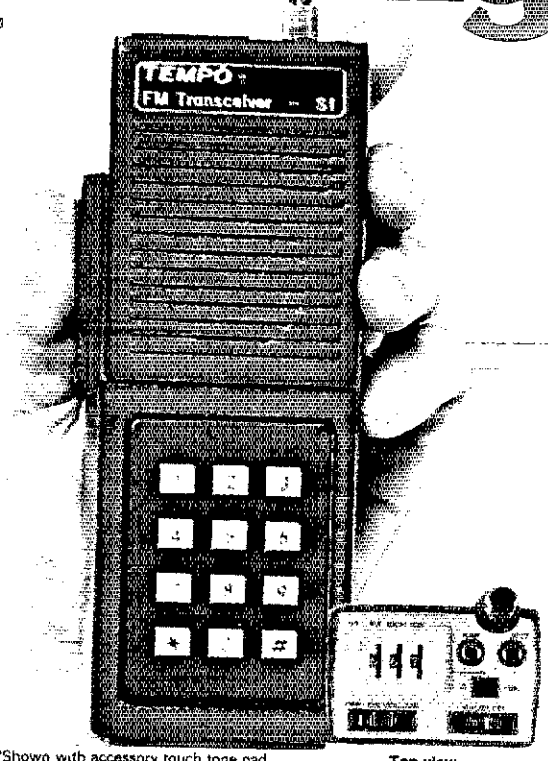
November 1979 $2.00

QST

entire Amateur Radio

WARC 79 — Your League is there.

the praise is pouring in



*Shown with accessory touch tone pad

Top view

We have never enjoyed such an overwhelming response to a new product. Letters of praise for Tempo's S-1 are coming in daily. Words such as great, fabulous, and fantastic are common. In a few short months the S-1 has taken the Amateur world by storm. In addition to its unique features and its versatility, it has now proven itself to be an extremely rugged and dependable unit...qualities unmatched at any price, but unheard of at the S-1's low price.

This amazing pocket sized radio represents a major breakthrough in 2-meter communications. Other units that are larger, heavier and are similarly priced can offer only 6 channels. The S-1's price includes the battery pack, charger, and a telescoping antenna. But, far more important is its *proven* performance record as a fully synthesized 800 channel hand held transceiver.

The optional touch tone pad adds greatly to its convenience and the addition of a Tempo solid solid state amplifier adds tremendously to its power.

The proven TEMPO S-1 does it all... portable...mobil ...base station and gives you 800 channels in one of the smallest hand helds

SPECIFICATIONS

Frequency Coverage:	144 to 148 MHz
Channel Spacing:	Receive every 5 kHz, transmit Simplex or ±600 kHz
Power Requirements:	9.6 VDC
Current Drain:	17 ma-standby 500 ma-transmit
Batteries:	8 cell ni-cad pack included
Antenna Impedance:	50 ohms
Dimensions:	40 mm x 62 mm x 165 mm (1.6" x 2.5" x 6.5")
RF Output:	Better than 1.5 watts
Sensitivity:	Better than .5 microvolts

SUPPLIED ACCESSORIES
Telescoping whip antenna, ni-cad battery pack, charger.

OPTIONAL ACCESSORIES
Touch tone pad: $55 • Tone burst generator: $29.95 • CTCSS sub-audible tone control: $29.95 • Rubber flex antenna: $8 • Leather holster: $16 • Cigarette lighter plug mobile charging unit: $6 • Matching 30 watt output 13.8 VDC power amplifier ($30) $89 • Matching 80 watt output power amplifier ($80): $169

Price... $349.00 With touch tone pad... $399.00

The Tempo line also features a fine line of extremely compact UHF and VHF pocket receivers. They're low priced, dependable, and available with CTCSS and 2-tone decoders. The Tempo FMT-2 & FMT-42 (UHF) provides excellent mobile communications and features a remote control head for hide-away mounting.

The Tempo FMH-42 (UHF) and the *NEW* FMH-12 and FMH-15 (VHF) micro hand held transceivers provide 6 channel capability, dependability plus many worthwhile features at a low price. FCC type accepted models also available.

Please call or write for complete information. Also available from Tempo dealers throughout the U.S. and abroad.

TEMPO VHF & UHF SOLID STATE POWER AMPLIFIERS

Boost your signal. . . give it the range and clarity of a high powered base station. VHF (135 to 175 MHz)

Drive Power	Output	Model No.	Price
2W	130W	130A02	$209
10W	130W	130A10	$189
30W	130W	130A30	$199
2W	80W	80A02	$169
10W	80W	80A10	$149
30W	80W	80A30	$159
2W	50W	50A02	$129
2W	30W	30A02	$ 89

UHF (400 to 512 MHz) models, lower power and FCC type accepted models also available.

51 YEARS OF SERVICE

NEW TOLL FREE ORDER NUMBER: (800) 421-6631
For all states except California.
Calif. residents please call collect on our regular numbers.

11240 W. Olympic Blvd., Los Angeles, Calif. 90064 213/477-6701
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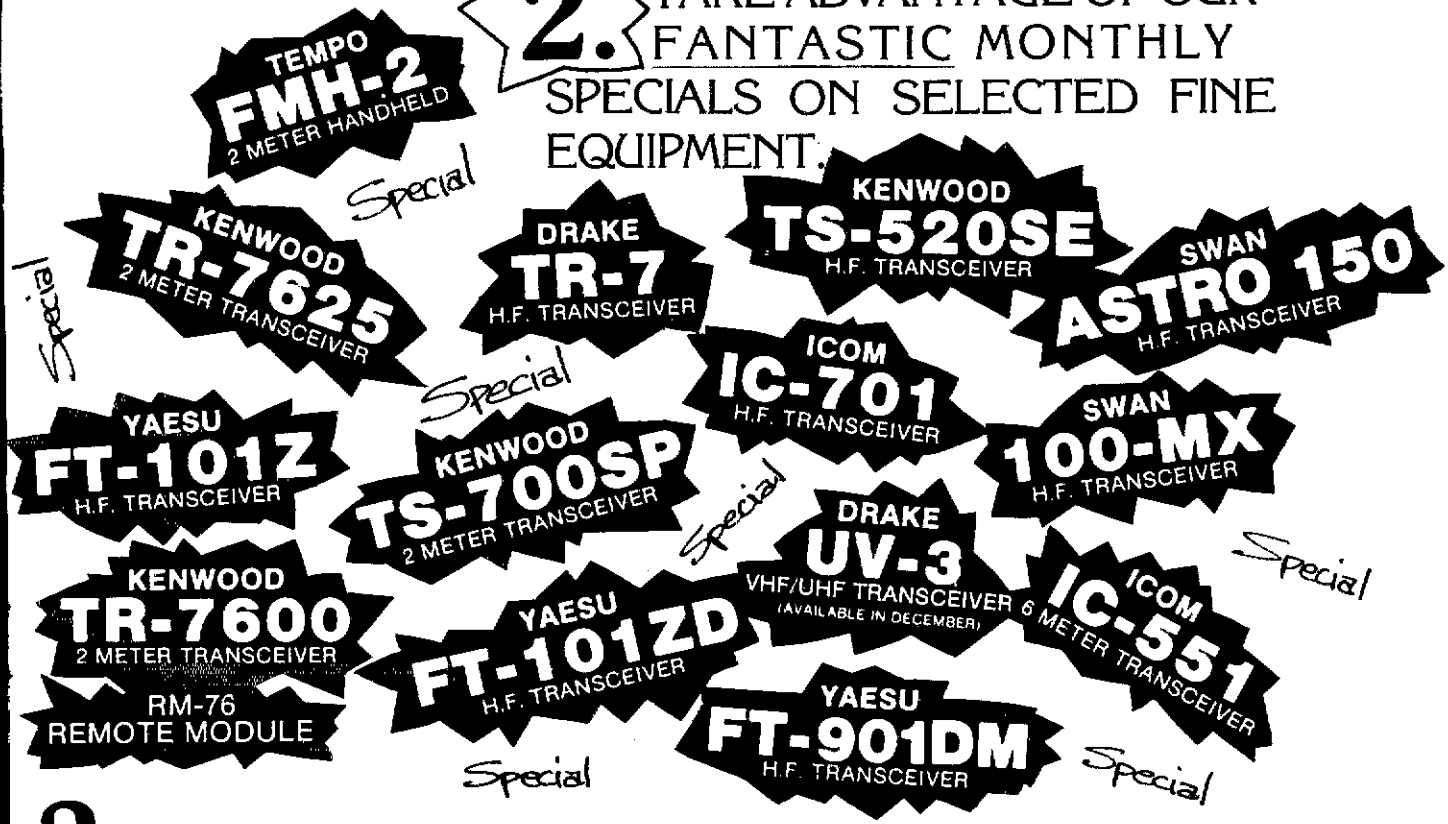
Henry Radio

Prices subject to change without notice

NOW... YOU SAVE THREE WAYS AT HENRY RADIO

1. CALL FOR OUR LOW, LOW CASH OR CREDIT CARD PRICES ON ALL MAJOR EQUIPMENT.

2. TAKE ADVANTAGE OF OUR FANTASTIC MONTHLY SPECIALS ON SELECTED FINE EQUIPMENT.



3. ENJOY THE WORLD FAMOUS HENRY RADIO SERVICE. NO ONE ELSE CAN OFFER YOU THE BACKGROUND OF EXPERIENCE AND THE VALUE OF RESPONSIBLE MARKETING LIKE HENRY RADIO.

Henry Radio also offers a broad line of commercial and FCC type accepted amplifiers covering the range of 3 MHz to 500 MHz. Henry amplifiers are in use all around the world. Commercial and export inquiries are invited.

Tempo solid state amplifiers are available at Tempo dealers throughout the U.S.

NEW TOLL FREE ORDER NUMBER: (800) 421-6631
For all states except California.
Calif. residents please call collect on our regular numbers.

51 YEARS OF SERVICE

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931 N. Euclid, Anaheim, Calif. 92801 714/772-9200
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Henry Radio

IC-701, Your Synthesized Passport

Enter the exciting world of HF DX with ICOM's outstanding, fully synthesized **IC-701**. Globe-spanning QSO's are as easy as hook-up and tune-in. Complete installation requires only a good 50 Ohm antenna and an AC power plug-in. Your **IC-701** comes with everything else you need for beginning DX transmissions, including the matching **IC-701PS** external speaker and power supply, the fine **SM-2** base microphone, and even two built-in VFO's.

Turn on the power, and the world's at your single fingertip. The **IC-701** lets you scan all the Amateur HF bands from 160M to 10M (plus some MARS coverage above and below some of the Ham bands) with one finger. No more fooling around with two or more tuning knobs, and no complicated retuning when you QSY.

When talking on your **IC-701**, you get a 200 watt PEP input signal whose punch is significantly increased by the high quality built-in RF speech processor. This makes your 200 watts sound like so much more that we recommend you leave the speech processor on all the time.

For adding on frequency memory and remote frequency control, the **IC-701**'s synthesizer is completely compatable with ICOM's **RM2** remote computer controller: and with ICOM's optional **EX1** extention, you can operate with the **RM2** and a linear amplifier at the same time.

Nothing else matches the value and ease of the **IC-701**. Plunge into the excitement of HF DX now, and get the whole HF world with ICOM's **IC-701** LSI system.

Specifications subject to change without notice. All ICOM radios significantly exceed FCC regulations limiting spurious emissions.

HF/VHF/UHF AMATEUR AND MARINE COMMUNICATION EQUIPMENT

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(206) 747-9020

ICOM EAST, INC.
Suite 307
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Dallas, Texas 75234
(214) 620-2780

ICOM CANADA
810 SW Marine Dr.
Vancouver B.C. V6P 6E3
Canada
(604) 321-1833

Phone numbers for parts orders: **ICOM West, Inc.**, (206) 747-9020; **ICOM East,**

ICOM INFORMATION SERVICE
3331 Towerwood Dr., Suite 304
Dallas, Texas 75234

Q

Please send me: ☐ **IC-701 specifications sheet;** ☐ **full-color ICOM Product Line Catalog;** ☐ **List of Authorized ICOM Dealers.**

NAME _____ CALL _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

November 1979
Volume LXIII Number 11

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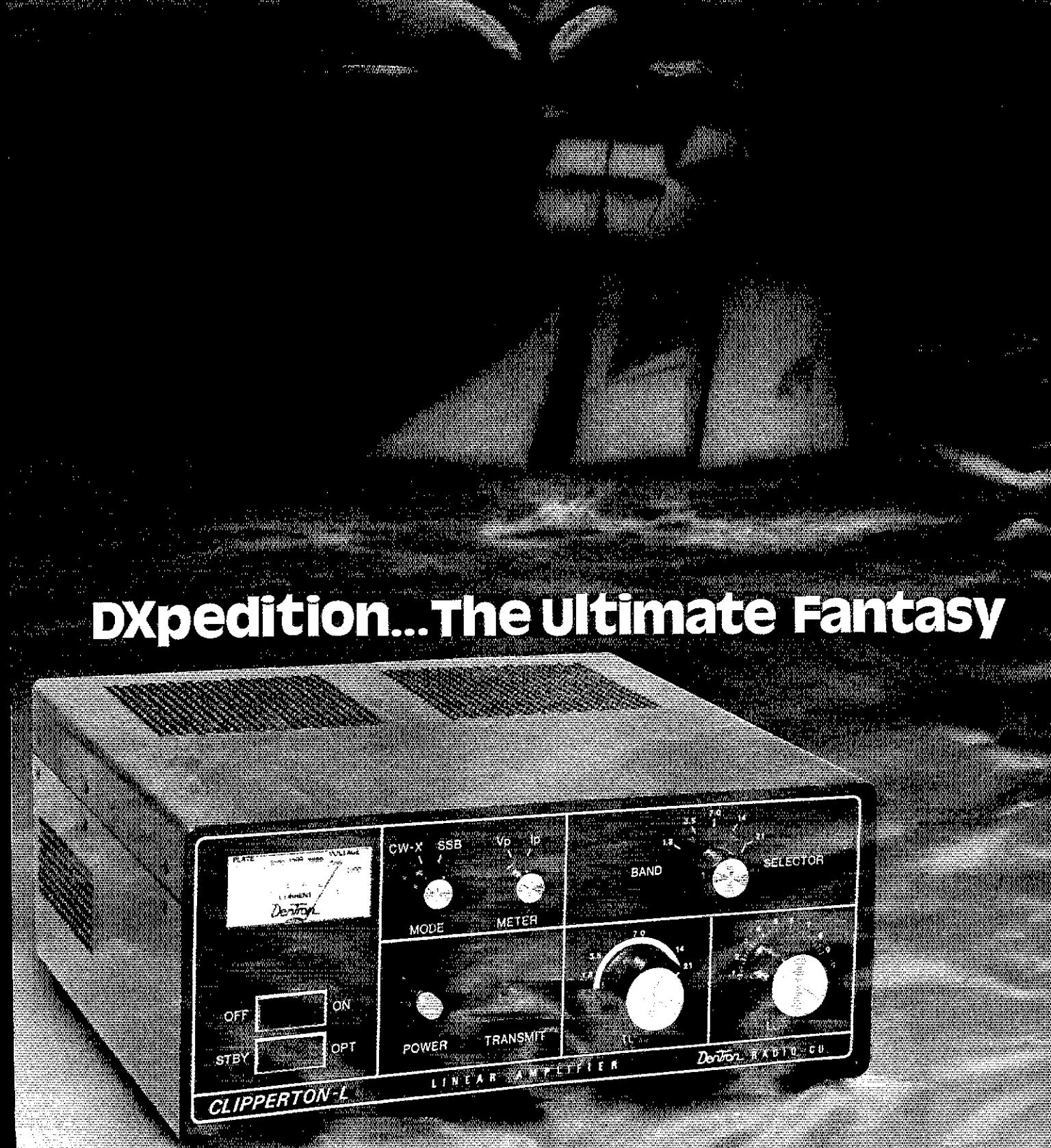
THE COVER

The years of preparation are paying off, as IARU observers stride toward the opening session of WARC-79. See pages 10 and 70 for an update.

Contents

DXpedition...The Ultimate Fantasy



Clipper ships sailing to foreign shores. Sixteen amateurs primed for adventure, coming together as the first group in 20 years to set foot on the remote French Island, Clipperton. Their goal: 30,000 QSO's in just 7 days.

If you're like most of us, a rare DXpedition is more a dream than a reality, but the Clipperton Linear Amplifier from DenTron brings the thrill of a DXpedition to you.

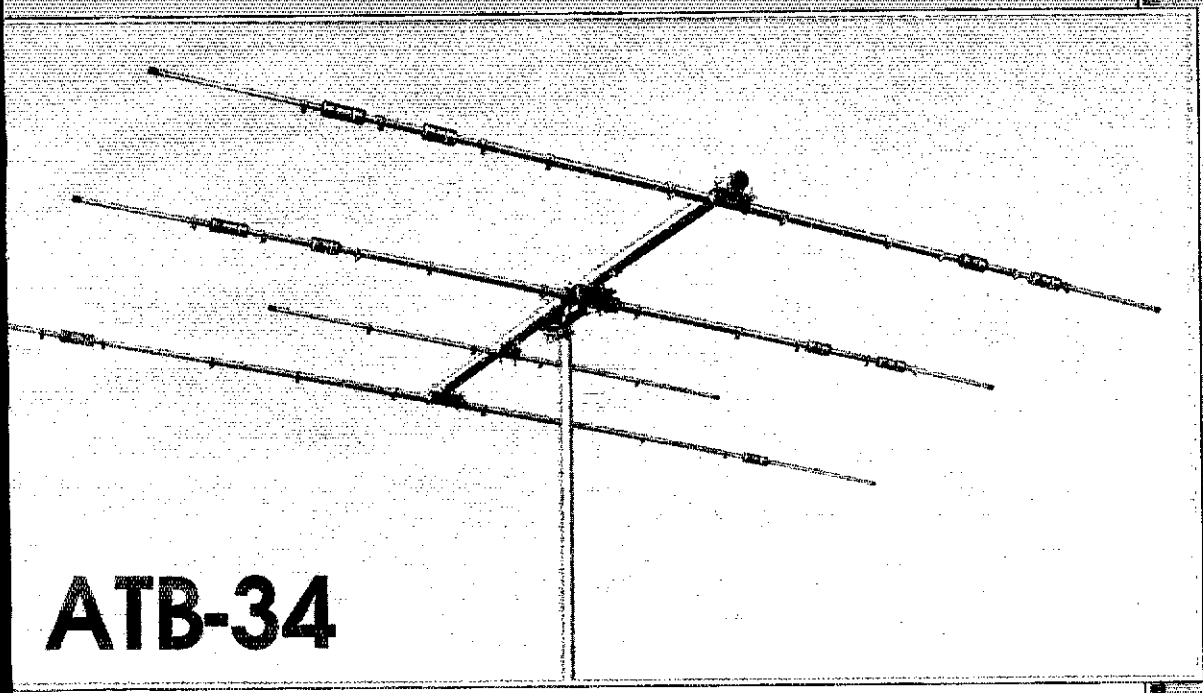
The Clipperton-L™ was inspired by the famous DXpedition on which 3 MLA-2500's were used. We built the Clipperton with 4 rugged, economical, 572 B's in the final to provide a full 2KW PEP on SSB and 1KW CW on 15 through 160 meters. With features like hi-lo power selector for equal efficiencies at 1 or 2 KW, a power transformer that is vacuum impregnated, wide spaced tuning and loading capacitors, built-in ALC and an improved whisper-quiet cooling system, the excitement of crashing a pile-up can be yours.

Clipperton-L suggested price $699.50.
FCC type accepted.

DenTron
Radio Co., Inc.
2100 Enterprise Parkway
Twinsburg, Ohio 44087
(216)425-3173

Dedicated to making amateur radio more fun.

CUSHCRAFT IS THE HF MULTI-BAND ANTENNA COMPANY.



ATB-34

Punch through the pile-ups with an ATB-34, the only three band beam to give you real full size performance. We invite a full comparison and ask you to check ATB-34 element lengths, check the trap design and construction. Check the spacing and the specially developed balun. All of these features add up to the no compromise performance that you expect from Cushcraft.

SPECIFICATIONS

Gain	*
F/B Ratio Avg.	*
3dB Beam Width	62°
Nominal Impedance	50 ohms
Power Handling	2000 Watts PEP
Boom Length	18'
Longest Element	32'8"
Turning Radius	18'9"
Wind Area	5.4 Ft.^{2}
Weight	42 lbs.
Maximum Mast O.D.	2.25"

*Antenna gain specifications cannot be published in QST. For complete information on all Cushcraft antennas, see your dealer or write for a free A-9 catalog.

ATV-5

Cushcraft vertical antennas are designed to meet the exacting demands of your amateur radio station. They give top performance in easy to use packages. They can be installed at ground level or roof top.

Durability is guaranteed with double wall seamless aluminum base sections and fiberglass high Q traps. If you are interested in local contacts or long path DX communications, a Cushcraft vertical antenna is your best choice.

ATV-3	ATV-4	ATV-5
10-15-20 Meters	10-15-20-40 Meters	10-15-20-40-80 Meters
Height 13'7" (4.2m.)*	Height 19'2" (5.9m.)*	Height 24'9" (7.4m.)*

ALL MODELS
Power Handling 2000 Watts. Nominal Impedance 50 ohms. Maximum Mast Size 1¾" O.D. Termination: accepts PL-259

*Nominal height when set for phone operation.

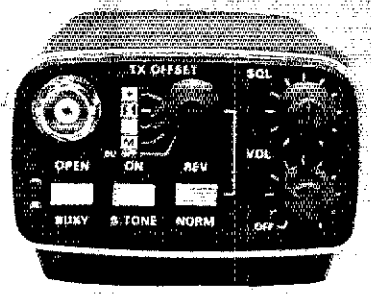
IN STOCK WITH DEALERS WORLDWIDE **UPS SHIPPABLE**

cushcraft
CORPORATION
THE ANTENNA COMPANY

KENWOOD'S TR-2400

...synthesized, BIG LCD, 10 memories, scanning...and more!

