state, TTL circuitry using G10 glass boards, regulated power supplies, and high voltage transistor switch. Optional automatic ID available. Assembled MKB-1, \$275.00. In kit form, \$175.00.*



NEW FROM HAL—TOP QUALITY RVD-1002 RTTY VIDEO DISPLAY UNIT. Revolutionary approach to amateur RTTY... provides visual display of received RTTY signal from any TU, at four speeds (60, 66, 75, and 100 WPM), using a TV receiver modified for video monitoring. Panasonic solid-state TV receiver/monitor, or monitor only, available. RVD-1002, \$525.00; Panasonic TV receiver/monitor, \$160.00; monitor only, \$140.00.*

TOP QUALITY... WITH THE HAL RKB-1 TTY KEYBOARD. Gives you typewriter-easy operation with automatic letter/number shift at four speeds (60, 66, 75, and 100 WPM). Use with RVD-1002 video display system, or insert in loop of any teleprinter, for fast and easy RTTY. Completely solid state, TTL circuitry using G10 glass boards, regulated power supplies, and transistor loop switch. RKB-1 assembled, only \$275.00.*



HAL provides a complete line of components, semi-conductors, and IC's to fill practically any construction need. Send 24¢ to cover postage for catalog with info and photos on all HAL products available.

*Above prices do not include shipping costs. Please add 75¢ on parts orders, \$2.00 on larger kits. Shipping via UPS whenever possible; therefore, street address required.

HAL COMMUNICATIONS CORP., Box 365 A, Urbana, Illinois 61801

Bil Harrison, W2AVA, says

"Why pay more?"

It really costs you less -
to enjoy the best -
especially when you get it
from the best - - -



"Ham Headquarters, USA"

Ben Snyder, W2SOH, says

"That's right!" . . .



"I'm very competitive"

"When you deal with me, I personally see to it that your needs receive individual attention.





You will enjoy quickest delivery from our large inventories of factory-fresh, latest improved production models. If you wish, we will fire-up and check it out for you. And, because we do not let things out on trial basis, everything you get will be truly brand new, untampered with!

Should you ever run into any trouble, we are hear to take care of

you. We service what we sell, our Lab is among the finest in the Country.

With it all, I'm very competitive, I will try to beat any equivalent deal you've got. (And, even if my price might seem a few dollars higher, I assure you it's still your greatest bargain anywhere!

So, drop me a line or phone me. Tell me what you want to get, what you have to trade in, what offers you have - and I'll do the rest.

<p>COLLINS</p> 	<p>32S3 XMITTER \$1330.00 75S3B RECEIVER \$1101.00 KWM2 XCVR \$1446.00</p>	<p>TS-900 XCVR \$795.00 R-599 RECEIVER \$389.00 T-599 XMITTER \$429.00 TS-511S SSB XCVR \$415.00</p>	<p>KENWOOD</p> 
<p>New! YAESU TRADE-INS WELCOMED!</p>			
<p>DRAKE</p> 	<p>TR4C XCVR \$499.00 T4XC XMITTER \$530.00 TR22 2 MTR FM XCVR \$219.95 TR72 2 MTR FM XCVR \$299.95</p>	<p>"ONE" SSB XCVR \$349.00 AC/ONE POWER SUPPLY \$99.00 FMP 2 MTR FM XCVR \$225.00</p>	<p>TEMPO</p> 

CHARGE IT!



Spread payments up to two years.

PROMPT ORDER DEPT.

We carefully pack and ship ham gear, accessories and parts to most any part of the world.