Kenwood TR-2400...It's a synthesized 2 meter hand-held transceiver...the answer to any Amateur's operating requirements! Its many advanced features include:

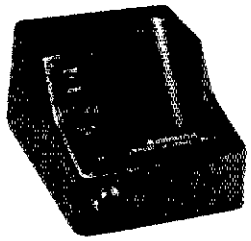


CONVENIENT TOP CONTROLS

- **LCD digital readout**
- Readable in direct sunlight (better than LEDs)
- Readable in the dark (with lamp switch)
- Virtually no current drain (much less than LEDs) and display stays on
- Shows receive and transmit frequencies and memory channel
- **10 Memories** (always retained with battery backup)
- **Automatic memory scanning** (for "busy" or "open" channels)
- **Mode switch for the following operations:**
- Simplex
- Standard repeater by offsetting the transmit frequency + 600 kHz or − 600 kHz
- Repeater with nonstandard splits by offsetting the transmit frequency to any frequency stored in memory 10
- **REVERSE** momentary switch for the following applications:
- Checking signals on the input of a repeater
- Determining if a repeater is "upside down"
- **Built-in Touch-Tone generator** using 16-button keyboard
- **Keyboard selection** of 5-kHz channels from 144.000 to 147.995 MHz
- **UP/DOWN manual scanning** and operation from 143.900 to 148.495 MHz in single or fast continuous 5-kHz steps. Even operates on MARS repeaters within this range by using memory 10 for transmit offset frequency.
- **LCD "arrow" indicators**
- "ON AIR"
- Memory recall
- Battery status
- Lamp switch on
- **Two lock switches** to prevent accidental frequency change and accidental transmission
- **Subtone switch** (subtone module not Kenwood-supplied)
- **BNC antenna connector**
- **1.5 watts RF output**

The TR-2400 comes with the following standard accessories:
- Flexible rubberized antenna with BNC connector
- Nicad battery pack
- Battery charger

Optional accessories include:
- Leather case
- Base Stand (for quick charge and easy base-station operation)
- DC (automobile) quick charger



ST-1 BASE STAND (OPTIONAL)

(Subject to FCC approval)

SEE YOUR AUTHORIZED KENWOOD DEALER FOR MORE INFORMATION ON THE TR-2400.

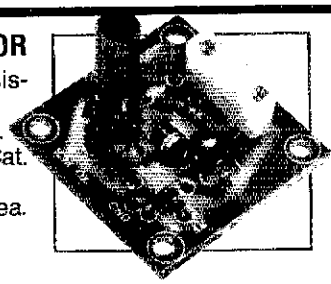
KENWOOD
...pacesetter in amateur radio

TRIO-KENWOOD COMMUNICATIONS INC.
1111 WEST WALNUT/COMPTON, CA 90220

FOR THE EXPERIMENTER

INTERNATIONAL CRYSTALS & KITS/OSCILLATORS • RF MIXERS • RF AMPLIFIER • POWER AMPLIFIER

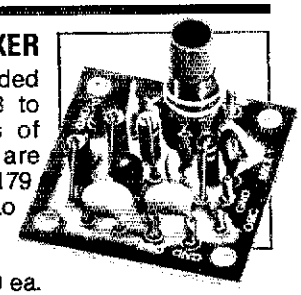
OX OSCILLATOR



Crystal controlled transistor type. 3 to 20 MHz, OX-Lo, Cat. No. 035100. 20 to 60 MHz, OX-Hi, Cat. No. 035101.

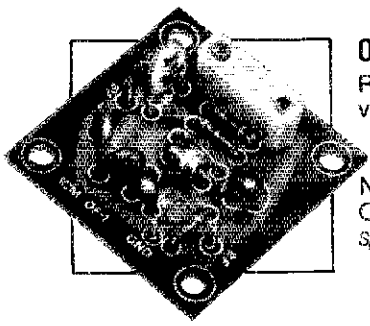
Specify when ordering. $5.22 ea.

MXX-1 TRANSISTOR RF MIXER



A single tuned circuit intended for signal conversion in the 3 to 170 MHz range. Harmonics of the OX or OF-1 oscillator are used for injection in the 60 to 179 MHz range. 3 to 20 MHz, Lo Kit, Cat. No. 035105. 20 to 170 MHz, Hi Kit, Cat. No. 035106.

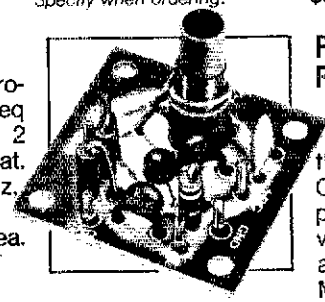
Specify when ordering. $5.80 ea.



OF-1 OSCILLATOR

Resistor/capacitor circuit provides osc over a range of freq with the desired crystal. 2 to 22 MHz, OF-1 LO, Cat. No. 035108, 18 to 60 MHz, OF-1 H Cat. No. 035109.

Specify when ordering $4.48 ea.

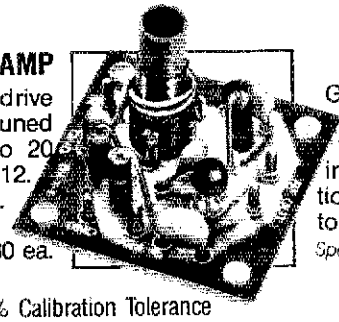


PAX-1 TRANSISTOR RF POWER AMP

A single tuned output amplifier designed to follow the OX or OF-1 oscillator. Outputs up to 200 mw, depending on frequency and voltage. Amplifier can be amplitude modulated 3 to 30 MHz, Cat. No. 035104.

Specify when ordering. $6.06 ea.

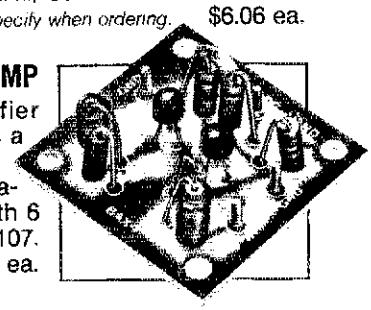
SAX-1 TRANSISTOR RF AMP



A small signal amplifier to drive the MXX-1 Mixer, Single tuned input and link output. 3 to 20 MHz, Lo Kit, Cat. No. 03512. 20 to 170 MHz, Hi Kit, Cat. No. 035103.

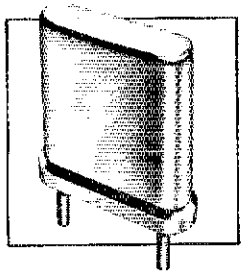
Specify when ordering. $5.80 ea.

BAX-1 BROADBAND AMP



General purpose amplifier which may be used as a tuned or untuned unit in RF and audio applications. 20 Hz to 150 MHz with 6 to 30 db gain. Cat. No. 035107.

Specify when ordering. $6.06 ea.



.02% Calibration Tolerance

EXPERIMENTER CRYSTALS (HC 6/U Holder)

Cat. No.	Specifications	
031080	3 to 20 MHz — for use in OX OSC Lo	
	Specify when ordering	$6.25 ea.
031081	20 to 60 MHz — For use in OX OSC Hi	
	Specify when ordering	$6.25 ea.
031300	3 to 20 MHz — For use in OF-1L OSC	
	Specify when ordering	$5.22 ea.
031310	20 to 60 MHz — For use in OF-1H OSC	
	Specify when ordering	$5.22 ea.

Shipping and postage (inside U.S., Canada and Mexico only) will be prepaid by International. Prices quoted for U.S., Canada and Mexico orders only. Orders for shipment to other countries will be quoted on request. Address orders to: M/S Dept., P.O. Box 34297. Oklahoma City, Oklahoma 73132

ICM

INTERNATIONAL CRYSTAL MFG. CO., INC.
10 North Lee • Oklahoma City, Okla. 73102

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Reports Invited: The ARRL Board of Directors (see list at left) determines the policies of ARRL. The 16 divisions of the League are further arranged into 74 administrative "sections," each headed by an elected Section Communications Manager. Your SCM welcomes reports of individual and club activity. ARRL Field Organization appointments are available covering a wide range of amateur radio operating interests. Whatever your license class, your SCM has an appointment available. Check with your SCM (below) for further information. Section boundaries are defined in the booklet *Operating an Amateur Radio Station*, free to members.

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British Columbia — H. E. Savage, VE7FB, 4553 West 12th Ave., Vancouver V6R 2R4 (604-224-5226)
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Ontario — L. P. Thivierge, VE3GT, 34 Bruce St. W., Renfrew K7V 3W1 (613-432-5967)
Quebec — Harold Moreau, VE2BP, 80 Principale, St. Simon Co., Bagot J0H 1Y0 (514-798-2173)
Saskatchewan — Norman F. Waltho, VE5AE, 1547 Glendale St. W., Moose Jaw S6H 7B3 (306-692-3047)

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Tennessee — O. D. Keaton, WA4GLS, 141 Medearis Dr., Old Hickory 37138 (615-758-2329)

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Michigan — Stanley J. Briggs, W8MPD/K8SB, 1885 Pinetree Rd., Trenton 48183 (313-676-6248)
Ohio — Harold C. Chapman, WB8JGW, 990 Northwest Potee Rd., S. Vienna 45369 (614-852-4260)

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Northern New Jersey — Robert E. Neukomm, WA2MVQ, 404 O'Brien Ct., Wyckoff 07481 (201-891-3064)

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Missouri — Larry G. Wilson, KØRWL, 5415 E. 97th St., Kansas City 64137 (816-966-8953)
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Eastern Massachusetts — Richard P. Beebe, K1PAD, 82 Wyman Rd., Billerica 01821 (617-667-5609)
Maine — Edward B. Bristow, Jr., WA1MUX, Box 187, Route 4, Skowhegan 04976
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Vermont — Robert L. Scott, W1RNA, 9 Laroe St., Swanton 05488 (802-868-4944)
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San Joaquin Valley — Charles P. McConnell, W6DPD, 1658 W. Mesa Ave., Fresno, CA 93711 (209-431-2038)
Santa Clara Valley — Jettie B. Hill, W6RFF, 22410 Janice Ave., Cupertino, CA 95014 (408-255-6714)

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New Mexico — Joe Knight, W5PDY, 10408 Snow Heights Blvd., N.E., Albuquerque 87112
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West Gulf Division

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Oklahoma — Leonard R. Hollar, WA5FSN, RFD 1, 710 South Tenth St., Kingfisher 73750 (405-375-4411)
Southern Texas — Roger D. Coday, N5FN, 213 Ave. G, RFD 4, Brazoria 77422 (713-798-7920)

THE AMERICAN RADIO RELAY LEAGUE, INC.

"It Seems to Us..."

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 worthwhile 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.

The FCC: Public Servant, or Public Enemy?

On October 6, a committee of the World Administrative Radio Conference, meeting in Geneva, agreed not to accept a U.S. proposal for a significant change in the qualifications of Amateur Radio operators. The U.S. proposal was to drop the international requirement of Morse code proficiency for operation below 144 MHz in favor of a "recommendation" that administrations have such a requirement (February *QST*, page 58, and October *QST*, page 9).

The U.S. proposal was debated extensively, and in the course of debate was favored by two administrations but opposed by at least 15 others. Brazil and others argued that the change would jeopardize existing reciprocal licensing agreements. The Federal Republic of Germany pointed out that amateurs had to know the code, to avoid interfering unknowingly with distress calls. Several administrations requested that the International Amateur Radio Union be heard on the question, and the chairman permitted IARU observer Eric Godsmark, G5CO, to express the Union's opposition on behalf of its 105 member-societies. In the end, the U.S. proposal was withdrawn and a proposal by Papua New Guinea was adopted by the committee. This proposal, which the committee will now recommend for adoption by the conference, lowers the frequency limit for code-free licensing to 30 MHz, a change which affects only the 50-MHz band.

All of this should not have been necessary. If the Federal Communications Commission was doing its job properly, it *would not* have been necessary.

The history of this sorry episode begins more than four years ago, with the formation of the FCC Advisory Committee for Amateur Radio (ACAR). The task given to the ACAR was to make recommendations to the Commission, on behalf of the Amateur Service, as to the WARC proposals the U.S. should make. The committee carefully examined Article 41, which contains the miscellaneous rules pertaining to the Amateur Service, and considered several possible changes. In the end, however, the ACAR recommendation was that no changes be proposed.

In April 1977, the FCC released its Fifth Notice of Inquiry in Docket 20271. This was one of a series of Notices which requested public comment on draft WARC proposals. In the Fifth Notice, the Commission requested comment on a proposal of "no change" to Article 41. What little public comment there was on the issue, including the comments of the League, supported "no change." There seemed little reason for concern or alarm. After all, wasn't the Commission's proposal in line with the ACAR recommendation? Was it not consistent with the opinions expressed by the amateur community during the restructuring proceeding, Docket 20282, less than two years earlier? Are we not protected from arbitrary FCC actions by the Administrative Procedure Act and by congressional oversight of the agency? What possible grounds could there be for the Commission to change its mind?

The tragedy of this tale is that the FCC *proceeded to ignore the public comments and advice which the Commission itself had invited.* Instead, it recommended to the Department of State that the U.S. WARC proposals include the ill-conceived change described earlier. How did it happen? Opinions vary, but it seems to boil down to this: The change was apparently conceived by one or two people within the Commission, and no one in authority cared enough about the Commission's responsibilities to the public to bother to veto it. As it was a matter of administrative detail, the Department of State had no grounds on which to refuse to go along. Thus, the U.S. WARC delegation was saddled with making and supporting an unpopular proposal, irrespective of the personal judgment and opinions of its members.

Thankfully, though the delegation did its best to defend the proposal, it lost. But the fact remains that it was necessary for an international meeting, with an agenda of staggering size and importance, to deal with a proposal *which never should have left the United States.*

There are two lessons in this. First, low morale at the FCC has been the subject of much concern lately. Apparently, the morale and, as a result, the performance of the agency are so poor right now that we cannot count on the protection of the usual administrative checks and balances against the arbitrary use of authority. Second, and even more important, there are enormous pressures within and upon the Commission to find an easy solution to the FCC-created CB problems in and around the 27-MHz band. There are bound to be proponents of making the illegal operators into radio amateurs — not by raising their technical and operating qualifications to the standards of the Amateur Service, but by lowering those standards. We believe that on October 6, the world's telecommunications community shouted a resounding "no!" to the lowering of those standards. We hope someone in Washington was listening. — *Richard L. Baldwin, W1RU*

League Lines...

WARC-79 got off to a slow start the week of September 24. The opening was delayed for three days while agreement was reached on a chairman. At press time, most of the committees (see page 70) had organized their work and were just beginning to discuss the more than 13,000 proposals which have been submitted by administrations, nearly 11,000 of them dealing with frequency allocations. The number of working groups and subgroups is somewhat less than expected, because some national delegations are relatively small and many delegates are reluctant to have meetings conducted in parallel. Only one issue of direct interest to amateurs had been discussed as of 3 October: A working group will not propose changes in the 28-MHz band following the withdrawal of a proposal for sharing with the mobile service (see July QST, p. 54). This is a good start, and the Conference atmosphere is very friendly. But a word of caution: Much more difficult issues are ahead, and even the 28-MHz matter will not be final until the close of the Conference.

Those of you who wrote in response to the October editorial: Please send copies of your letters regarding keeping the Morse code requirement for amateurs to the Office of International Telecommunications Policy, Department of State, Washington, DC 20520.

Professor Francesco Cossiga, IØFCG, was elected in August as the Premier of Italy. IØFCG is a well-known radio amateur and has been a member of Associazione Radioamatori Italiani for many years.

Please, please do not send U.S. currency indiscriminately to foreign radio amateurs. In many countries there are severe penalties for the importation of currency by mail. Recently, K8IQQ received a letter from a ham in Pakistan who said he missed three months of work, nearly lost his job, and had to defend himself against imprisonment, fines and worse, all because U.S. amateurs send "green stamps" with their QSLs. Please, send no money to Pakistan! If you are ever in doubt as to the legality of green stamps, send IRCs.

The Canadian Tariff Board has recommended that "transmitters, receivers, and transceivers designed for use only on the amateur bands of the radio-frequency spectrum as defined by government regulations" be exempted from entry duties when imported into Canada. This is in accordance with a brief the CRRL has submitted in this matter. While implementation of the proposal is still in the future, its approval by the tariff board is an essential first step. See page 69.

Effective October 1, 1979, Amateur Radio operations in the Canal Zone will be administered by the Republic of Panama. Atlantic-side stations will have HP2 prefixes and three-letter suffixes beginning with X, and Pacific-side stations will have HP1 prefixes and three-letter suffixes beginning with the letter X.

Because of a critical personnel shortage, the Headquarters Technical Department is temporarily unable to accept technical information service (TIS) phone calls. Answers to TIS letters will be very slow until staff vacancies are filled. Openings still exist for technical editors and lab technicians. Please contact W1FB or K1TD at Hq. if interested.

The French Atlantic Affair, a made-for-TV mini-series with Amateur Radio central to the plot, is scheduled to be aired the evenings of November 15, 16 and 18. Check your local listings for the exact times and channels.

September marked the beginning of a new W1AW service, a weekly bulletin of up-to-date DX information supplied by the National Capitol DX Association. This new DX bulletin replaces the regular W1AW bulletin transmissions on Fridays (UTC), and is sent at 0100, 0400, 1500 and 2200 UTC on cw; 0200, 0500, 1600 and 2300 UTC on RTTY; and 0230 and 0530 UTC on voice on the regular W1AW bulletin frequencies. Remember, times between 0000 and 0500 UTC Friday are Thursday evening in U.S. time zones. Regular ARRL bulletins of special interest may be included in these transmissions. Keep up with the latest in the world of DX by tuning in the new W1AW DX bulletins.

The Personal Communications Foundation has a new mailing address: 9036 Reseda Blvd., Suite 203, Box 812, Northridge, CA 91328. Tel. 213-349-2887.

Building an Operating Impedance Bridge

Here's a versatile instrument that can completely characterize your antenna system at full power. K9ZLU built this unit as part of his senior engineering project at Purdue University. You can build one from readily available materials.

By Robert H. Luetzow,* K9ZLU

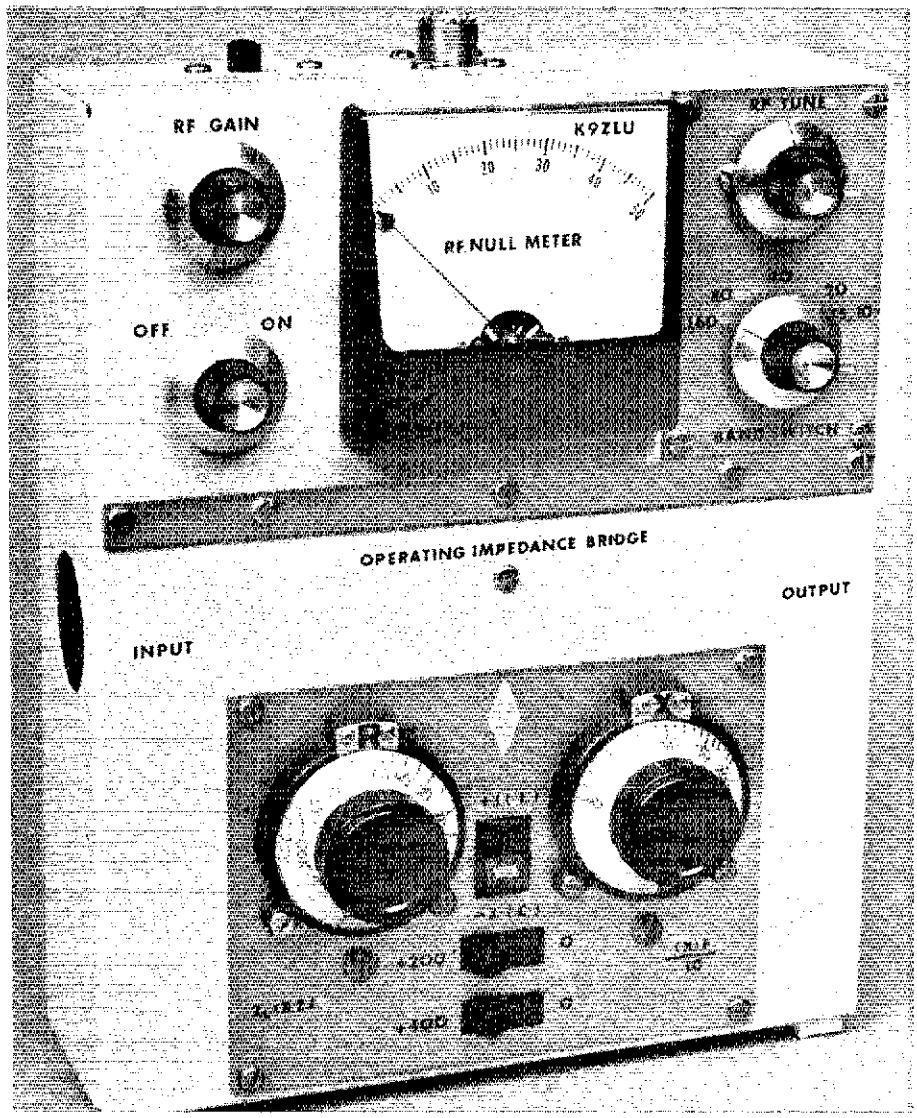
This report describes a type of impedance bridge that has not been discussed in any Amateur Radio publication: a home-built version of the model OIB-2 operating impedance bridge manufactured by Delta Electronics, Inc. The bridge principle is covered by U.S. patent 3,249,863, but Delta has granted the author permission to describe the unit so that amateurs may build them for private use.

The operating impedance bridge (OIB) is a coaxial in-line monitor capable of measuring the resistive and reactive components of the impedance presented to the output. If the unit is installed at the transmitter end of an antenna feed line of known characteristic impedance and electrical length, the antenna impedance can be determined with the aid of a Smith Chart or the transformation equations in the transmission line chapter of the *Handbook*.

The bridge described here is useful over the 1.8- to 30-MHz range for power levels up to the legal amateur limit. The unit will measure resistive loads from zero to 250 ohms. The reactance dial is calibrated at 10 MHz, where inductive or capacitive reactance of up to 600 ohms can be measured. At other frequencies, the dial reading is multiplied by a simple correction factor to obtain the true value.

Basic OIB Theory

Operating impedance is the complex ratio of the voltage across a load to the current flowing in the load when it is operating under normal power in its normal environment.[1] It is the in-line measurement capability that distinguishes



The OIB is a collection of modules mounted to a standard chassis. The switch and connector on the top of the unit are for use with an external detector, such as a communications receiver. Most of the parts, including the vernier dials, can be purchased from Radio Shack. Paste-on dial scales are printed in Fig. 13.

*1327 Grayston Ave., Huntington, IN 46750

[1]Notes appear on page 17.

this bridge from other impedance measuring instruments commonly used by amateurs. The OIB is useful for measuring the impedances of individual elements in a phased array. Another application is determining the input characteristics of solid-state power amplifiers. These characteristics often vary with the drive level.

The OIB uses two transmission line sections in a directional coupler arrangement. One of these delivers power directly from the source to the load with very low insertion loss. A pickup line is lightly coupled (−40 dB) to the direct line and has an RX network at each end. When the networks are adjusted to simulate the impedance presented to the output port, a meter connected to the center of the pickup line registers a null.

The basic circuit is shown in Fig. 1. A wave W travels from the source to the load on the main transmission line, which has a characteristic impedance of Z_{01}. Unless the load is perfectly matched to the line, a wave $R_L W$ will be reflected by the load and travel toward the source. These two waves are coupled to the secondary (pickup) transmission line which has its own characteristic impedance of Z_{02}. The coefficient of coupling between the transmission lines is k. The waves on the secondary transmission line are kW and $kR_L W$, the forward and reflected waves coupled from the main transmission line; $kR_A W$, the wave reflected by the adjustable load, and $kR_L R_S W$, the wave reflected by the "set" or standard load. When the networks are adjusted to produce a null on the meter, the sum of the reflected waves is zero as shown by: $R_A + R_L + R_L R_S = 0$. When these reflection coefficients are replaced by their defining impedance ratios and the resulting equation is solved for Z_L, we derive the formula:

$$Z_L = \frac{(Y_A - Y_S)Z_{01}Z_{02}}{2}$$

where

Z_L = the series equivalent load impedance and

Y_A and Y_S = the admittances of the adjustable and standard loads.

This formula, which is true for an exact center tap on the secondary transmission line, shows that the load impedance is directly proportional to the bridge conductance and susceptance standards. As shown in Fig. 1, these standards are calibrated directly in their series equivalent impedances R_A and R_S and X_A and X_S. When Z_L is zero, Y_A and Y_S must only be equal admittances, and when encountering inductive or capacitive loads, all one must do is interchange the positions of X_A and X_S. This theoretical discussion is necessarily brief. Readers are encouraged to consult the references for a comprehensive treatment of operating impedance concepts.[2,3,4]

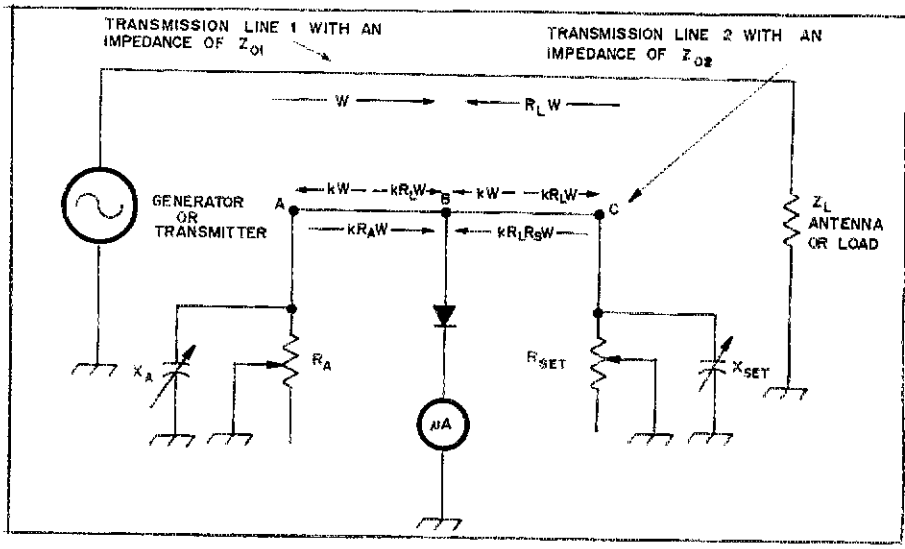


Fig. 1 — The basic operating impedance bridge. The wave notation is explained in the text.

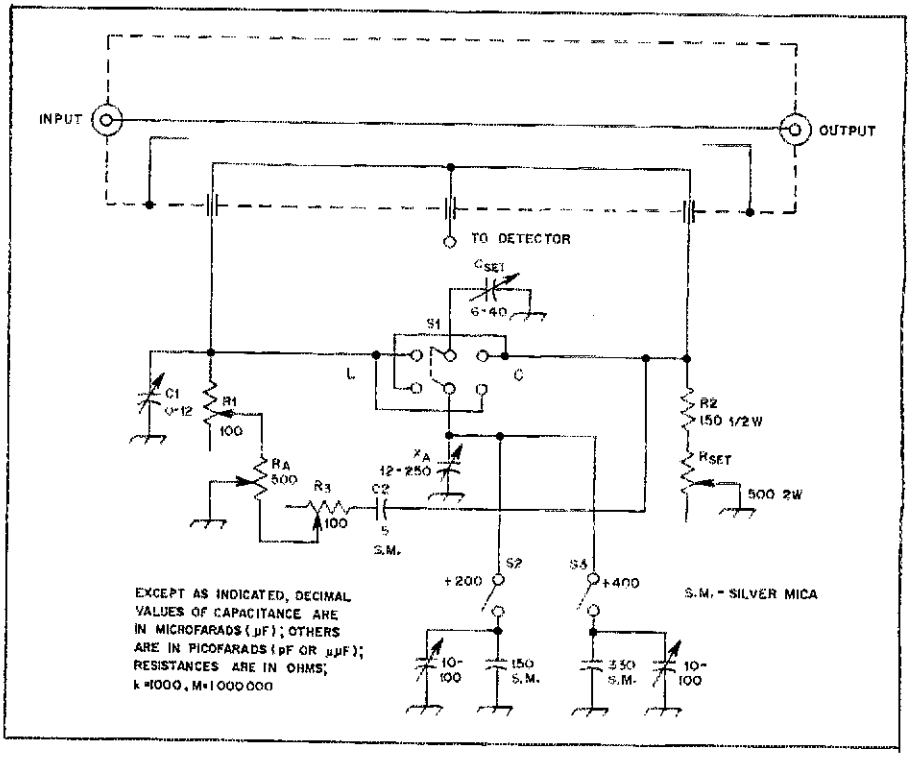


Fig. 2 — Detailed directional coupler and bridge circuitry used in the OIB. X_A and R_A are front panel controls (see text). The trimmer potentiometers are pc-mount types. All components are described in the text.

The actual bridge circuit is slightly more complex than the theoretical model. Fig. 2 is the detailed schematic. Range extender capacitors have been added, as has been a small differential coupling circuit.[3] The conductors near the ends of the pickup line are brass or copper tabs used to adjust the coefficient of coupling or "box constant" between the main transmission line and the pickup line.

Null Detector Circuit

If at least 150 watts is fed through the bridge, the simple diode and microammeter shown in Fig. 1 is a satisfactory detector. For low-power measurements, a more sensitive indicator is required. With the coefficient of coupling used here, the meter circuit must have a full-scale sensitivity of 100 microvolts for reliable null

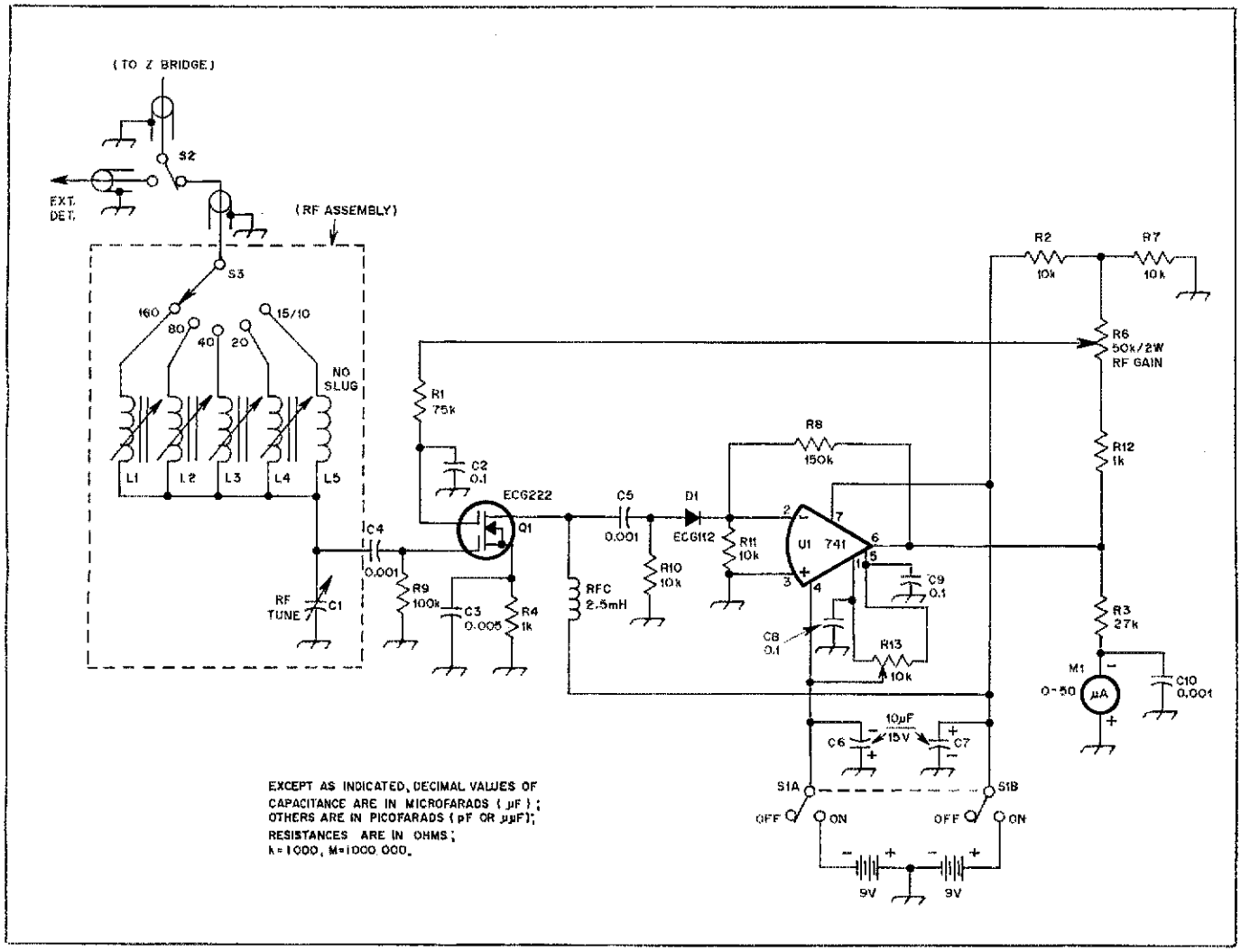


Fig. 3 — Rf null-detector circuit. Fixed resistors are 1/4-watt, ± 10 percent. R6 is a front panel control and R13 is a pc-mount trimmer. Coil forms and slugs are from a Radio Shack assortment. Forms are 1/4-inch (6-mm) diameter.

C1 — 365-pF broadcast-replacement unit with one rotor plate removed from each end.
L1 — 65 turns no. 32 enamel, randomly wound, 3/8-inch (10-mm) long.
L2 — 40 turns no. 32 enamel, randomly wound, 3/8-inch (10-mm) long.
L3 — 29 turns no. 32 enamel, single layer, closewound.
L4 — 9 turns no. 20 enamel, single layer, closewound.
L5 — 4 turns no. 25 enamel, single layer, closewound (no slug).
M1 — 0-50 μ A (Simpson model 1327 cat. no. 4380 or equiv.)

indications at the one-watt level. The rf voltage at the detector rises quite rapidly on either side of the null, so some form of age is required to prevent damaging the meter. Fig. 3 shows the rf detector circuit. A dual-gate MOSFET, Q1, operates as a bandswitched TRF amplifier driving a diode detector. U1 is a dc amplifier which supplies current to the microammeter and age voltage to gate 2 of Q1.

Construction

An aluminum chassis measuring 10 × 8 × 2.5 inches (254 × 203 × 64 mm) houses the OIB. The bridge circuit, pickup box and null detector modules are built on plates of double-sided pc board. The controls are mounted on these plates and the circuit boards are secured to the controls or spacers. Cutouts in the chassis allow the subassemblies to be installed through the "front panel."

The inside of the OIB is exposed in the photo on page 15. This photo, together with the drawings in Figs. 1 though 13, should enable the builder to closely duplicate this unit.

The pickup box is fabricated from copper-clad circuit board material. Although they aren't shown in the assembly drawing, the box constant tabs should be formed as in the photograph. They should be fashioned from copper or brass stock. The screw holes for mounting the tabs are oversized to allow adjustment of the tab positions.

The bridge circuit module is a three-tiered assembly held together by means of spacers and controls. Fig. 10 shows the relative positions of the major components. Be sure that all grounded areas of the three boards, the switch bracket and the X_A capacitor are bonded to each other. Coax braid serves this function in the unit pictured. The housing of the R_A control is *not* grounded. This component is held above ground by means of a fiberglass shaft. To prevent hand capacitance effects and possible rf burns, the escutcheon of the resistance dial must be grounded. In the author's unit, this was accomplished by melting a hole through the rear of the plastic body and soldering a grounding wire to the rear of the escutcheon. This modification is not externally visible. An alternatve way to ground the dial is to install a screw through the escutcheon and front panel.

Mechanical rigidity of the bridge circuit is of prime importance. Any change in the

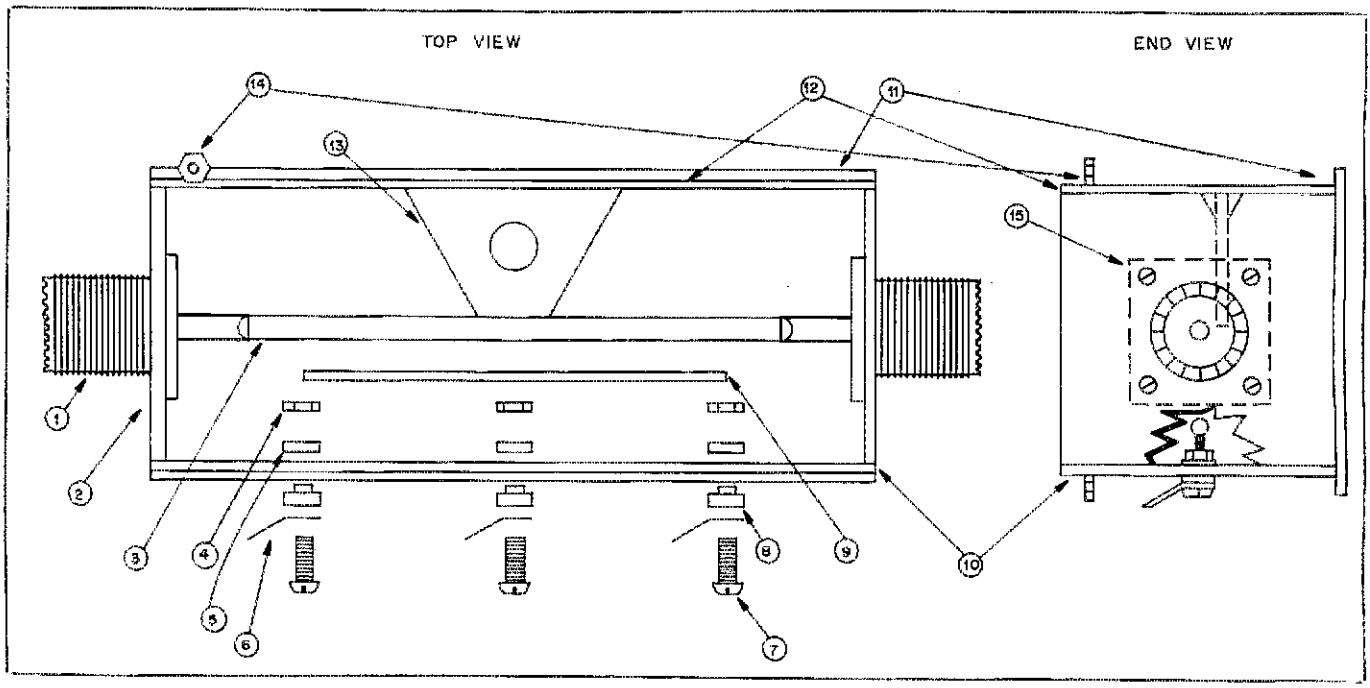


Fig. 4 — Pickup box assembly drawing.
1 — SO-239 UHF female coaxial connector (2 places).
2 — End plate (2 places) (see Fig. 8).
3 — Main transmission line, 3/32-inch (2.4-mm) diameter brass tube.
4 — 6-32 brass nut (3 places).
5 — No. 6 plastic washer (3 places).
6 — No. 6 solder lug (3 places).
7 — 6-32 × 1/2-inch (13-mm) brass machine screw (3 places).
8 — No. 6 plastic shoulder washer (3 places).
9 — Secondary transmission line, no. 18 copper wire.
10 — Side plate, 6-1/4 × 2 inches (159 × 51 mm) copper-clad (single side) pc board.
11 — Bottom plate (see Fig. 6).
12 — Side plate (see Fig. 5).
13 — Transmission line support (see Fig. 9).
14 — Same as item 4 (all four corners).
15 — 4-40 machine screw and nut (8 places).

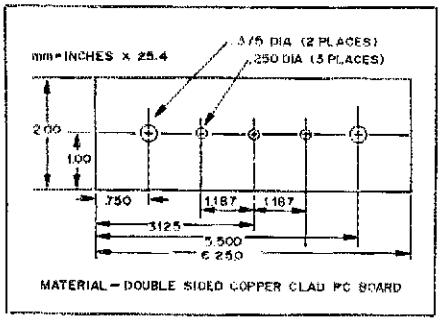


Fig. 5 — Pickup box side plate. The large holes are for positioning the box constant tabs.

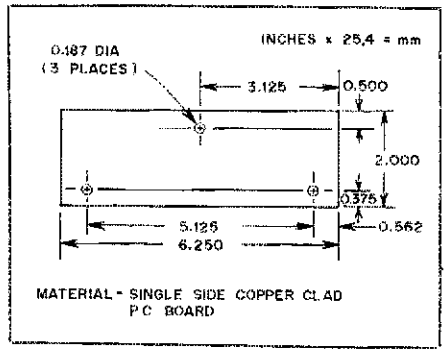


Fig. 6 — Pickup box bottom plate.

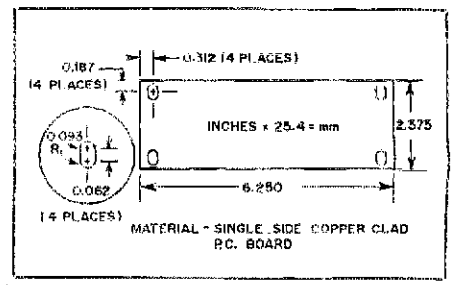


Fig. 7 — Pickup box top cover. The slotted holes line up with the nuts soldered to the side plates to facilitate securing the top with 6-32 machine screws.

stray capacitance between the components will change the calibrated alignment of the impedance bridge. The fixed capacitors in the bridge circuit should be silver mica and the X_A capacitor should be an air-variable type. The X_A capacitor is a broadcast receiver replacement unit with four rotor plates removed. The reactance dial scale in "Hints and Kinks" is calibrated for a capacitor having semicircular plates. If the plates are shaped differently, the dial will have to be calibrated experimentally. X_A is mounted on an angle bracket and a spacer. Either air or mica compression trimmers may be used for the X_{set} and range calibrating capacitors. The potentiometers should be good-quality hot-molded carbon or ceramic metal in order to keep the contact noise low during a null condition. In this unit, R_A is a linear type control, but one having an audio taper might provide finer resolution at the high end of the resistance scale.

The null-detector circuit is composed of two boards. The tuned circuits are fastened to a subpanel and the electronics are mounted on the meter studs. The circuit boards were designed so that the components could be soldered to the copper pads on the foil side of the boards. This type of construction was selected so that one could use parts of varying physical dimensions without concern for fitting the leads into circuit board holes. Soldering to the top of the boards also simplifies the task of aligning the switches with the holes in the front panel. Etching patterns for the circuit boards are printed in the "Hints and Kinks" section of this issue. One may easily design a different layout for the OIB, but the R and X dial calibrations are likely to be different.

Calibration

The first step in calibrating the OIB is to zero the null detector circuit with no signal applied. Adjust R13 to set the meter to zero. Next, apply some rf power and balance the bridge with the X_A capacitor set to approximately 20 pF, which corresponds to the zero mark on the reactance dial. The bridge is in a balanced condition when a resistive load of 20 to 50 ohms is measured and the L/C switch can be toggled without disturbing the null reading. This null condition is found by means of adjusting the X_{set} capacitor and C1 while toggling the L/C switch. When the bridge is balanced this way, the zero

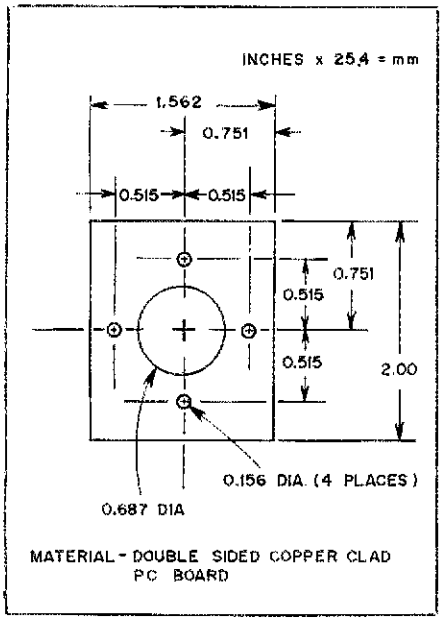


Fig. 8 — Pickup box end plate.