Address your orders to:

**20 SMITH STREET
Farmingdale, N.Y. 11735**

Or - Phone your orders to
(516) 293-7990

Prices subject to change without notice

SINCE 1925



Harrison
"Ham Headquarters, USA"®

- FARMINGDALE, L.I.
2265 ROUTE 110
2 miles South of L.I.E. exit 495
(516) 293-7990
- NEW YORK CITY
8 BARCLAY STREET
Near City Hall
BARclay 7-7922
- VALLEY STREAM
10 SUNRISE HWY.
(At Rockaway Ave.)
(516) 872-9565

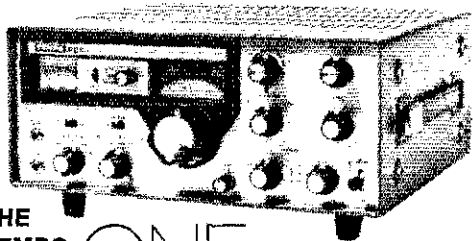
OPEN NITES 'TIL 9

OPEN NITES 'TIL 10

the tempo line

...a reputation built on quality and value

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



THE TEMPO ONE SSB TRANSCEIVER

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

FREQUENCY RANGE: All amateur bands 80 through 10 meters, in five 500 khz. ranges: 3.5-4 mhz., 7-7.5 mhz., 14-14.5 mhz., 21-21.5 mhz., 28.5-29 mhz. (Crystals optionally available for ranges 28-28.5, 29-29.5, 29.5-30 mhz.)
SOLID STATE VFO: Very stable Colpitts circuit with transistor buffer provides linear tuning over the range 5-5.5 mhz. A passband filter at output is tuned to pass the 5-5.5 mhz. range.

RECEIVER OFFSET TUNING (CLARIFIER): Provides ± 5 khz. variation of receiver tuning when switched ON.

DIAL CALIBRATION: Vernier scale marked with one kilohertz divisions. Main tuning dial calibrated 0-500 with 50 khz. points.

FREQUENCY STABILITY: Less than 100 cycles after warm-up, and less than 100 cycles for plus or minus 10% line voltage change.

MODES OF OPERATION: SSB upper and lower sideband, CW and AM.

INPUT POWER: 300 watts PEP, 240 watts CW

ANTENNA IMPEDANCE: 50-75 ohms

CARRIER SUPPRESSION: -40 dB or better

SIDEBAND SUPPRESSION: -50 dB at 1000 CPS

THIRD ORDER INTERMODULATION PRODUCTS: -30 dB (PEP)

AF BANDWIDTH: 300-2700 cps

RECEIVER SENSITIVITY: $1/2 \mu$ v input S/N 10 dB

AGC: Fast attack slow decay for SSB and CW.

SELECTIVITY: 2.3 khz. (-6 dB), 4 khz. (-60 dB)

IMAGE REJECTION: More than 50 dB.

AUDIO OUTPUT: 1 watt at 10% distortion.

AUDIO OUTPUT IMPEDANCE: 8 ohms and 600 ohms

POWER SUPPLY: Separate AC or DC required. See AC

"ONE" and DC1-A.

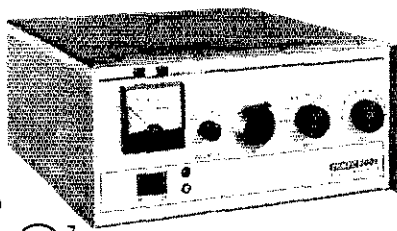
TUBES AND SEMICONDUCTORS: 16 tubes, 15 diodes, 7 transistors

TEMPO "ONE" TRANSCEIVER \$349.00

AC/ONE POWER SUPPLY 117/230 volt 50/60 cycle \$ 99.00

DC/1-A POWER SUPPLY 12 volts DC \$110.00

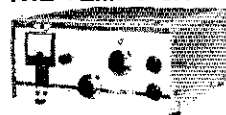
VF-ONE EXTERNAL VFO \$ 99.00



THE TEMPO 2001 LINEAR AMPLIFIER

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

THE TEMPO 6N2



For 6 and 2 meter amateur operation, 2000 watts PEP input on SSB or 1000 watts input on FM or CW. Completely wired in one small package with an internal solid-state power supply, built-in blower, and RF relative power indicator. \$595.00

Prices subject to change without notice.

THE TEMPO RBF-1



Dual meters continuously monitor output power and SWR during transmission. Offers two power scales of 0-200 and 0-2000 watts plus operation from 1.9 to 150 MHz. Tempo offers this combination in-line SWR bridge and wattmeter at a surprisingly low \$29.95.

The Tempo line is available at select dealers throughout the U.S.