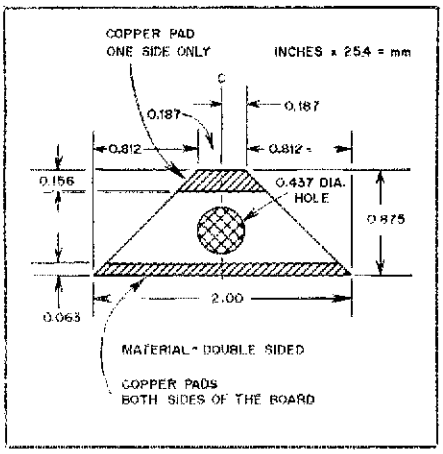
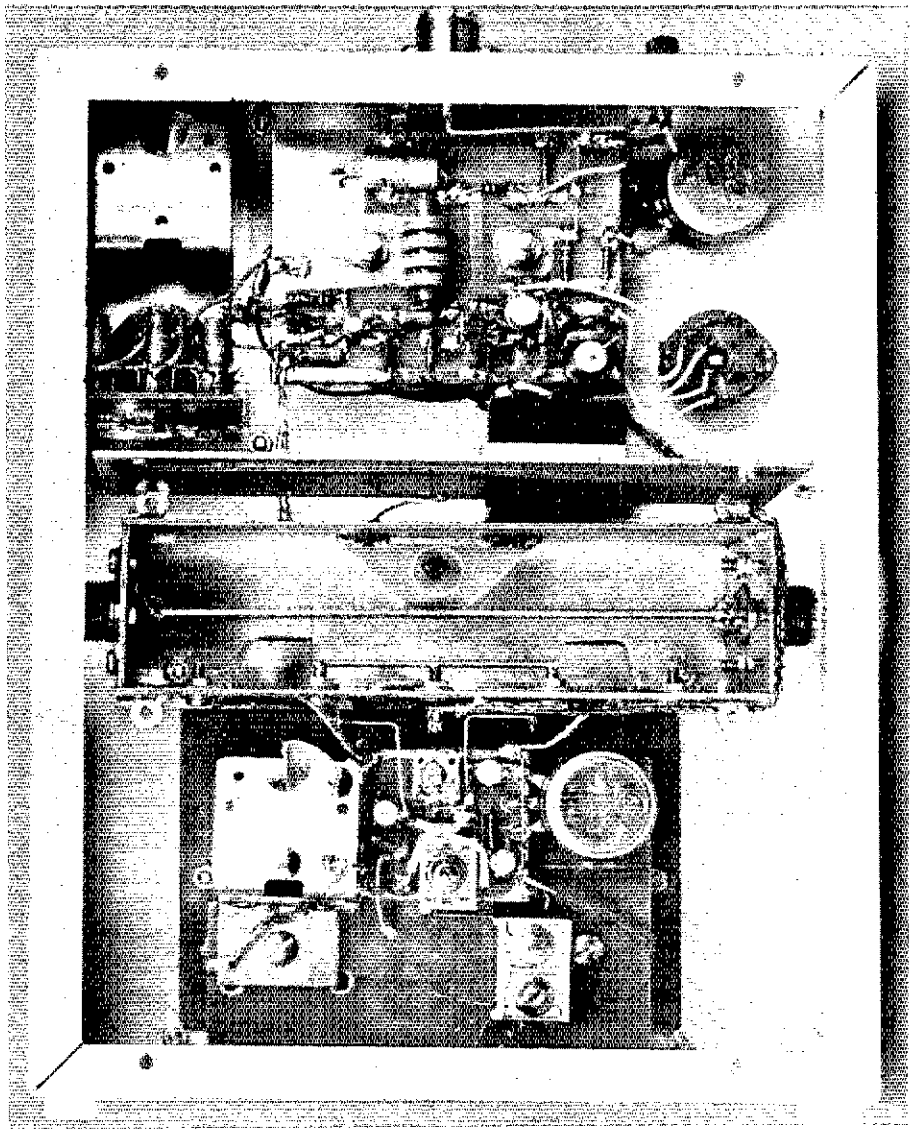


Fig. 9 — Main transmission line support. The hole allows access to the pickup box mounting hardware

reactance reading is valid only for the particular connector or leads used to connect the load. If the connecting arrangement is changed, the bridge must be rebalanced. Also, when measuring a high resistive load, the capacitive reactance is much more apparent. A reactance reading of zero is frequency-independent, so this adjustment can be made using the station transmitter to supply rf power. Non-zero reactances are calibrated at 10 MHz. Few amateurs are equipped to generate rf power (one watt or better) at this frequency. If you calibrate the OIB at 10 MHz, be certain to work into nonradiating loads. If you use an amateur frequency, consider the correction factor explained later. Of course, it's important to avoid causing interference on the ham bands, too.



Interior of the OIB. The cover of the pickup box has been removed. For proper operation, the grounded portions of the modules must be bonded together.

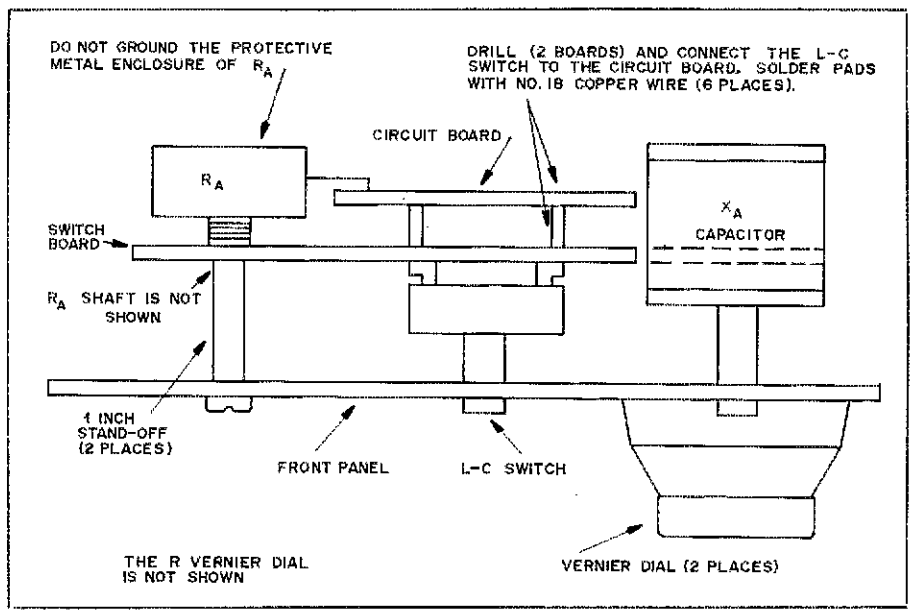


Fig. 10 — Bridge circuit assembly. See text for important information regarding the mounting of R_A. Further detail is shown in the switch board etching pattern printed in the "Hints and Kinks" section.

After the zero adjustment is completed, connect a capacitive reactance of 200 ohms to the output of the bridge and adjust the box constant tabs over the ends of the pickup line so the zero and 200 ohm settings match the dial calibration. Both tabs must be adjusted. If the tabs aren't located symmetrically with respect to the transmission lines, the instrument will display unequal readings for inductive and capacitive reactances of equal magnitude. Any capacitive reactance below 200 ohms can be used, but remember that the capacitances of the female connector on the pickup box, the male connector on the load and any leads connected to the load must be included.

The resistance dial is easier to calibrate. First, adjust the R_A potentiometer so that about 85 percent of its resistance is between R_1 and the wiper of R_A. Terminate the pickup box with a shorted connector, and with R_1 set to midrange, adjust the R_{set} control for a null indication. This null indication locates the zero mark for the resistance dial. Now adjust the R control to 200 ohms (as indicated by the dial), and with a 200-ohm resistive load terminating the pickup box, adjust R_1 for a null indication. The X_A control will need to be readjusted to balance the load capacitance. R_2 is used to readjust the zero setting of the R dial at higher frequencies.

The controls will have to be readjusted several times to secure accurate readings from the R and X dials. There is a little interaction between the R and X calibrating controls, but the box constant tabs are the only controls that greatly affect both the resistance and reactance settings. After the calibration is completed, the box constant tabs should be soldered in place.

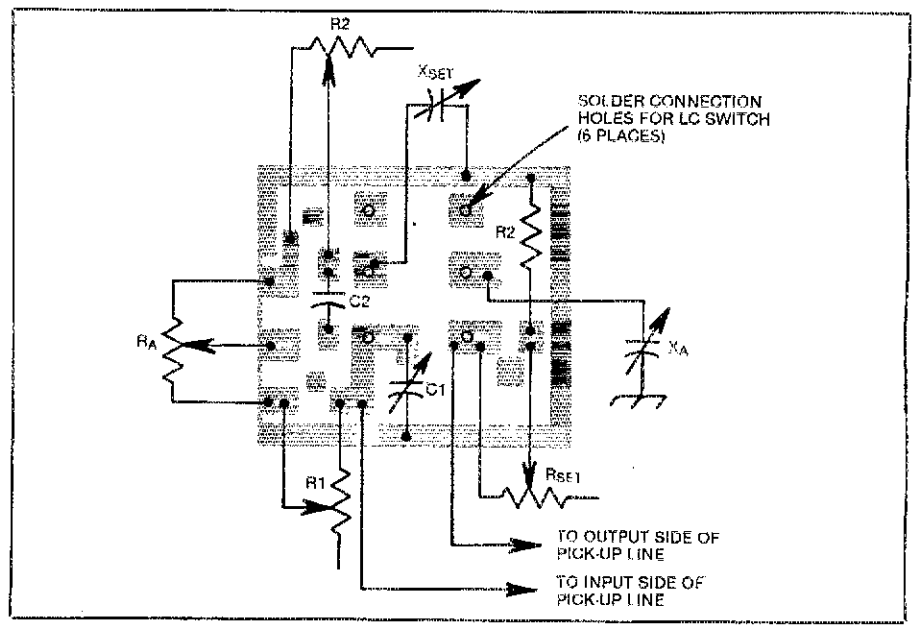


Fig. 11 — Component placement guide for bridge circuit board. Component leads are soldered directly to the foil. The circuit-board etching patterns appear in the "Hints and Kinks" section of this issue.

Since the OIB is calibrated at 10 MHz, a correction must be made to the reactance dial reading when operating at other frequencies. All one need do is express the operating frequency as a multiple of 10 MHz and multiply the dial reading by that number. For example, if the operating frequency is 14 MHz, the multiplying factor is 1.4, and if the operating frequency is 7 MHz, the multiplying factor is 0.7.

Conclusion

There are some important things to keep in mind when using this instrument. When a length of cable is used between the OIB and the load, the cable will act as

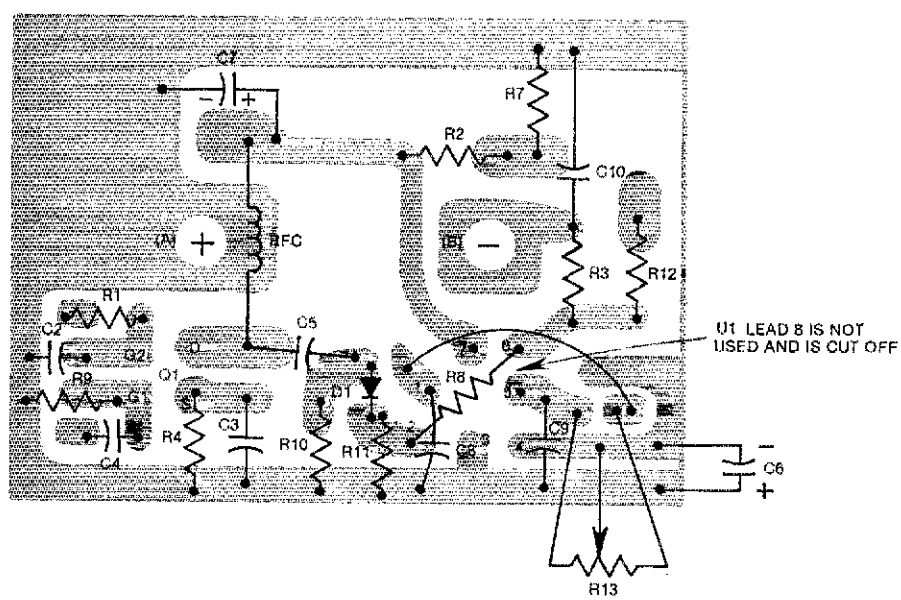


Fig. 12 — Component placement guide for null-detector circuit board. Component leads are soldered directly to the foil.

an impedance transformer unless it is perfectly matched to the load. Therefore, graphical or analytical methods, as mentioned earlier, must be used to calculate the actual load impedance. Don't forget to consider the velocity factor of the cable. As the operating frequency is increased, the effect of the pickup box becomes larger. One must add half the length of the pickup box to the total length of the transmission line used between the bridge and the load.

The last words will be a *warning!* When this operating impedance bridge is used in an rf power transmission line, high rf voltages may appear on the unit if the coax shield is broken, disconnected or improperly grounded to the total transmitting system. Antenna currents on the shield caused by an unbalanced condition at the load are another possible source of high voltage on the case. So *beware* of this type of situation and don't burn any fingertips!

One can perhaps better appreciate the value of this instrument when one considers that the cost of a commercial OIB is around $1200. The author will try to answer questions about this project that aren't covered by the references. Please include an s.a.s.e. with your inquiry. Have fun and many good operating impedance measurements. QST

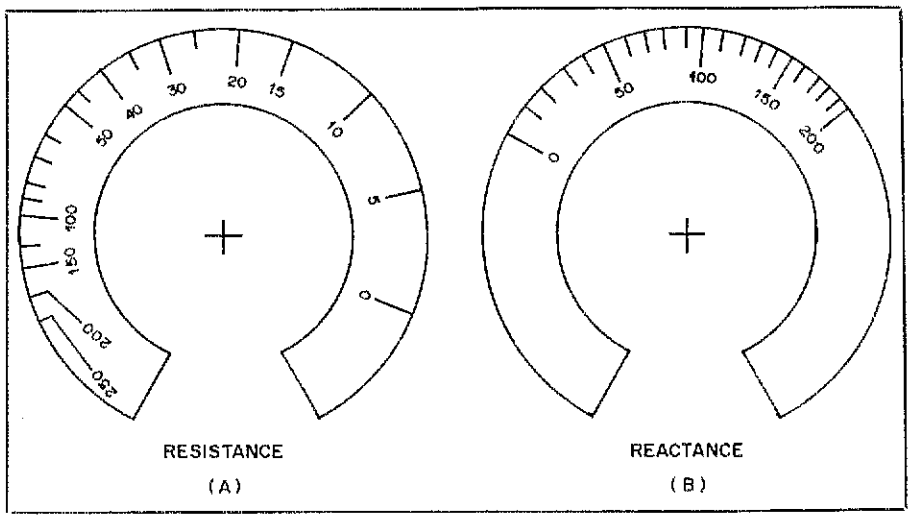


Fig. 13 — Dial scales for the OIB. These scales are the correct size for Radio Shack vernier dials. The calibration of the reactance dial will vary with different capacitors (see text).

Notes

[1]*Instruction Book for Model OIB-3 Operating Impedance Bridge*, Delta Electronics, Inc., July 1977.
[2]*Application Bulletin Number 1 for New Measurements You Can Make with the OIB-1 Operating Impedance Bridge*, Delta Electronics, Inc., December 1964.
[3]*Application Bulletin Number 3 for Use of the Operating Impedance Bridge*, Delta Electronics, Inc., June 1964.
[4]Wright, "Unique Bridge Measures Antenna Operating Impedance," *Electronics* for February 23, 1963.
[5]*Reference Data for Radio Engineers*, 5th edition, 1968, ITT Corporation, p. 22.

Strays

CPR IS FOR EVERYONE

☐ Two recent incidents involving hams practicing cardiopulmonary resuscitation emphasize the need for continued training in CPR. Barb Cowan, WA9SEA, was taking the Advanced test at the FCC Indianapolis office when another ham, Lou Ross, K9QFU, suffered a heart attack in the testing room. Barb, who had recently completed a CPR course, immediately began treatment, assisted by Mel Martin, K9PQP. Barb and Mel continued treatment until an ambulance arrived. Good work, Barb and Mel! We wish Lou a speedy recovery. (Information via Ron Weiss, W9OFF)

In another situation Fred Gissoni, K4JLX, of Louisville, KY, and his wife Betty administered CPR to a man who had had a heart attack at a meeting they were attending. Their efforts saved his life. This in itself is not very remarkable. But the fact that Fred and Betty are blind and that they performed this critical life-saving emergency service is very remarkable. CPR is for everyone. Sign up for a CPR course with your local Red Cross as soon as possible. An article in May 1978 *QST*, page 44, provides more information.

SLOW BOAT?

☐ Ever think the mail service is getting slower? Ask Laurence Walter, K6IM. He mailed his log for last year's November Sweepstakes on December 8, 1978. His battered SS entry finally arrived in Newington on September 26, 1979. Credit him with 61,320 points, 438 QSOs and 70 sections in 17 hours of operation. — *Tom Frenaye, K1KI*

Bob Dyruff, W6POU (standing center), recently hosted a symposium at his home in Montecito, CA. The Santa Barbara ARC group made an in-depth study of past and present problems facing Amateur Radio. Conclusions will be made available to the ARRL Long-Range Planning Committee or any study group of the ARRL. Symposium participants recommend that other ARRL-affiliated clubs hold similar sessions.

Feedback

☐ The list of *QST* abbreviations (October, pages 65-66) contains a glitch — RTTY is actually the abbreviation for radioteletype.

☐ The "Simple RF Sniffer" in Basic Amateur Radio, October 1979 *QST*, should have a blocking capacitor between the diode voltage doubler and the input jack, J1, in order to permit the rectifier to double when the coil probe is plugged in. When the whip antenna is attached at J1 the circuit works okay as a doubler. Increased sensitivity with the coil probe can be had by inserting a 0.01-μF disc capacitor between the diodes and J1. Thanks to N1AW for spotting the error.

Learning to Use Rectangular and Polar Notation

If you've been victimized by a missing phase angle, or thought that polar notation was only for Eskimos, this article should help break the ice.

By Jim Bartlett,* K1TX

Amateur Radio has its complicated side. But sometimes the complicated can become easy to understand, especially if a particular approach is taken to the subject. Take capacitors, inductors and resistors, for example. When used together they make up what are commonly called *complex circuits*. There are several methods available that we can use to manipulate reactances and resistances while solving for impedances in these circuits, but the one that *seems* most elaborate to many amateurs just might be clear-cut and precise for you! This method involves the use of *polar and rectangular notation*.

You should have a basic understanding of reactive components and impedance before continuing. The references and glossary at the end of this article are good sources of information on this. First, let's review briefly the method of obtaining the impedance for a series RCL circuit. In Fig. 1A, we have just such a circuit. Since the components are in series, the circuit may be expressed directly in the form R + jX. in this case, we would have 2 + j10 − j10, since there is a capacitive reactance of 10 ohms and an inductive reactance of 10 ohms. The j terms can be combined, and in this case they cancel, leaving the resistive component of 2 ohms. So the impedance (Z) of the circuit would be 2 ohms.

Another series circuit is shown in Fig. 1B. The difference here is that the reactive components are not equal, and when the j terms are combined, we have 5 + j12. To find the overall impedance, we can use the formula shown in Fig. 1B, and by performing the indicated operations, we would find that Z = 13 ohms.

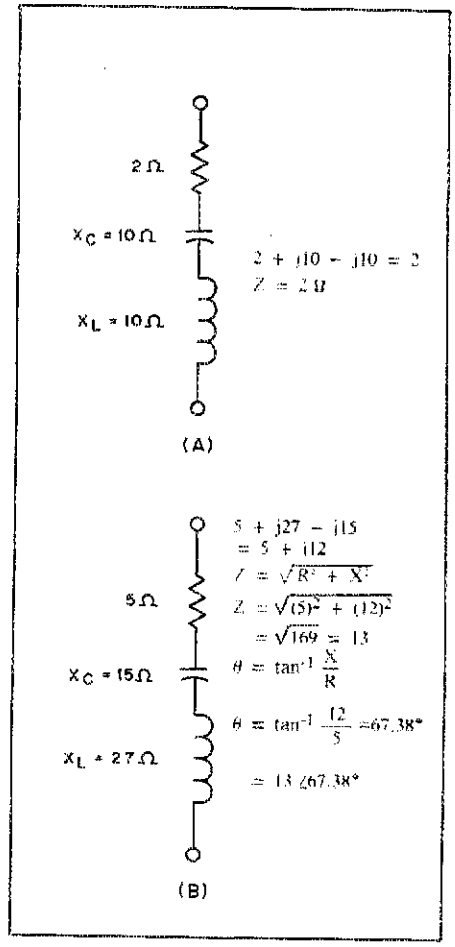


Fig. 1 — At A, a series complex circuit with X_C equal to X_L, and at B, the same type of circuit with reactances unequal.

There is a problem with saying that the impedance of this circuit is 13 ohms; we have a tendency to forget that this impedance is *not* purely resistive — as it *was* with the circuit in Fig. 1A. There is an inductive component shown in the R + jX form, but apparently missing in the final calculated impedance. Where did it go? It didn't really go anywhere . . . it wasn't computed in the first place because the impedance calculation wasn't completed! The reactance in a circuit such as that in Fig. 1B is indicated in an impedance by the addition of a *phase angle*. This is important because without it, we have only stated part of the impedance. That's right, the number that we calculated as 13 ohms is just the *magnitude* of the impedance. The phase angle tells us the direction of the magnitude. So you might say that giving an impedance *magnitude* without its phase angle is like giving a stranger in need of help the distance to the police station but not telling him the direction he should travel!

The phase, angle, commonly called either *theta* (θ), or *phi* (ϕ), the international symbol for phase angle, is 67.38° for the circuit in Fig. 1B. It is calculated by finding the angle whose tangent is X over R. The word *arctangent* means "the angle whose tangent is," and you'll often

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see arctangent abbreviated arctan or written $\tan^{-1}$. You can see that the θ for the circuit in Fig. 1A, if we had computed it, would have been zero, because as X approaches zero, so does the $\tan^{-1}$. An impedance expressed in this form ($Z\angle\theta°$) is in what we call *polar notation*.

An Old Example Revisited

In the next example, let's use a sample circuit that was given in a previous *QST* article which discussed the handling of complex circuits using admittance, conductance and susceptance values.[1] This circuit was selected so that you can follow this discussion and then compare the results, if you wish, with those obtained using the other method. Both methods work — some people prefer the admittance method, others prefer this one. It really makes no difference which method *you* use, but you should try both, select the one that works the best for you, and then stick with it. Nothing can confuse you more than trying to memorize two redundant methods when you're trying to study for your Advanced or Extra Class test.

In Fig. 2A, a series-parallel complex circuit is shown. To find the impedance of the entire circuit, we first break it down into two series circuits. After we have determined the impedance of each of these "legs" of the circuit, we will then put them back in parallel and find the impedance of the complete circuit.

At B, the two series legs are shown with the impedance shown for each in *rectangular* notation. This is what we call the form used when the resistive and reactive components are given as we have done here. Notice the important + and − signs associated with the j operative in each case. Always be sure that you include these in your calculations.

Using a Graphic Approach

Before we convert these R + jX values into impedances with phase angles, let's look at the resistive and reactive components as they would be represented pictorially on a Cartesian plane (see Fig. 2C). In each of the two graphs in the drawing, the resistive component of the R + jX term is plotted along the horizontal X axis, and the reactive component along the vertical Y axis. Inductive reactance is customarily termed positive reactance, so it is plotted upward from the center or origin of the graph, while "negative" X_C is plotted downward. If lines are drawn up from the X axis and out from the Y axis and a point is marked at their intersection, a rectangle is formed. The hypotenuse of the two included right triangles represents the magnitude of the impedance, and the angle of this line with respect to the X axis is equal to the phase angle, θ.

Plotting R and jX values for the purpose of determining Z and θ might be fun the first couple of times, but it certainly would get old pretty fast. We showed this method only to place the R + jX, Z and θ terms in a common frame of reference so that their relationship could be seen more easily. From here on, we'll use an electronic calculator to make rectangular-to-polar conversions. If you wish to build and use an inexpensive form of calculator based on the Cartesian-plane method, such a device was described by WB2NAG.[2]

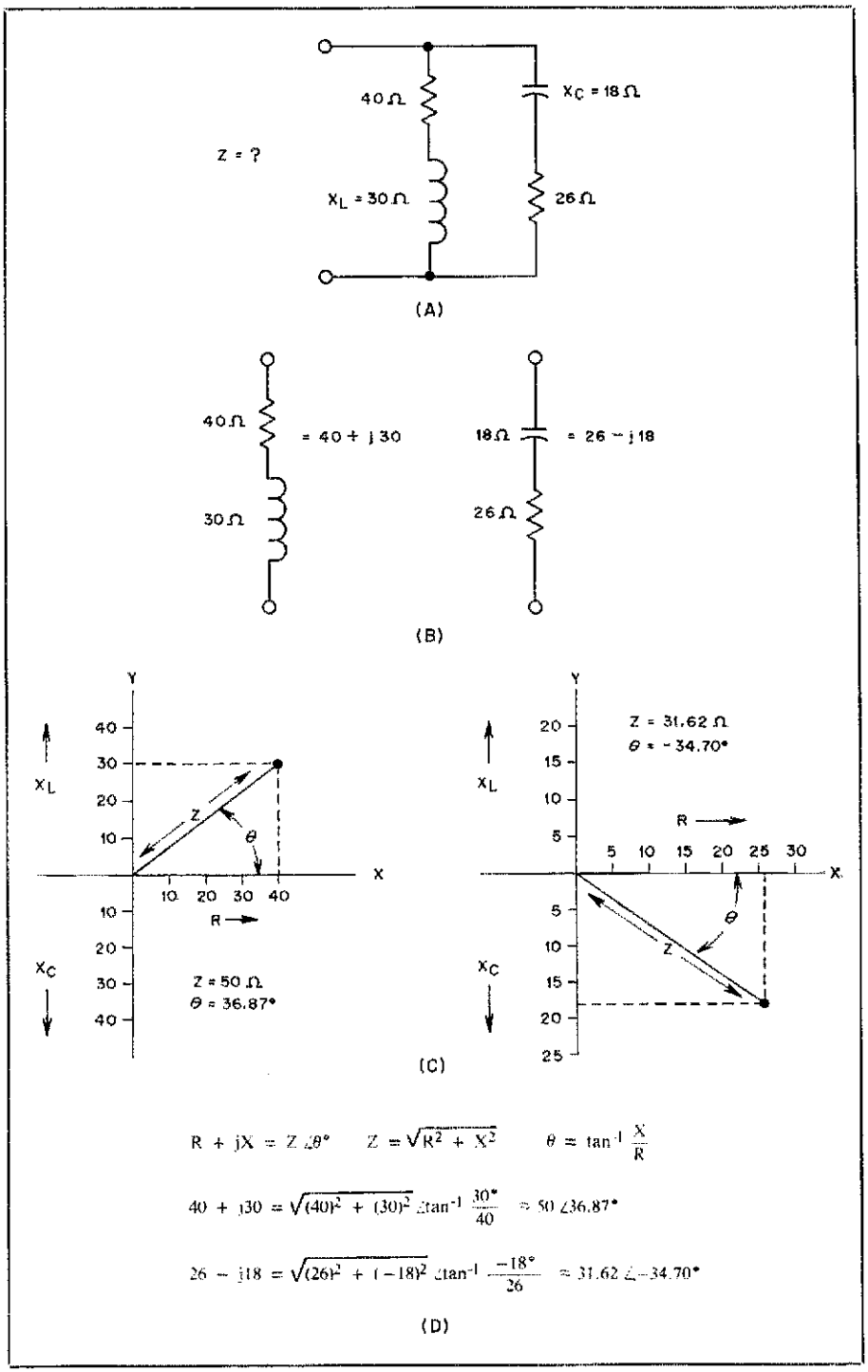

Fig. 2 — A series/parallel combination complex circuit is shown at A. First it is broken down into two series legs as shown at B. Each of these legs is then placed in both rectangualr and polar notation by using graphs, as in C, or by calculation as in D.

Polar and Rectangular Notation

If we use the equations shown in Fig. 2D, we find that the RL leg (40 + j30) is approximately equal to $50\angle 36.87°$, and the RC leg (26 − j18) is approximately equal to $31.62\angle -34.70°$. We say

*Notes appear on page 21.

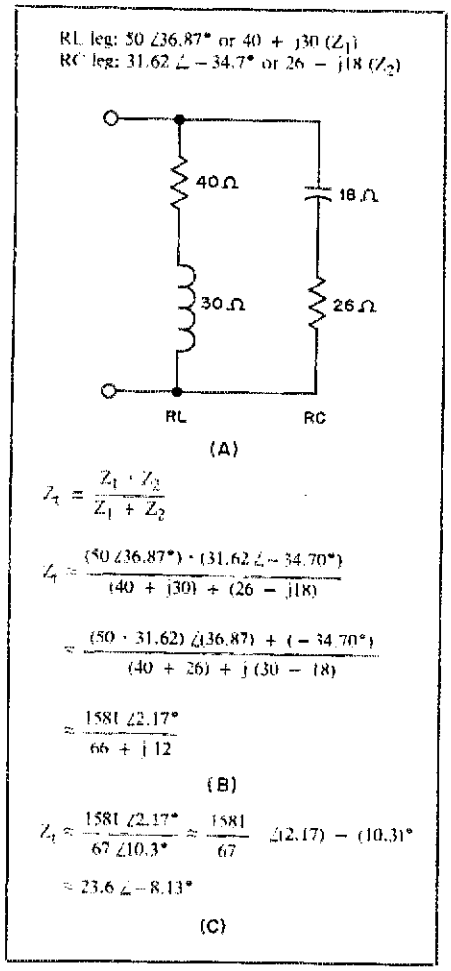

Fig. 3 — The impedance of each leg of the circuit is shown at A in both notation forms. The total impedance is then solved as shown in B and C, with the result shown in polar form.

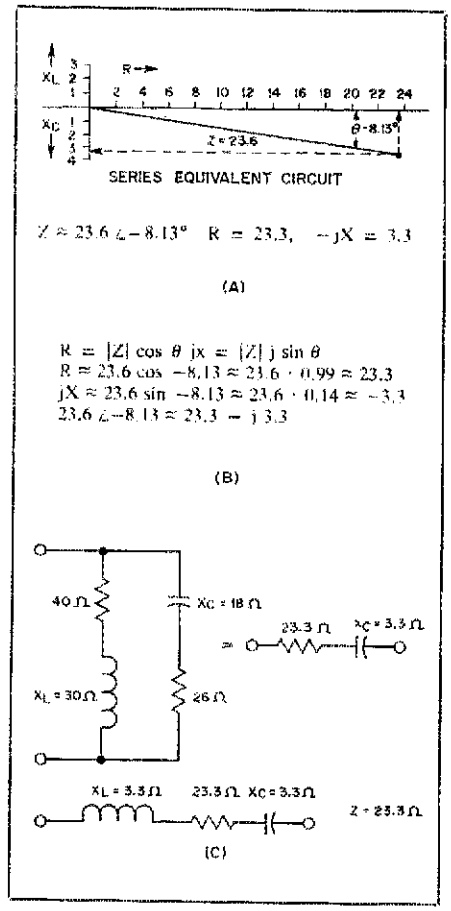

Fig. 4 — A graphical approach to solving for the series equivalent is shown at A. Calculations are used to arrive at the same result in B. A comparison of the initial circuit with the resulting series equivalent is shown at C, along with an example of reactive-component cancellation, as discussed in the text.

approximately equal because the magnitude or the phase angle (or both) are usually rounded off during calculations. However, the values you obtain with an electronic calculator will be quite close (more than accurate enough for any amateur work). To obtain the highest degree of accuracy, you should try to do as many of the calculations as you can without writing down intermediate results and entering them again later. This kind of transcription usually causes more rounding off — especially when you are using a calculator that carries out calculations with internal storage of more digits than it displays.

Fig. 3A shows the two series legs with their impedances expressed in both polar and rectangular notation. To complete the impedance calculation for the whole circuit we started with, we just need to recombine the two series legs in parallel, as in Fig. 3A.

To find the impedance of a circuit containing two impedances in parallel, we use the formula shown in Fig. 3B. As will be shown, to solve this problem we need each impedance expressed in both polar and rectangular notation, and we will need to perform three operations: addition, multiplication and division. Here's where you need to learn a few simple rules pertaining to the use of these operations on the impedances. When addition or subtraction is indicated, rectangular form is used; polar notation is used when two impedances are to be multiplied or divided. Keeping this rule in mind, we can see immediately that the Z_1 and Z_2 terms on the top of the equation in Fig. 3B need to be in polar form, and the terms on the bottom need to be expressed in rectangular form. The resulting expression is shown just below the general equation in Fig. 3B. Now we are faced with the need to *multiply* the two terms on top. To do this, we simply *multiply* the Z magnitudes together, and *add* the phase angles (keeping + and − signs in mind).

Next, we need to add the bottom terms in the equation. We do this by adding the resistive components together, and adding the reactive components (jX) together, again keeping + and − signs in mind. If all of these operations are performed, the result should be that shown in the last line in Fig. 3B.

Now, to perform the division that is indicated, we must first put the bottom term into polar notation. This is easily accomplished by using the formulas listed in Fig. 2D, and we find that 66 + j12 is equal to 67∠10.3° (see Fig. 3C). Finally, we perform the division — but here another rule must be learned. To divide the two terms given in polar form, we divide the magnitudes as we would any two numbers, and *subtract* the lower phase angle (that θ which is part of the divisor) from the upper phase angle (part of the dividend). The quotient of the two magnitudes is the magnitude of the impedance for the complete circuit, and the difference between the two phase angles is θ. In this case, the impedance is 23.6∠−8.13°. [The rules for handling phase angles when performing multiplication and division are the same as for handling exponents of like quantities in such operations. — Ed.] These last few steps are shown in Fig. 3C.

This form of impedance calculation — using polar and rectangular notation — is, or at least should be, easier to follow because the formulas you use are the same as those used for calculations involving parallel resistors. Note that the equations

$$Z_t = \frac{Z_1 \cdot Z_2}{Z_1 + Z_2}$$

and

$$Z_t = \frac{1}{\frac{1}{Z_1} + \frac{1}{Z_2} + \frac{1}{Z_n}}$$

are the same as those you use to calculate R_t for parallel resistance circuits. The resistance formulas you learned as a Novice are just special cases of the above equations. For resistance, you simply replace each Z in these equations with an R. This is possible because with pure resistance (a scalar, not vector with magnitude) you can forget about phase angles and reactive components since they don't exist in the problem. If you view the polar/rectangular method in this light — noting the close relationship to parallel-resistance calculations — it may seem a bit more logical than the admittance/susceptance method.

Obtaining the Series Equivalent

From here, we could determine the *equivalent series circuit* by converting the result we obtained to rectangular notation. This might be helpful if we wanted to know what kind and how much reactance would be necessary to put in series with the input to such a circuit in order to cancel out the reactive component of the impedance. In Fig. 4A, the magnitude and phase angle of the circuit impedance are used to plot a line on the Cartesian plane. A line Z units long is drawn at an angle θ

degrees with respect to the X axis. From the end of this line, we can extend lines up and across to intersect with the X and Y axes respectively. The points of intersection are the R and jX components of the impedance expressed in rectangular form.

We can obtain the same results much more easily by using the equations shown in Fig. 4B. The absolute value of Z times cos θ yields the R component, and the absolute value of Z times sin θ produces the jX vector. In Fig. 4C, the series-equivalent circuit is shown next to the original series-parallel circuit. Below the two equivalent circuits is the series circuit with the proper amount of inductive reactance added to cancel out the 3.3 ohms of X_C. The impedance of this circuit would be the same in both rectangular and polar forms: 23.3 ohms. Whenever you see an impedance stated in this way (without any jX vector or θ) you should be able to assume that it is a purely resistive impedance. I say *should* because there will always be cases of the missing phase angle, and you never know when you might be the victim of one! QST

Notes

[1]Hall, "A Simple Approach to Complex Circuits," *QST*, July 1977.
[2]Carlini, "WB2NAG Polar to Rectangular Converter," Hints and Kinks, *QST*, December 1975.

References

Gibilisco, "Trigonometry for Beginners," *QST*, October 1979.
Radio Amateur's Handbook, 56th Ed., ARRL.
Radio Handbook, 20th Ed., Sams and Co., Inc.
Understanding Amateur Radio, ARRL.
The Radio Amateur's License Manual, 7th Ed., ARRL.

Glossary

Complex circuits: Circuits containing resistance and reactance.
Impedance: A more general term than resistance or reactance, as it applies to circuits containing either or both.
j: Always precedes either X or else a numeric value of reactance in ohms; an "operative" indicating vector addition rather than algebraic. A plus sign preceding the j indicates inductive reactance and a minus sign indicates capacitive reactance.
Phase angle (of an impedance): Trigonometric relationship between the resistance value and the reactance value and sign of the impedance.
Polar notation: A method of expressing an impedance, by giving its overall magnitude and its phase angle.
R: Shorthand notation for resistance.
Reactance: A quality similar to resistance, but exhibited by inductors and capacitors in circuits where ac or rf is applied.
Rectangular notation: A method of expressing an impedance, by giving the magnitude of its resistive component and the magnitude and sign of its reactive component. (See j above.)
X: Shorthand notation for reactance, either capacitive or inductive.
Z: Shorthand notation for impedance.
θ: Shorthand notation for the phase angle of an impedance.

Strays

Mayday!

Newcomers to Amateur Radio often wonder why Morse code is still required for attaining a ham license. I can tell them why.

Disaster struck on what was supposed to be our "dream of a lifetime" fishing trip. Three of us took off in a Cessna 180 float plane bound for a small lake in Manitoba's north country, 260 miles away.

At first, luck was on our side. Within two hours, each of use had caught trout weighing about 25 pounds. Our rocky fishing point was narrow, however, and we were having trouble keeping our lines untangled. To ease the congestion, Chuck fired up the Cessna and taxied to the other side of the lake to fish.

That's when our luck started to change. Dave's new rod cracked during a cast, his line broke, and half of his rod sailed into the water. Then came the bugs. An exotic mixture of black flies, mosquitoes and other insects began devouring a rare dish — us. We summoned Chuck back across the lake with the insect repellent, which was in the plane. Right when we thought things couldn't get any worse, they did — much worse.

As Chuck started the plane to taxi over to us, an unseen current gripped the aircraft and pushed it out into the middle of the lake. In an effort to break free of the current, Chuck applied more power. With a sickening crunch, the plane struck and stuck to rocks hidden beneath the foaming water. Eventually, Chuck managed to pry his plane loose and taxi to shore to check the damage. A hole gaped in the right float which was quickly filling with water. A crude patching job failed to close the hole, and the waterlogged plane would not take off. In one final, desperate attempt to lift the damaged plane out of the water, the left float was punctured by another rock. We were trapped! Our secluded fishermen's paradise had become a watery prison.

Chuck immediately began calling "Mayday," but the only response was silence. We built a signal fire and alternated calling "Mayday" at 30-minute intervals hoping to contact a commercial flight on the polar route. Still, our calls got no reply. The elt (emergency locator transmitter) was screaming its electrifying siren on 121.5 MHz, the same frequency as our vhf radio. I turned off the elt after each distress call to listen for replies.

Just as the light and our hopes were dimming, we got a response. A Pan American pilot answered and accurately copied our position as 59° 20′ north by 97° 40′ west. Later another pilot radioed that a rescue helicopter was on its way.

When the chopper pilot estimated that he was 40 miles south of our location, we refueled the signal fire so he could see it on his approach. Convinced that our rescue was near, we began packing our gear. We stowed away the adf (automatic direction-finding receiver), but left the vhf gear in the plane for any last-minute communications.

After more than an hour of billowing smoke and nerve-racking waiting, the helicopter had not shown up. I decided to use the vhf unit to see if anything was wrong. Before I could get to the rig, it began squawking. An airline pilot was asking if 57° 20′ north by 97° 40′ west was the correct location. I couldn't believe it! The search was taking place two degrees south of us; approximately 120 miles away.

I grabbed the microphone to send the correct coordinates. The pilot reported that he was receiving only a carrier, no voice. I tried again, but got the same result. Apparently, when I removed the adf from the plane I had broken a wire under the panel in the audio circuit. We were without communications. Or were we?

I put the microphone on my knee and hit the button with my finger in the familiar staccato of Morse code — SOS SOS SOS DE CF IXJ CF IXJ CF IXJ HW CPY BK. The airline pilot said to someone else, "That guy down there sure knows his Morse code. He's telling us something, but none of us knows Morse code." My heat sank. What good was code if the guy at the other end couldn't copy it?

As I had done so many times on the ham bands, I began to send very slowly while the pilot looked up each character in his flight manual. Finally, he confirmed our correct position. The next morning, a Canadian Forces Hercules search and rescue plane zeroed in on us. A few hours later, a helicopter arrived and, thanks to Morse code, we were transported back to civilization. — *Jim Prentice, VE4JI, The Pas, MB* QST

● *Basic Amateur Radio*

A Simple Utility Power Supply

This beginner's power supply delivers 2 to 18 volts regulated, at 0.7 ampere. Here's how to build it, plus some tutelage on the subject.

By Doug DeMaw,* W1FB and Bob Shriner,** WAØUZO

A ham shack without a power supply is not a ham shack! Well, it *might* be a shack, but not an operational one. The same is generally true of the workshop: In order to experiment with circuits it is handy to have a power supply that can be plugged into the 117-volt outlet, rather than using batteries. Ideally, the supply should have variable output voltage, moderate current availability and be regulated. Another criterion is clean dc output. Our project this month is centered on a simple unit that fits this description. The assembly format follows that of last month's assignment, and utilizes the "universal" circuit board which was described in *QST* for September 1979. This power supply will be used with many of the Basic Radio projects which will appear in subsequent issues of *QST*.

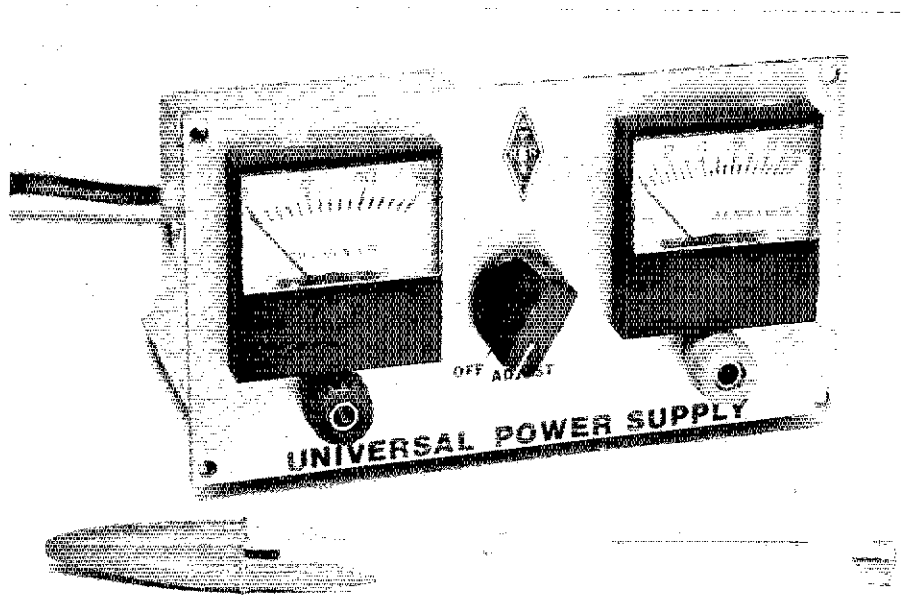

Fig. 1 — Photograph of the simple regulated power supply. The panel and side brackets are made from sections of pc board.

Some Fundamentals

When building a home project it is not only desirable to know our way around the chassis or foundation, it's important to understand the basics of how the circuit functions. In addition to enhancing our general knowledge about circuits, we'll be in a better position to repair the circuit if it malfunctions. Therefore, with the reader's permission, the authors will don their tutors' fedoras at this point. Oh yes, we'll skip the equations for the purpose of keeping things as ordinary as possible in this discussion.

An ac-operated power supply almost always contains one fundamental part — the *power transformer*. The electrical symbol for this component is given in Fig. 2A. Transformers contain two or more windings of wire. Each is insulated from the others and from the iron core material. For our discussion we have selected a simple transformer with only two windings — a primary and a secondary. The secondary has an electrical tap point at the exact center, although for many applications a center tap is not required. If we were to connect the primary winding to the wall outlet in our shack (117 V ac) and attach an oscilloscope across the secondary winding, a pure 60-hertz sine wave should be seen. If the secondary winding has more wire turns than the primary does, the voltage across the secondary will be higher than the 117-V source at the primary. If the secondary has fewer turns than the primary, the voltage across the secondary will be less than 117. A transformer can have many secondary windings, each of which delivers a specific voltage and current

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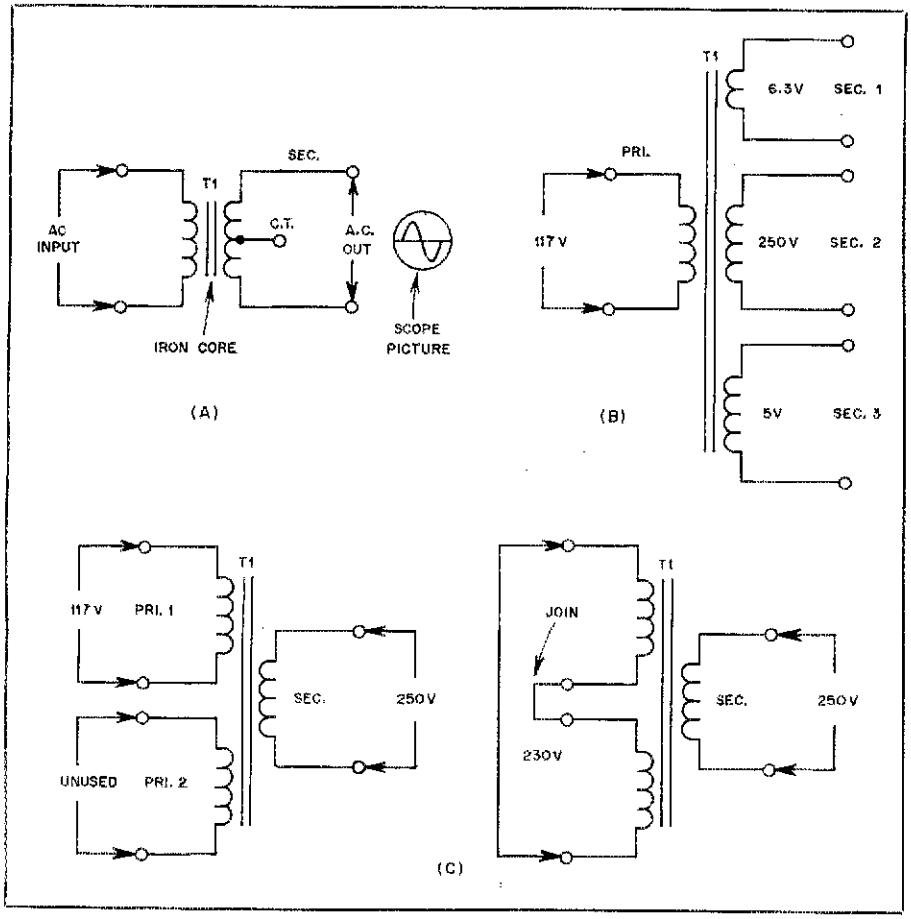


Fig. 2 — Schematic illustrations of various power transformers (see text).