Henry Radio stores can now supply the complete line of Yaesu equipment.

Henry Radio

11240 W. Olympic Blvd., Los Angeles, Calif. 90064 213/777-5701

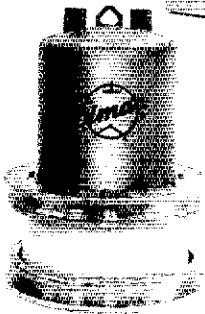
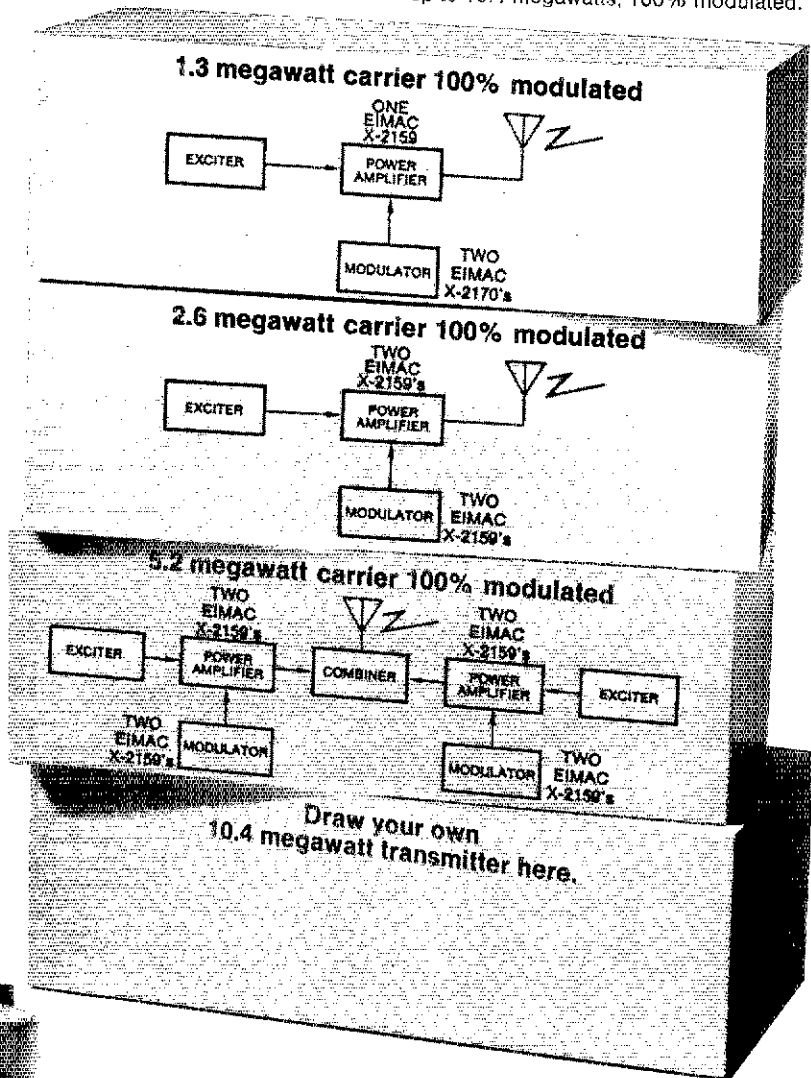
931 N. Euclid, Anaheim, Calif. 92801 714/772-9200

Butler, Missouri 64730 316/574-5177

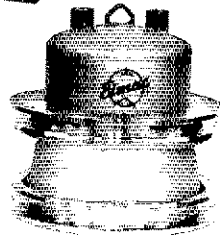
World's Largest Distributor of Amateur Radio Equipment

10,400,000 Watts!

EIMAC super-power tetrodes provide transmitter "building blocks" up to 10.4 megawatts, 100% modulated.



X-2159



X-2170

For information on the X-2159 and X-2170 super-power tetrodes, contact the EIMAC Division of Varian, 301 Industrial Way, San Carlos, California 94070. Or any of the more than 30 Varian /EIMAC Tube and Device Group Sales Offices throughout the world.