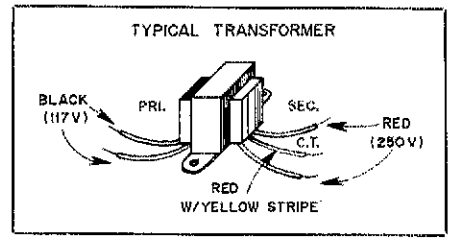


Fig. 3 — Pictorial view of a typical transformer. The wire leads are color-coded to help identify the windings.

(Fig. 2B). Some transformers have more than one primary winding (each is identical) to permit operation from the 117-volt or 230-volt commercial mains (Fig. 2C). One primary is used for 117 volts, but for 230-volt use the two primary windings are connected in series. The secondary voltage is the same in either case.

Most power transformers are built for use at a power-line frequency of 60 Hz, which is standard in the USA and some countries of the world. However, some areas of the world use a 50-Hz line frequency. A 60-Hz transformer can be used at 50 Hz, but the transformer iron core may run somewhat warmer than at 60 Hz. The higher the ac-line frequency, such as the 400-Hz rate used for some purposes in the military and commercial world, the smaller the transformer core needs to be for a given power rating. Another advantage of higher line frequencies is that the rectified voltage (dc) from the power supply is easier to filter and purify as the frequency is increased. This is because the filter capacitors require less capacitance and the filter chokes need less inductance (for a specified amount of ripple reduction) than at frequencies which are lower.

Most power transformers follow an industrial standard with regard to the color of the leads that come from their windings. An example of this is given in Fig. 3. For more elaborate transformers the following color code is generally used:

1) Primary Leads: black
   If tapped:
   Common: black
   Tap: black and yellow striped
   Finish: black and red striped
2) High-Voltage Place Winding: red
   Center-Tap: red and yellow striped
3) Rectifier Filament Winding: yellow
   Center-Tap: yellow and blue striped
4) Filament Winding no. 1: green
   Center-Tap: green and yellow striped
5) Filament Winding no. 2: brown
   Center-Tap: brown and yellow striped
6) Filament Winding no. 3: slate
   Center-Tap: slate and yellow striped

Some variations of the foregoing are found abroad, requiring the experimenter to determine which winding is which by means of a VOM.

How much current a transformer can deliver without overheating is determined mainly by the size and properties of the iron core which is used. The larger the cross-sectional area of the core, the higher the power rating for a given core material. Also, the higher the current or power rating, the larger the diameter of the wire used in the windings. If an attempt is made to take more power from the transformer than it is designed to deliver, the core will "saturate": The output voltage will drop and the core will get hot. The wire in the windings may overheat also. Sustained operation during overloading can cause the transformer to burn up. If the primary winding is fused (and it should be for safety's sake), the fuse will blow and remove the primary voltage during severe overload periods.

Rectification

Now that we understand what a power transformer is and something about how it's made, let's address the matter of changing the ac voltage from the secondary winding of our transformer to dc. Needless to say, the transformer can't deliver dc voltage (there are no such things as "dc transformers"), so we will have to install a *rectifier* diode to obtain direct current (dc). This diode can be a vacuum-tube rectifier or solid-state type, but for this discussion we'll stick with the more modern silicon diode style of rectifier.

Ac voltage from the transformer secondary (Fig. 4A) is applied to the diode, D1. If positive-polarity dc is desired, the ac is fed to the anode (a) of the diode. If we require a negative dc voltage, the ac is supplied to the cathode (k) terminal of the diode. The circuit of Fig. 4A shows a *half-wave rectifier*. It requires just one diode. This diode will pass current only in one direction. It can be thought of as a one-way gate. Pure dc will not come from the cathode of the diode. Instead, we will have what is known as "pulsating dc" (ripple). The nature of the resulting waveform is shown below the circuit of Fig. 4A. The bottom (negative) half of the waveform has been removed by the rectifier.

A dc voltmeter is shown connected across the load resistor, R, in Fig. 4A. It will read the *average* value of voltage at the output of D1. This will be equal to 0.45 times the rms (root mean square) voltage which is present across the transformer secondary winding. Thus, if the transformer voltage was 250 rms, the average dc voltage at the output of D1 would be approximately 112.5 volts for the circuit of Fig. 4A.

Now, if we change the circuit to that of Fig. 4B, adding a capacitor (C), the filtered dc voltage with normal current being delivered to the load (R) will be

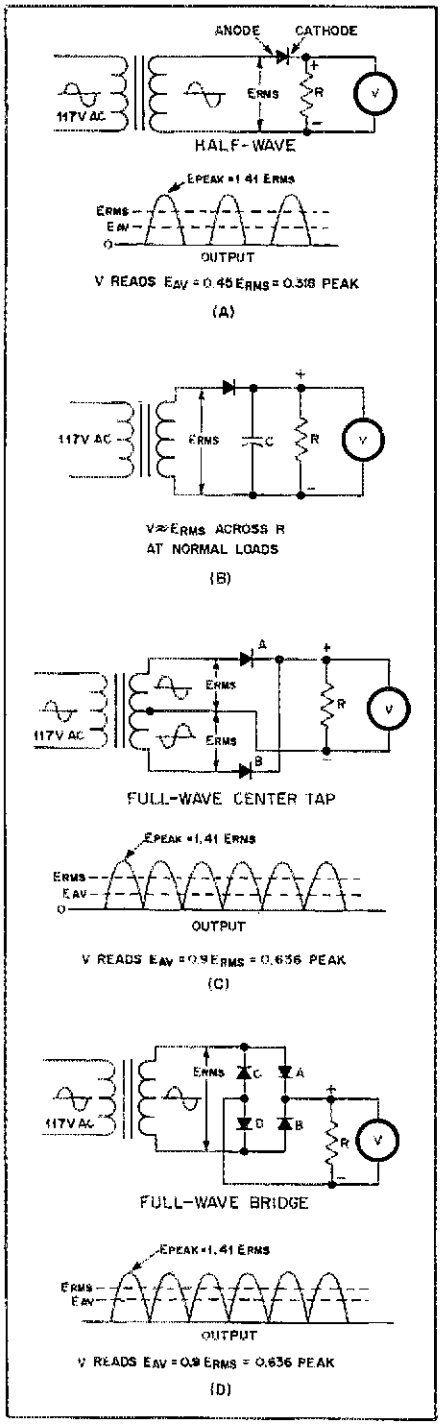


Fig. 4 — Various types of rectifiers and the resultant pulsating-dc waveforms. Each of these circuits is explained in the text.

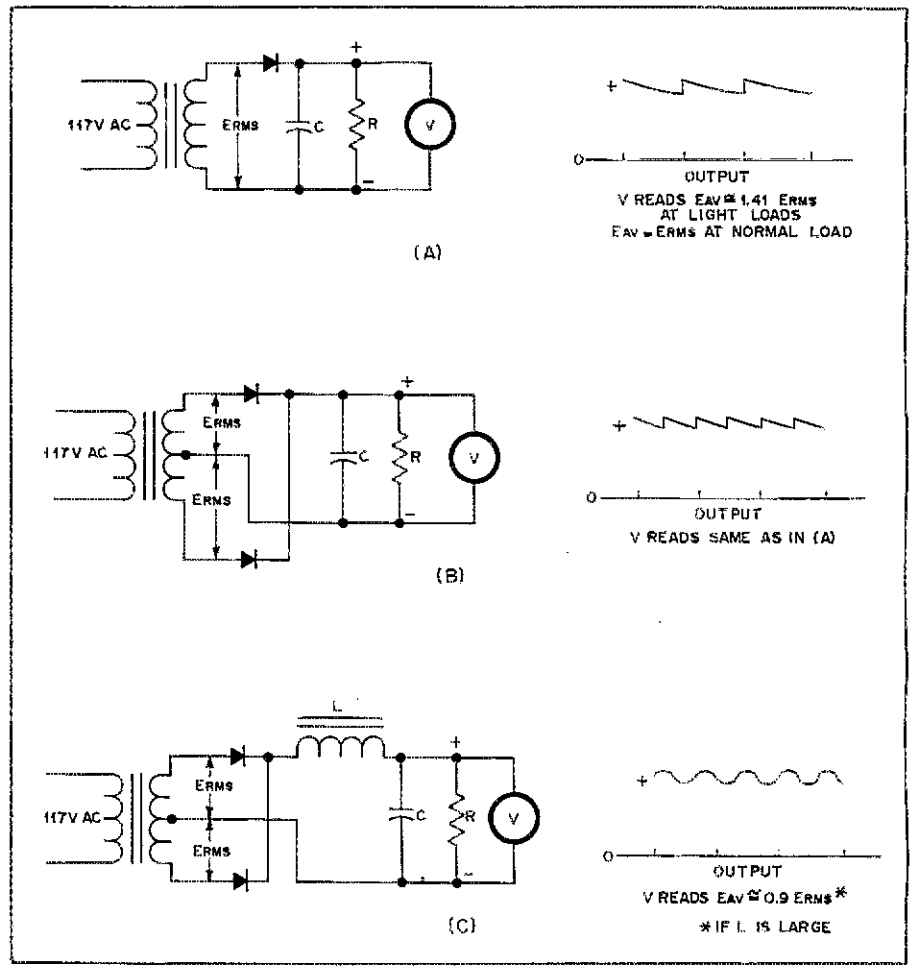


Fig. 5 — Schematic diagrams of (A) a half-wave rectifier with capacitor-input filter, (B) a full-wave rectifier with capacitor-input filter, (C) a full-wave rectifier with a choke-input filter. Output waveforms are shown at the right of each circuit.

approximately equal to the rms voltage across the transformer secondary. Therefore, we would have approximately 250 volts of filtered dc showing on our meter.

Fig. 4C shows a full-wave rectifier circuit with a center-tapped transformer winding. The waveform after rectification is shown also. A full-wave bridge rectifier is illustrated in Fig. 4D. No transformer center tap is needed for this circuit. The output waveform is the same as for the circuit of Fig. 4C. There are circuits for voltage doublers, triplers and quadruplers. We will not discuss them in this article. Data on those types of power supplies are given in *The Radio Amateur's Handbook* and *Understanding Amateur Radio*, published by the ARRL.

Power-Supply Filters

Even though a form of dc voltage exists after the ac is rectified, the pulsations or ripple are usually too great to permit using the dc with most amateur circuits. If no filtering was added there would be hum or a buzzing sound on the transmitter carrier (a frequent cause of cw notes which are below T9 is inadequate power supply filtering). If a poorly filtered power supply was used with a receiver, the audio in the speaker or earphones would have buzz or hum superimposed on it.

In a half-wave power supply (Fig. 2A) the ripple is at the same frequency as the rms voltage from the transformer secondary (60 Hz). Ripple from a full-wave rectifier is at *twice* the line frequency, or 120 Hz, as this kind of rectifier is a frequency doubler. As we said earlier, the higher the frequency the easier it is to filter. Therefore, full-wave rectifiers are preferred for most applications. These fluctuations must be ironed out until the ripple barely exists (ideally there would be none). Here's where our filter circuit comes into the picture.

When a filter capacitor (C of Fig. 5A) is located immediately after the rectifier diode we have what is called a *capacitor-input filter*. Those which follow the rectifier immediately with an inductor (choke) are termed *choke-input filters* (L of Fig. 5C). It should be noted that *all* power supply filters use filter capacitors, but not all filters contain chokes.

Both types of filters, with half-wave and full-wave rectifiers, are shown in Fig. 5. To the right of each power supply circuit are the typical waveforms for the type of rectifier depicted. In all examples which use a capacitor-input filter, the output dc voltage after filtering is substantially greater than when no filter capacitor is used after the rectifier. We learned that the output voltage for the circuit in Fig. 4A was less than the transformer secondary voltage — 112.5 volts for a 250-volt rms source. However, the circuit of Fig. 5A, with the simple addition of C, will yield an average dc voltage of 1.41 times

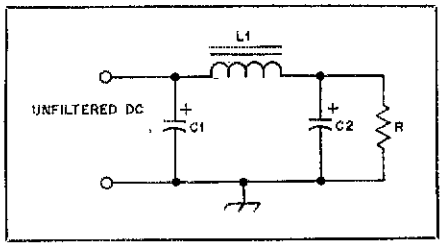


Fig. 6 — Typical pi type of filter section for a capacitor-input filter.

the rms voltage of the transformer secondary. Thus, if the rms voltage was 250, the filtered dc across the load, R, would be 352.5 volts! When designing a power supply for a specified piece of equipment we must always take this voltage increase into account. This will prevent excessive voltage from damaging some part of our circuit.

The choke-input circuit of Fig. 5C will yield the same dc output after filtering that can be obtained from the circuit in Fig. 4B, or 0.9 times the rms voltage at the transformer secondary. For a 250-volt transformer the filtered dc would be 225 volts.

The network shown in Fig. 6 is called a filter section. The proper values for C1, C2 and L1 are based on how much current the supply must deliver to a specified piece of equipment and the amount of ripple reduction we may desire. Generally speaking, the higher the value of C1 and C2 in μF, and the greater the inductance in L1, the better the filtering action. Since we promised to avoid math in this article, we can't give you specifics on this subject. But, chapter 5 of *The Radio Amateur's Handbook* gives complete data for calculating these values mathematically. For acceptable ripple reduction in a 12-volt, 1-ampere power supply we would find a 1000-μF value at C1, and a 2000-μF value at C2, with L1 being on the order of 0.5 to 1 henry. As the voltage and current from the supply change, so does the required value of each filter component. For example, a 300-volt, 100-mA supply might use 20 μF at C1, 40 μF at C2 and 4 henries at L1. In other words, at higher voltage and lower current the inductance of the filter choke increases while the values of capacitance become lower for the same percentage of ripple reduction.

Voltage Regulation

Some radio circuits (such as VFOs) need to have a constant supply voltage at all times in order to ensure operational stability in terms of stage gain and/or frequency of operation. A power supply which can provide a steady output voltage, despite changes in ac line voltage, or shifts in current taken by the load (receiver, transmitter, etc.), is called a *regulated power supply*.

Some regulated supplies are designed to deliver a specific output voltage over a broad range of load currents. Others are built so that the output voltage can be set by means of an adjustable resistor (potentiometer) to provide a variety of regulated voltages. The operating voltage chosen is determined by the setting of the level control. A common type of power supply today is one which delivers, say, 1 ampere of current (maximum) and has a voltage range of 1 to 30.

Just how a modern-day solid-state voltage regulator operates is beyond the scope of this article. Detailed information on the subject is given in *Solid State Design for the Radio Amateur*, chapter 7, and chapter 5 of the 1979 *Handbook*.

Most regulators are ICs (integrated circuits) which have three leads — input, output and ground. They come in various current and voltage ranges (positive or negative), and some are intended as regulators in variable-voltage supplies. These regulators are used after the power-supply rectifier and filter capacitor (see U1 of Fig. 6).

Zener diodes are often used as regulators in various branches of a radio circuit. Generally, they are employed in circuits that draw only a few milliamperes. We are not apt to find a Zener diode used as the principal regulator in a power supply.

Rectifier-Diode Ratings

Silicon junction diodes are used in solid-state power supplies as rectifiers. We must make certain that the diodes chosen are capable of passing the current our equipment will draw without having their safe ratings exceeded. Similarly, the voltage rating of the diode needs to be taken into account. However, we must be more concerned with the *peak-current* rating of the diode. This is the largest current that can be permitted to flow through the diode at any time during the rectification cycle. This is especially crucial if we are using a capacitor-input filter of the type shown in Fig. 4B. Why? Because when the power supply is first turned on the filter capacitor is discharged and looks like a *dead short* momentarily. The peak

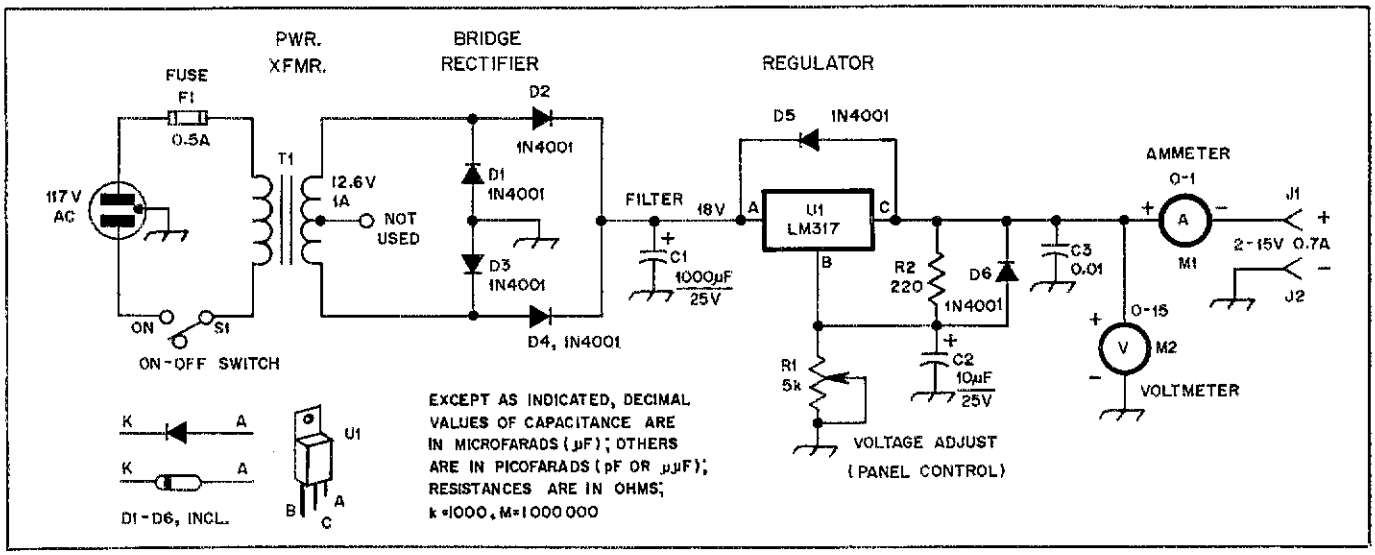


Fig. 7 — Schematic diagram of the regulated power supply.
C1, C2 — Electrolytic or tantalum capacitor.
C3 — Disc-ceramic capacitor.
D1-D6, incl. — 50-PRV, 2-A silicon diode. 1N4001 or equivalent.
F1 — Small fuse, 0.5 A. Solder pigtails to end caps for pc-board mounting.
J1, J2 — Plastic binding posts. Use red for positive and black for negative.
M1 — Miniature 0- to 1-A dc meter.
M2 — Miniature 0- to 15-V dc meter. See footnote 1 of this article.
R1 — 5000-Ω, linear-taper, carbon control with switch built on.
R2 — 220-Ω, 1/2-watt composition resistor.
S1 — Single-pole, single-throw switch (part of R1 assembly).
T1 — 12.6-volt, 1-A filament transformer, such as Radio Shack no. 273-1505.
U1 — National Semiconductor 3-term. regulator, no. LM317 or equiv.

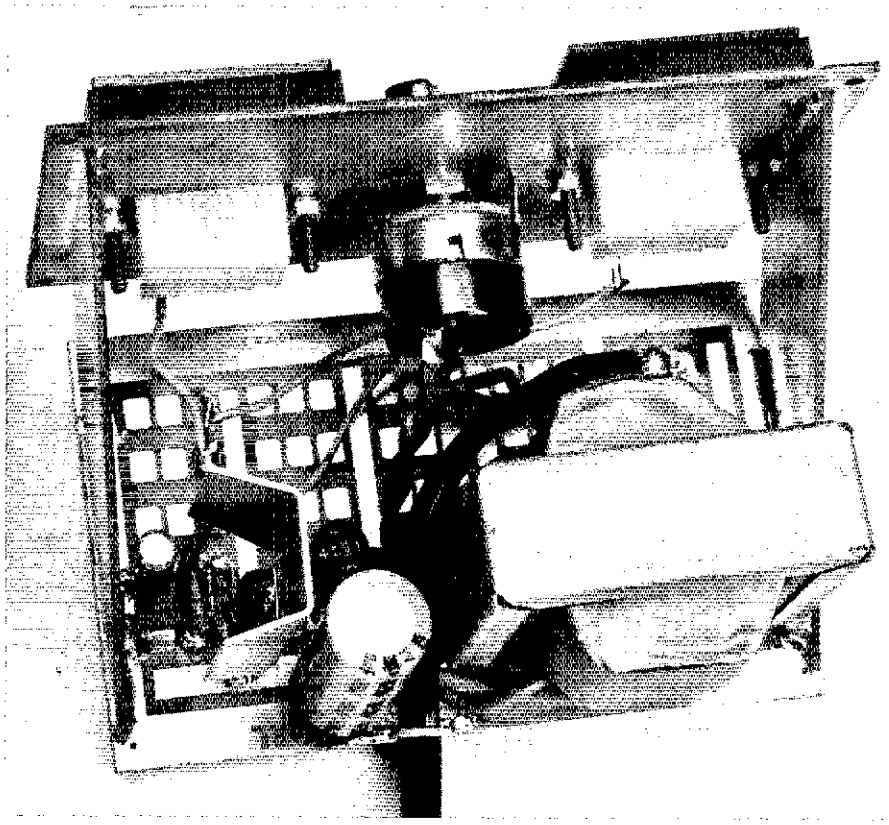


Fig. 8 — Rear view of the assembled power supply. The ac line cord is held secure by means of a tight loop of wire which is soldered to the pc board. The metal object in the left foreground is the heat sink for U1. The layout is slightly different from the recommended one in Fig. 9.

current can be many times the value of the normal output current of the power supply until the capacitor becomes fully charged. When a choke-input type of filter is used, this consideration is not particularly important, as the peak current is almost as small as the dc output current of the supply. A diode with too low a rating will be destroyed when the supply is turned on.

The PRV (peak-reverse voltage) for the circuits of Fig. 5A, B and C will be 2.82 times the rms secondary voltage of the transformer. Thus, if the secondary voltage is 12, the PRV rating of the rectifier diode should be at least 33.8 volts. To stay on the safe side of things we would use a 50-volt diode. A practical rule of thumb for the diode current rating in the circuits of Fig. 5 is to select one which has a current rating of three or four times the normal power supply load current. Thus, if we built a power supply that was intended to deliver 12 volts at 0.5 ampere, we would use 2-ampere diodes with a 50-PRV rating. The *Handbook* has more definitive data on this general subject.

Our Power-Supply Project

Many of the Basic Radio learn-and-build projects which will follow this article in later issues of *QST* will require operating voltages between 9 and 13 volts. Therefore, it is a good idea to provide details now for building a simple 2-15 volt, 0.7-ampere regulated power supply. Many of the parts (if not all of them) can be gleaned at Radio Shack stores or ham-radio flea markets. If you do not live near such sources of parts you can send for a complete parts kit.[1]

The unit is built on the universal breadboard which was featured in Basic Radio last September (*QST*). A panel and side brackets can be made from pieces of double-sided (copper on both sides) pc board.

The Circuit

A schematic diagram for our power supply is presented in Fig. 7. A 12.6-volt, 1-ampere transformer is used at T1. This is the heart of our power supply. It is followed by D1, D2, D3 and D4, which serve as a full-wave bridge rectifier. The center tap of T1 (if it has one) is not used.

C1 is an electrolytic capacitor. It filters the pulsating dc from the rectifier diodes. Our regulator is labeled U1, which in the engineering world means "unrepairable assembly." In other words, if it burns up we must throw it away.

Voltage-adjust control R1 is mounted on the panel. It enables us to vary the power-supply output voltage from 2 to 15. D5 and D6 are used as protective diodes for U1 in the event of a short-circuited load condition or unwanted voltage surges on the power line. M1 monitors the current taken by the equipment we will connect to the power supply. M2 reads the output voltage which is determined by the setting of R1.

Even though T1 is rated at 1 ampere, we can't take that much current from the power supply without overheating the transformer. The regulator, U1, dissipates part of the available power from T1 and causes a drop of roughly 3 volts across it when current is being taken by the load (external equipment). Therefore, we should not allow the load to draw more than 700 mA (0.7 A). If we were to set a conservative limit on the power supply we would rate it at 0.5 A during continuous duty (a constant, long-term operational load).

Construction Details

Fig. 8 shows the assembled power supply. T1 is held in place by soldering the metal frame to the circuit board and the side bracket, at one end. The opposite end of T1 is soldered to one of the long pc-board conductors and to a couple of the small copper pads. The mounting tabs on the transformer frame can be sawed off prior to installation.

A homemade heat sink (to keep U1 from becoming too hot) is made from a piece of copper, brass or aluminum stock. It is 1-1/4 inch (32 mm) high and 1-1/2 inch (38 mm) wide before bending it into a U shape. The heat sink is attached to the metal tab of U1 by means of a short screw and nut.

The remainder of the small parts, except for those on the panel, are soldered to the small copper pads on the pc board. A suggested layout is given in Fig. 9. You may wish to plan your own layout in the interest of neatness and increased spacing between the components. The layout is not critical in the least.

Dimensions for the panel and brackets were given in Basic Radio of *QST* for October 1979. This power supply can be built without the panel and brackets if M1 and M2 aren't used: Some builders may not care about monitoring the current. If so, M1 can be deleted. If a VOM or VTVM is available in your shack, M2 can be left out of the circuit. Voltage checks can be made with your VOM. If the panel isn't used, R1 can be mounted on a small metal or pc-board bracket and affixed to the main pc board. Four adhesive-backed plastic feet can be attached to the bottom of the

[1] Circuit boards, negatives and parts kits for this project are available from Circuit Board Specialists, P. O. Box 969, Pueblo, CO 81002.

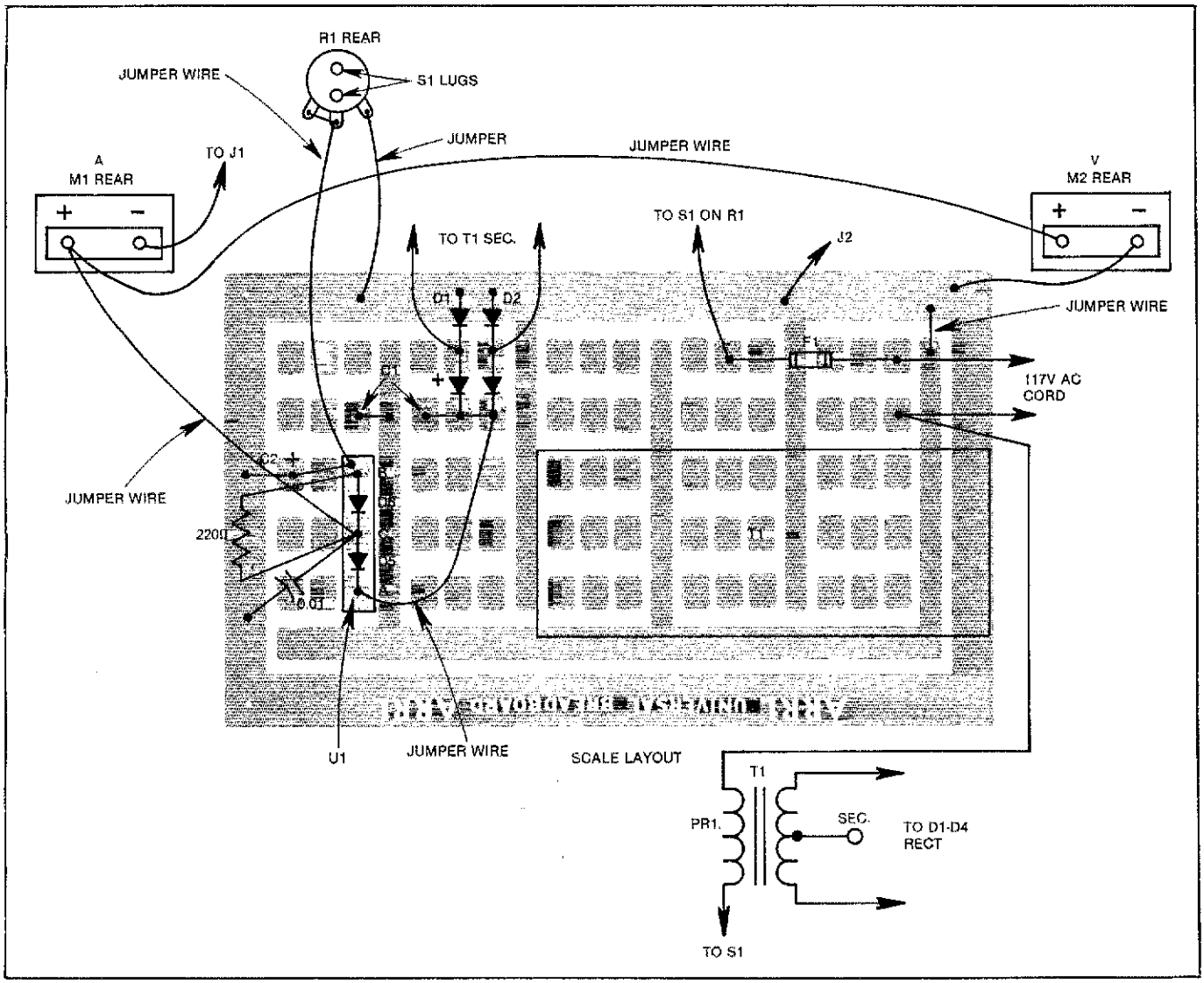


Fig. 9 — Layout of the power supply which is built on the "universal breadboard." (See page 47 of September 1979 *QST* for the etching pattern.) J1, J2, M1, M2 and R1 are mounted on the front panel.

main board to help keep the power supply from sliding about on the operating table.

Closing Comments

We hope you have grasped the basics of power-supply operation from what we have said here. This discussion should help you to assemble the unit with ease. Also, if a breakdown should ever occur, your newly acquired knowledge about how this type of supply works will enable you to repair the circuit quickly.

Stand by for other interesting beginner projects which will be appearing in this column in the months ahead. This supply will be used to power many of the upcoming projects.

Strays

MOVING? UPGRADING?

❑ When you change your address or call sign, be sure to notify the Circulation Department at ARRL hq. Enclose a recent address label from a *QST* wrapper if at all possible. Address your letter to Circulation Department, ARRL, 225 Main St., Newington, CT 06111. Please allow six weeks for the change to take effect. Once we have the information, we'll make sure your records are kept up-to-date so you'll be sure to receive *QST* without interruption. If you're writing to Hq. about something else, please use a separate piece of paper for each separate request.

I would like to get in touch with . . .

❑ anyone who has successfully built the digital clock with large bright orange display that Poly Paks sold some years ago. Contact Erland Belrup, SM7COS, Hjortshog 4540, S-260 34, Morarp, Sweden.

Minimize Your Counter Design

Here's an intelligent application for the computer in your ham shack! One simple BASIC program helps you design digital counter circuits.

By George D. Rose, Jr.,* W4GCE

In this age of digital integrated circuits, frequency synthesizers and programmable counters, just about everyone is coming up with some new circuit implementation. A lot of these new circuits involve the controlling of programmable digital counters.

When someone decides to design a circuit that requires the controlled selection of a counter modulus, the first problem is the selection of an input or clock frequency that will achieve the desired output frequencies with whole integer counter moduli (divisors). The next problem is to determine if the chosen clock frequency is the lowest possible frequency to use in order to minimize the number of counter stages. The fewer the number of counter stages in a programmable chain, the less the RFI (radiation) problems, and the easier the circuitry is to handle — as well as being less costly.

For example, if one were to design a programmable counter to selectively generate the two common RTTY audio tones of 2125 Hz and 2295 Hz, it would become apparent, after some hand-calculator manipulation, that there are a number of frequencies that are common integer multiples of both desired tones. See Table 1. Any of these combinations might be hit upon by a process of iteration, but one would not be sure that it was the *least* common multiple without some trial and error effort.

If, instead of only two numbers, three or more are of interest, then the iterative process becomes very laborious. There is a mathematical process that can be used to permit the determination of the *least common multiple* of a pair of integers. It is called the Euclidean Algorithm. While the process is a bit messy, this age of home computers makes the manipulation of the Euclidean Algorithm quite civilized. It is not my intent to describe this process, but to present a computer program written in BASIC[1] to calculate the least common multiple of up to 20 integers, and also present the moduli (divisors) in both decimal and binary form. The program operation is shown in Fig. 1.

Table 1 — Common integer multiples of two desired tones, along with decimal divisors.

Tone 1 2125 Hz	*Tone 2 2295 Hz*	*Common Multiple*
X 27	X 25	57,375 Hz
X 54	X 50	114,750 Hz
X 81	X 75	172,125 Hz

When the number displayed as the LEAST COMMON MULTIPLE is divided by the DEC MODULO, the result will be the desired output as shown under DATA. It is of further interest to note that the BINARY MODULO represents the ones and zeros as they would be programmed directly into an integrated circuit down-counter such as a TTL 74193. The most significant digit appears on the left as it is printed out.

The BASIC language program is shown in Fig. 2. It is written in a general form that should run on most existing computers with little change.[2] Fig. 3 provides a few more examples of the program operation. The author wishes to acknowledge the assistance of Bob Martin, K4LKQ, in the development of this program.

[1]Beginners all-purpose symbolic instructional code.

[2]Editor's Note: For the Radio Shack TRS-80 (and other home microcomputers) you may find it necessary to use double precision on variable C (used in calculations in program steps 180, 270 and 410). If the program will not run as is, or doesn't yield the same numbers as the sample runs in this article, try adding this line to the program: 15 DEFDBL C.]

```
RUN                          LEAST COMMON MULTIPLE IS 803250
ENTER UP TO 20 NUMBERS
ENTER Ø TO FLAG END OF DATA INPUT
? 2125
? 2295                  DATA   DEC MODULO   BINARY MODULO
? 2550                  2125   378          00000000000000000101111010
? 2975                  2295   350          00000000000000000101011110
? Ø                     2550   315          00000000000000000100111011
                        2975   270          00000000000000000100001110
```

Fig. 1 — Sample run of the LCM program. An entry of "Ø" as an input number tells the computer that no more data follow. This causes the program to continue, executing the LCM calculation and outputting the data shown here.

*105 Middleboro Pl., Lynchburg, VA 24502

```
10  REM LEAST COMMON MULTIPLE DETERMINATION
20  PRINT "ENTER UP TO 20 NUMBERS"
30  PRINT "ENTER Ø TO FLAG END OF DATA INPUT"
40  DIM D (20)
50  I = 1
60  INPUT F
70  IF F = Ø THEN 210
80  IF I = 1 THEN 100
90  GOTO 110
100 C = F
110 D(I) = F
120 I = I + 1
130 IF I < 3 THEN 60
140 A = F
150 B = C
160 REM LCM CALCULATION
170 GOSUB 610
180 C = C*F/B
190 GOTO 60
200 REM OUTPUT ROUTINE
210 PRINT
220 PRINT "LEAST COMMON MULTIPLE IS"; C
230 PRINT
240 PRINT "DATA", "DEC MODULO", "BINARY MODULO"
250 PRINT
260 FOR J = 1 TO I - 1
270 PRINT D(J), C/D(J),
280 GOSUB 410
290 NEXT J
300 END
400 REM BINARY CALCULATION
410 E = C/D(J)
420 L = 8388608
430 IF E>= L THEN 510
440 PRINT "Ø";
450 L = L/2
460 IF L < 1 THEN 490
470 GOTO 430
490 PRINT
500 RETURN
510 PRINT "1";
520 E = E - L
530 GOTO 450
600 REM EUCLIDEAN ALGORITHM
610 R = A - B*INT(A/B)
620 IF R = Ø THEN 660
630 A = B
640 B = R
650 GOTO 610
660 RETURN
```

Fig. 2 — Listing of the program statements used to calculate the least common multiple.

```
RUN
ENTER UP TO 20 NUMBERS
ENTER Ø TO FLAG END OF DATA INPUT
? 2125
? 2295
? 2550
? 2975
? Ø

LEAST COMMON MULTIPLE IS 803250
DATA    DEC MODULO    BINARD MODULO
2125    378           00000000000000101111010
2295    350           00000000000000101011110
2550    315           00000000000000100111011
2975    270           00000000000000100001110

;
RUN
ENTER UP TO 20 NUMBERS
ENTER Ø TO FLAG END OF DATA INPUT
? 2125
? 2295
? 2975
? Ø

LEAST COMMON MULTIPLE IS 401625

DATA    DEC MODULO    BINARY MODULO
2125    189           00000000000000010111101
2295    175           00000000000000010101111
2975    135           00000000000000010000111

;
RUN
ENTER UP TO 20 NUMBERS
ENTER Ø TO FLAG END OF DATA INPUT
? 1760
? 2400
? 4800
? 9600
? Ø

LEAST COMMON MULTIPLE IS 105600

DATA    DEC MODULO    BINARY MODULO
1760    60            00000000000000000111100
2400    44            00000000000000000101100
4800    22            00000000000000000010110
9600    11            00000000000000000001011
```

Fig. 3 — Additional examples of program operation.

Strays

OPERATIONS AT 13,700 FEET

☐ For the past year Tom Stelmak, WB7EVG, Livingston, MT, has waited for another chance to operate from the summit of 13,700-foot Grand Teton Mountain near Jackson Hole, WY. An early snowstorm in August last year forced abandonment of plans.

In June of this year Tom met Erik Rubright, NØATB, Hygiene, CO, at their summer jobs in the Yellowstone National Park Hospital. When their mutual interest in climbing was discovered, plans were set for a July ascent of the Grand Teton.

The climb began with an eight-mile hike to the base camp at the 11,600-foot lower saddle between the Grand Teton and Middle Teton Mountains. The climbers began the final 2100-foot ascent early the following day and reached the summit with no problems. After several calls on 52 simplex with no takers, they brought up the Eagle Head repeater (22/82) near Bozeman, MT, some 150 miles north. QSOs with Dave, N7ATT and John, WA7LIK, both mobile in Bozeman, made the climbing effort complete. Tom and Erik believe that they are the first radio amateurs to operate from the summit of Grand Teton Mountain.

Erik Rubright, NØATB, and Tom Stelmak, WB7EVG, at 13,700 feet on the summit of Grand Teton Mountain near Jackson Hole, WY.

QST Congratulates and Welcomes . . .

☐ singer Donny Osmond to the world of Amateur Radio. Donny will be signing KA7EVD with his new Novice privileges. — *ARRL Public Information Office*

STAMPS? WHY NOT?

☐ Hams are in a unique position to help the Sisters at the Carmelite Monastery. The Sisters have asked for any and all kinds of cancelled stamps (both domestic and foreign). Simply cut out, leaving a one-inch border, and send to Carmelite Monastery, River Road and Central, Des Plaines, IL 60016. — *Jan Shillington, N9YL, Glendale, IL*

A Universal Solid-State BFO

Build this stable, crystal-controlled BFO for cw, usb and lsb. Improve the performance of old receivers, or use this module in new receiver designs.

By Doug DeMaw,* W1FB

Do you have an old receiver with a free-running BFO of the LC variety? If so, it's probably hard to get it set properly for usb and lsb injection to the detector. In fact, the old BFO may be darned unstable, just to make matters more frustrating! A quick design update is offered here — somewhat a weekender type of project. The end result of replacing the old BFO with the one described here will make selection of the proper cw, usb and lsb frequencies a simple matter. The overall stability of the receiver will be enhanced at the same time.

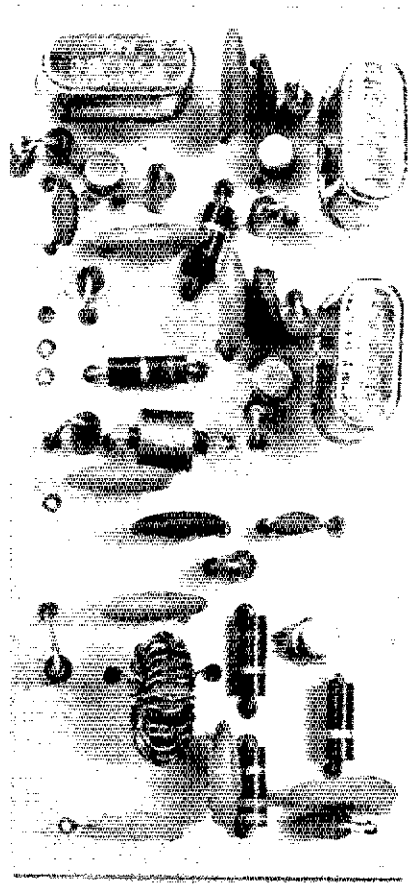
Circuit Details

Examination of Fig. 1 indicates that broadband circuitry is used throughout the BFO module. The drain circuit of the oscillators contains a 10-mH rf choke for operation at 455 kHz. Feedback is provided by means of C1 through C5, inclusive. Output from the Pierce FET oscillator, which is activated by means of S1, is fed to broadband amplifier Q4 via a capacitive divider, C4 and C5. The base of Q4 looks like roughly 50 ohms. Negative feedback is used from collector to base at Q4, and degenerative feedback is obtained as a result of using the 10-ohm, unbypassed resistor at the emitter of Q4. The feedback keeps the amplifier stable and levels the gain at approximately 3 dB. T1, a 4:1 transformer, steps the 200-ohm collector impedance down to 50 ohms at the BFO-strip output port. The circuit, as shown, delivers 10 volts pk-pk across a 56-ohm resistive termination. Available power is 223 mW.

Although a pure sine wave is not obtained at the output of T1, the waveform is entirely suitable for injecting product detectors or mixers of the diode variety. Severe overshoot on the leading edge of the output waveform existed until C6 was added. The resultant waveform is shown in Fig. 1.

Although 40673 dual-gate MOSFETs are indicated at Q1, Q2 and Q3, almost any comparable device can be used, such as the 3N211. The gates are tied together to simulate the performance of JFETs. Ordinary JFETs such as the MPF102 and 2N4416 types will work nicely in place of the MOSFETs. Almost any npn transistor can be used at Q4 provided it has an f_T of 100 MHz or higher, carries a Vceo rating of 24 volts or more, and has a collector dissipation of 450 mW or greater.

Double-sided pc board is used for this circuit. The surface on the component side of the board serves as a ground plane. This aids stability by discouraging the formation of rf ground loops that cause unwanted feedback. The ground-plane surface should be connected (through the board) at several points to the ground pc foil on the etched side of the board. Ready-made pc boards, negatives and parts kit for this project are available from a supplier.[1]



Component-side view of the completed BFO module.

Tag Ends

There are no construction notes to offer, other than the recommendation that the completed circuit be housed in a shielded box. This will prevent unwanted radiation of the BFO energy into other parts of the receiver. A box can be made easily and at low cost from sections of double-clad pc-board material.

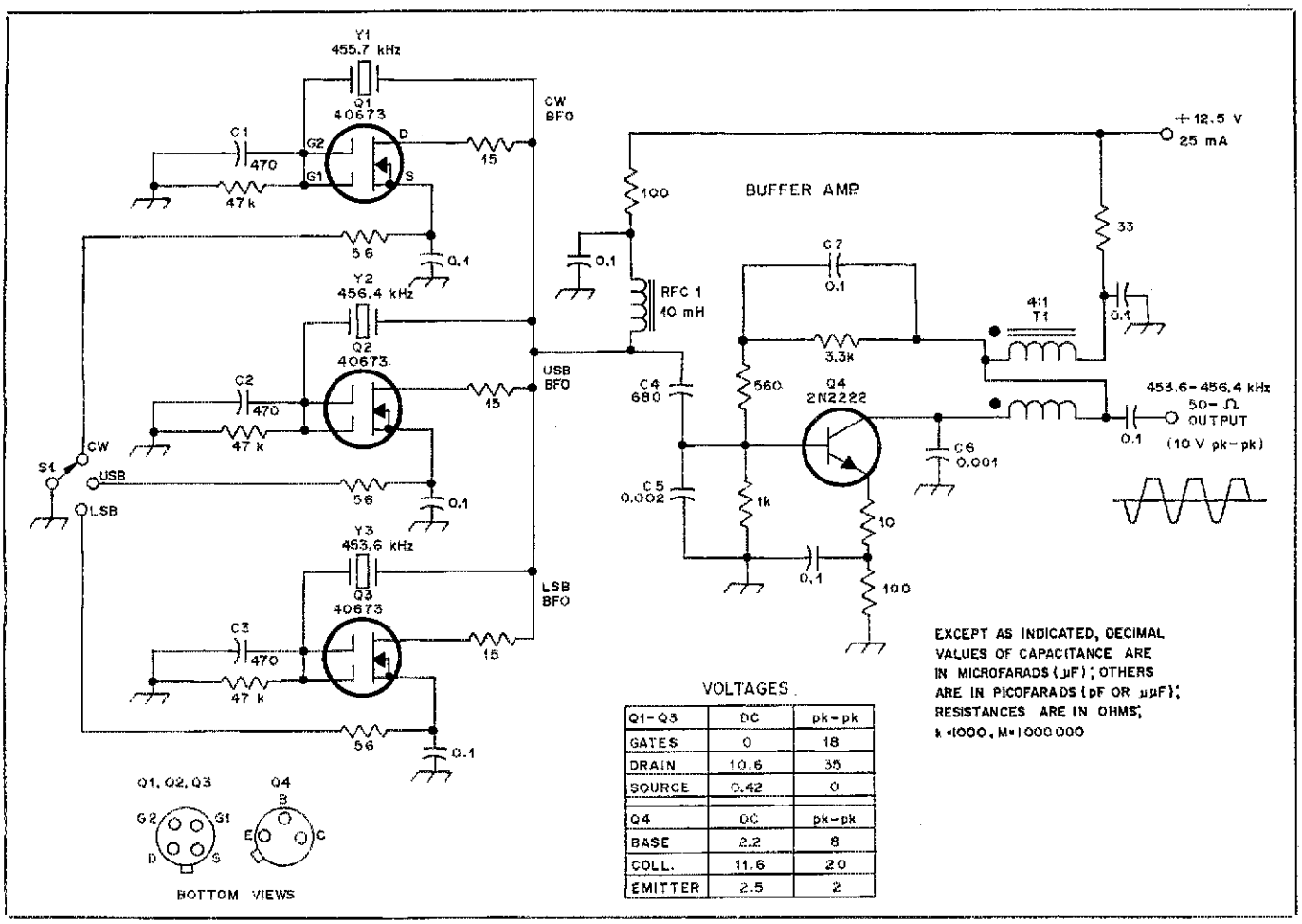
This BFO assembly is suitable for use from 455 kHz to 10 MHz. The values of C1 through C6 will need to be made smaller as the operating frequency is increased. The same ratio should be maintained between C4 and C5 if this is done. Typically, at 9 MHz, C1, C2 and C3 would be 25 pF (X_c = 744). C4 would be 36 pF (X_c = 514) and C5 would be changed to 100 pF (X_c = 175). C6 would be 50 pF. A 500-μH rf choke would be installed at RFC1 (X_L = 28,575). Y1, Y2 and Y3 would be chosen for the proper point on the filter curve.

Fig. 2 gives the parts placement for the module as viewed from the etched side of the board. A black-and-white pattern suitable for copying is printed in the "Hints & Kinks" section of this issue.

S1 can be a 2-pole, 3-position double-wafer switch if it is desired to shift the receiver local oscillator for cw, usb and lsb. This could be done by means of small tuning diodes which are turned on by means of the second switch section. Modern receivers employ this technique so that the dial calibration remains ac-

*Senior Technical Editor

[1]Circuit Board Specialists, P. O. Box 969, Pueblo, CO 81002.



VOLTAGES

Q1-Q3	DC	pk-pk
GATES	0	18
DRAIN	10.6	35
SOURCE	0.42	0
Q4	DC	pk-pk
BASE	2.2	8
COLL.	11.6	20
EMITTER	2.5	2

Fig. 1 — Schematic diagram of the three-oscillator BFO. Capacitors are disc ceramic. Resistors are 1/2-watt composition.
C1-C6, incl. — See text.
Q1-Q3, incl. — RCA 40673, TI 3N211 or equiv. See text.
RFC1 — Miniature 10-mH rf choke (J. W. Miller 70F102AI or equivalent). See text.
S1 — Single-pole, three-position wafer switch.
T1 — Bifilar-wound toroidal transformer, 4:1 impedance ratio. Use 20 turns of no. 28 enamel wire (bifilar) with 8 twists per inch. Wind on Amidon FT50-43 ferrite toroid (0.5 inch OD, 950 permeability).
Y1-Y3, incl. — Crystal of choice in HC-6/U holder. International Crystal Mfg. Co. type GP, 30-pF load capacitance. Mating international pc-mount crystal sockets used in this model.

curate for the three receiving modes.

The gain of Q4 can be increased if desired. The 10-ohm emitter resistor should be reduced to 5 ohms and the 100-ohm resistor to 56 ohms, if a gain increase is called for. The buffer amplifier is added mainly as isolation between the oscillators and the detector with which the circuit will be used. Inclusion of Q4 minimizes pulling effects. This is especially significant at the higher BFO frequencies, such as 9 MHz.

Those wishing to use this circuit with tube detectors may require higher injection-voltage levels than the 10-volt pk-pk value. A transistor-radio 455-kHz i-f transformer can be attached at the output of T1 in Fig. 1 (low-Z winding to T1). The high-Z winding of the i-f transformer would then be connected between ac ground and the tube grid. A voltage step-up will result.

Good luck in the workshop. This project may be the first step toward rehabilitating that old but grand receiver you've kept sequestered in the closet for so many years! CQ

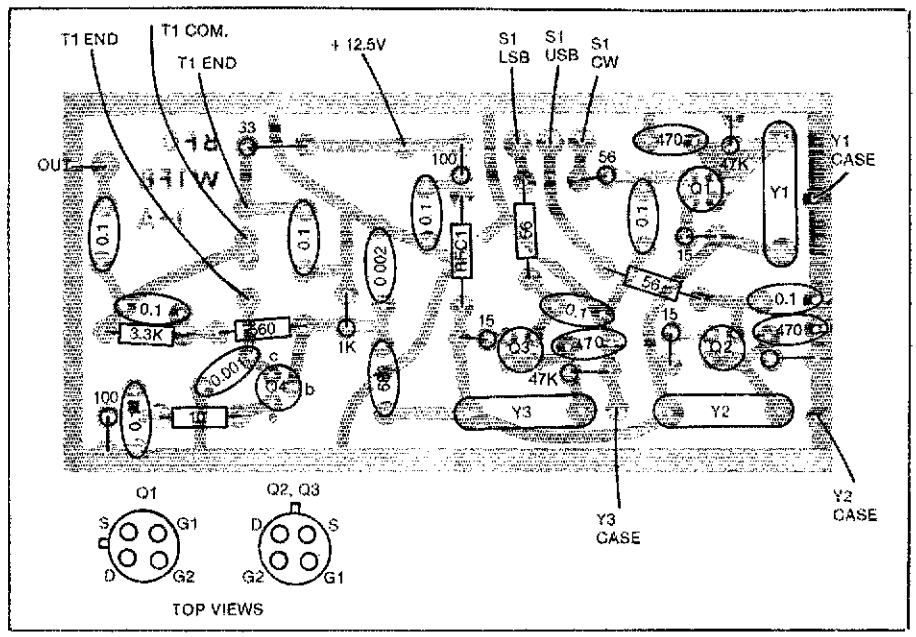


Fig. 2 — View of the non-foil side of the pc board showing location of parts. The shaded areas represent an X-ray view of the foil. Whole-number capacitances are in pF; others are in μF. Resistances are in ohms. The etching pattern appears in the "Hints and Kinks" section of this issue.

A "J" Driven 2-Meter Beam Antenna

A "J" element has plenty to offer for a small Yagi — and it simplifies feed-line installation.

By Jim McDonald,* WBØJQH

The "J" antenna, shown in *The ARRL Antenna Book* for many years, has appeared in various articles from time to time. Usually the antenna has been depicted as an alternative to the quarter-wave whip in mobile service or to the ground plane for base operation. However, it can be very effective as a driven element in a vertically polarized Yagi.

One difficulty encountered by builders of vertical beams is how to dress the coaxial transmission line away from the feed point of the antenna so that it does not degrade the performance of the director elements. By using the "J" for the driven element, the transmission line is below the elements and if used as shown in the illustration, it also acts as the support for the entire antenna.

The "J" element is made of 1/2-inch dia EMT conduit. The radiator portion is constructed from a 70-inch length of conduit and the matching section is 21 inches long. A 2-inch aluminum strap connects the two sections at a point 10 inches up the radiator. This results in a matching section 19 inches long and a radiator 39 inches long, which is about right for a center frequency of 147 MHz. A phenolic block is used as a spacer near the top end of the matching section to add some rigidity.

PVC pipe, 1/2-inch in dia, is used as the boom but any nonconducting material light enough in weight can be substituted for it. A small U bolt secures the boom to the driven element 18-1/2 inches down from the top. Aluminum rods are used as the directors and reflector. Their lengths and spacing can be determined from the diagram.

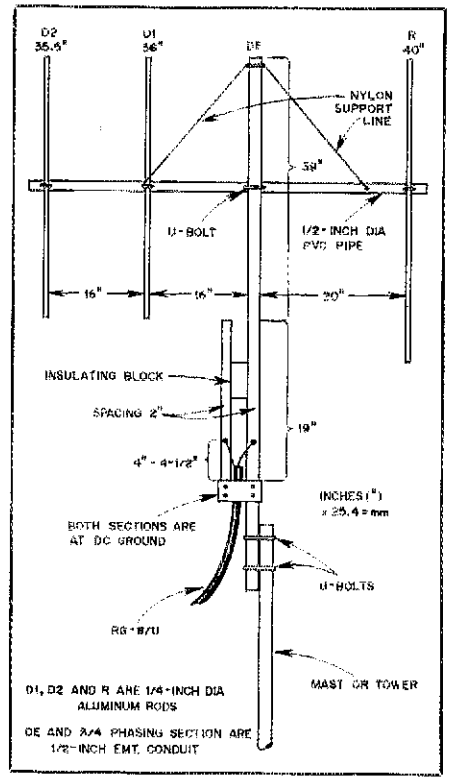


Fig. 1 — Details of a "J" driven 2-meter vertical beam antenna. The "J" consists of a half-wave vertical radiator fed by a quarter-wave stub matching section. The spacing between the two sides of the matching section should be two inches or less. The feed line may be moved along the matching section to determine the point of minimum SWR.

As the drawing indicates, the antenna is supported off-center. Light nylon line keeps the boom perpendicular to the "J" element. Some question may arise concerning the 20-inch (0.25-λ) spacing of the reflector. A 16-inch (0.2-λ) spacing should yield slightly greater gain, but this small increase was sacrificed in lieu of better mechanical balance.

The adjustment for the proper match between the matching section and transmission line is quite simple. I find that securing the base of the beam to the side of a metal tower at a height of about six feet and pointing the directors skyward saves lots of tower climbing while making the adjustments. The outer conductor of the coaxial cable is tapped along the 19-inch section and the center conductor along the radiator until the lowest value of SWR is obtained. In my installation the point was found between 4 and 4-1/2 inches up the matching section.

The beam is mounted atop the tower, approximately 4 feet above a triband beam and fed with RG-8/U coaxial cable. Results have indeed been gratifying. While the antenna offers a fairly broad pattern, as may be expected with a vertical beam, it also shows significant gain in the forward direction. Mobiles have been worked 30 to 40 miles distant on simplex with dependable results and repeaters as far as 125 miles away can be accessed easily. Not everyone will obtain such results because of differences in topography, but for a small Yagi the "J" driven beam has plenty to offer.

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A Morse Readout for Your Digital Dial

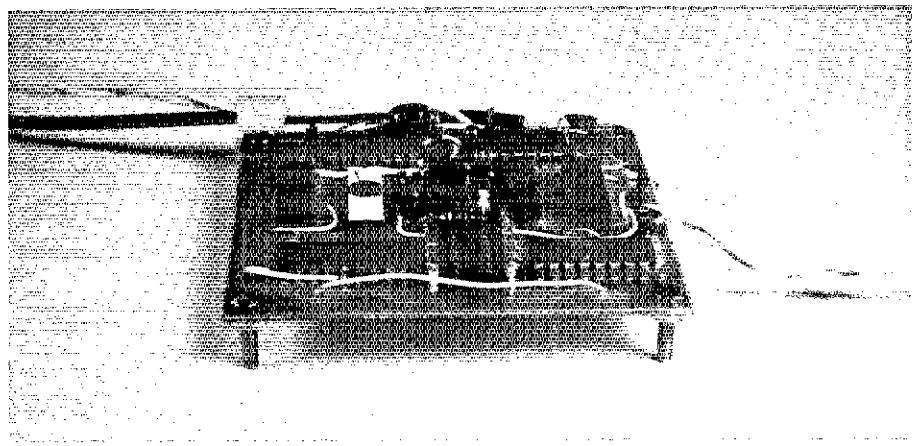
Modern instrumentation has introduced new problems for the visually handicapped. What to do about dials, frequency counters or multimeters that have digital readouts? For sightless radio amateurs, W3ICB offers this practical solution.

By William H. Alliston,* W3ICB

After I heard of a few near misses in traffic when a mobile operator glanced down to see his transceiver frequency setting, the thought arose that an audible frequency readout would be a definite safety feature. Talking to blind amateur operators in the area reinforced the opinion that such a device is needed. Modern digital instrument displays create new problems for the blind amateur experimenter who can no longer check dial settings by touch with the cover glass removed. An attempt to come up with an audible readout to fill this need resulted in the device described here — a nine- or 10-IC CMOS circuit that can read out typical multiplexed 7-segment digital displays in Morse numerals. The circuit fits on a printed-circuit board about three inches (76 mm) on a side — a size that can be fitted inside many transceiver cases, or used as a small external add-on with others. It can be used with digital dials, frequency counters, digital multimeters or most equipment having multiplexed 7-segment LED digital readouts.

The problem of decoding the 7-segment outputs into something usable to drive a Morse generator was solved by a search through the integrated-circuit literature. The search turned up a lucky find — a 7-segment to BCD decoder. The CMOS version — the 74C915 — was selected, and our local supplier had them in stock. (On rare occasions, the converse of Murphy's Law applies!)

The choice of Morse code for the audible readout was arbitrary.[1] While a slightly simpler circuit can be devised with a "count the beeps" output, Morse is a logical choice for radio amateurs.



The circuit-board arrangement for W3ICB's Morse Readout designed for use with digital dials.

Circuit Operation

The functioning of the circuit can be followed in Fig. 1. The 7-segment digit voltages from the multiplexed display come up sequentially on the input lines, *a* through *g*, while one of the strobe lines (1 through 7 — one for each digit) will be *on* to supply voltage to the digit being displayed during its time slot. This happens rapidly — perhaps 30 to several hundred times per second in typical displays. These digits are "caught on the fly" in the 74C915 decoder (U1) and are stored there by a set of digital latches during the audible readout. A counter, U3, and an 8-channel multiplexer, U2, are used to select each digit, one at a time, when its strobe line is on.

When the START button is depressed, U3 is preloaded with a value equal to the number of digits to be read out. The counter output (in BCD) goes to multiplexer U2 as an address. When the corresponding display-digit strobe line turns on, the resulting output from the multiplexer momentarily operates the latches in U1 so that the digit is stored for readout.

When one digit has been sent in Morse code, a reset signal results that causes U3 to count down by one, selecting the next digit for readout. (The reset is generated by one-half of the 74C221 dual monostable, U6, and is also the right length to form the pause between Morse digits.) When U3 changes count, the multiplexer,

*4880 Greensburg Rd., Murrysville, PA 15668

[1]Notes appear on page 37.

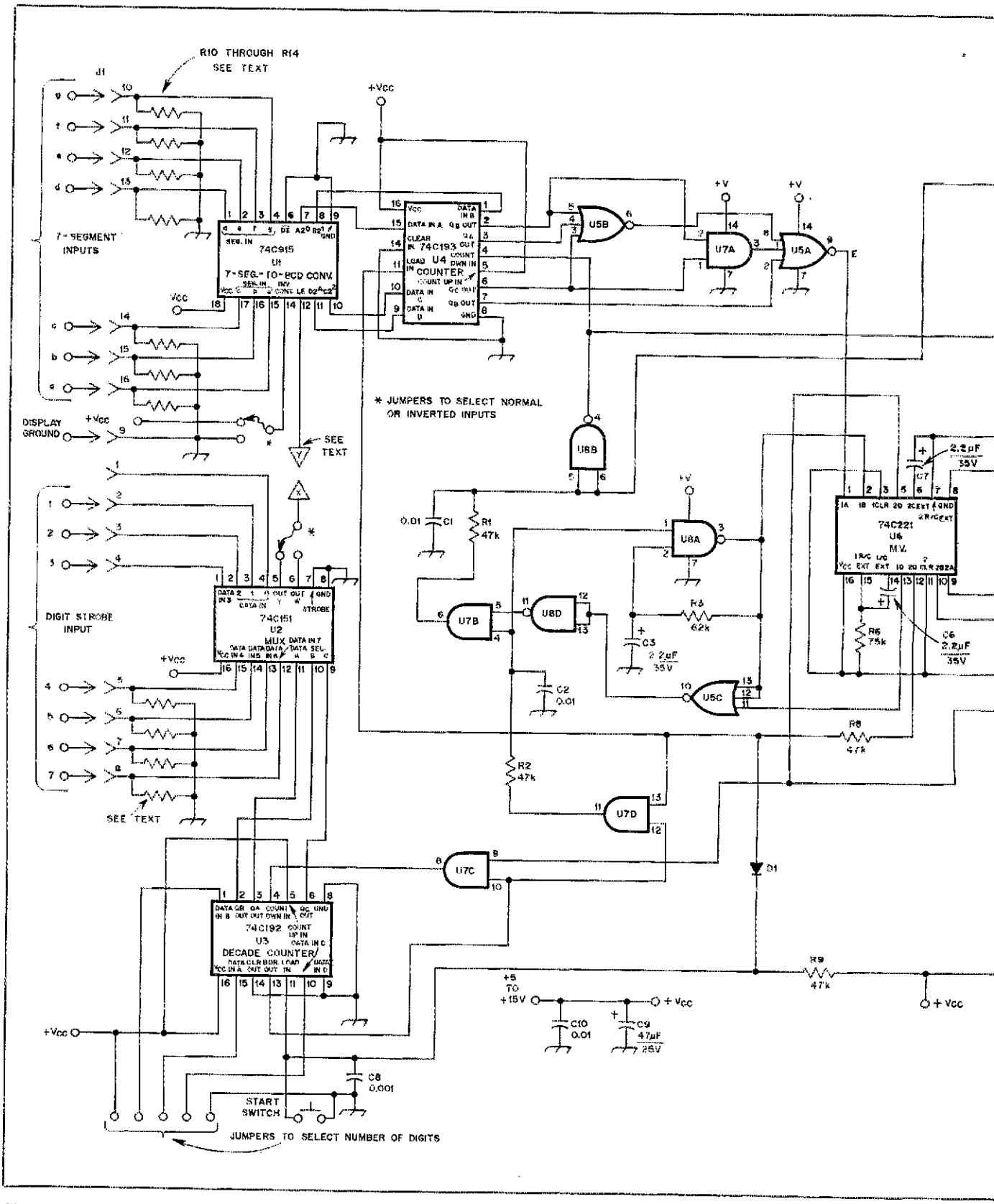
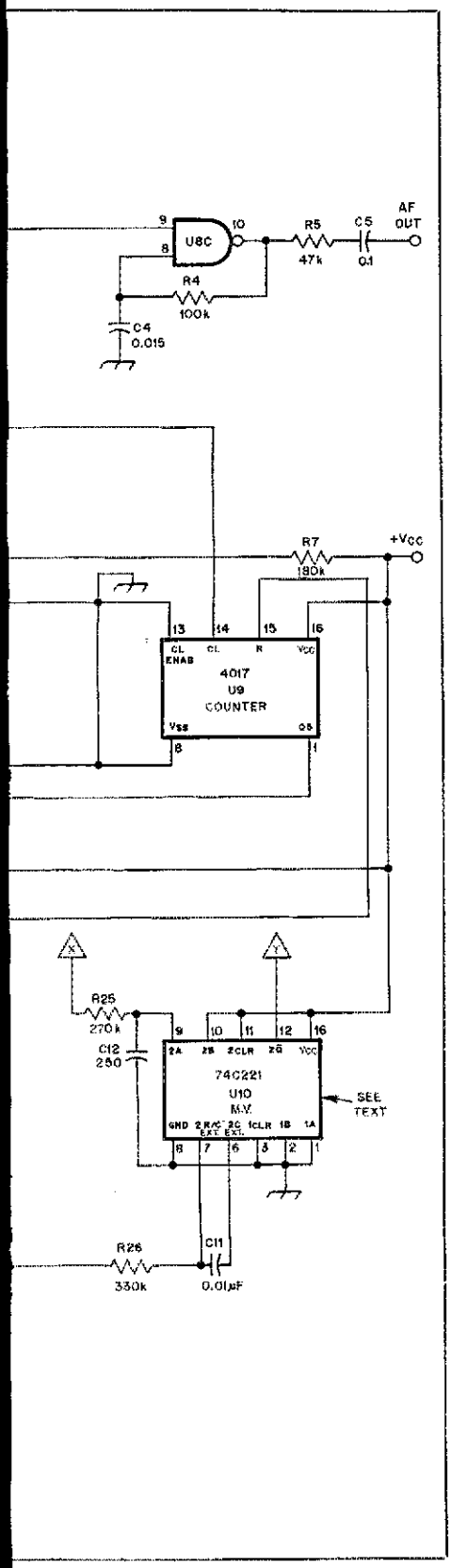


Fig. 1 — Circuit diagram for the Digital Display Morse Readout. Values indicated for R24 and R25 below are typical, but a change may be needed with a change in strobe frequency.

C1, C2, C10, C11 — 0.01-µF ceramic, 50 V.
C3, C6, C7 — 2.2-µF tantalum electrolytic, 35 V.
C4 — 0.015-µF ceramic, 50 V.
C5 — 0.1-µF ceramic, 50 V.
C8 — 0.001-µF ceramic, 50 V.
C9 — 47-µF tantalum electrolytic, 25 V.
C12 — 250-pF ceramic, 50 V.
D1 — 1N4148 silicon switching diode.
J1 — 16-pin DIP socket.

R1, R2, R5, R8, R9 — 47 kΩ, 1/8 or 1/4 W.
R3 — 62 kΩ, 1/8 or 1/4 W.
R4 — 100 kΩ, 1/8 or 1/4 W.
R6 — 75 kΩ, 1/8 or 1/4 W.
R7 — 180 kΩ, 1/8 or 1/4 W.
R10-R24, incl. — See text.
R25 — 270 kΩ, 1/8 or 1/4 W.
R26 — 330 kΩ, 1/8 or 1/4 W.

U1 — MM74C915, 7-segment to BCD converter.
U2 — MM74C151, 8-bit data selector/multiplexer.
U3 — MM74C192, synchronous up/down decade counter.
U4 — MM74C193, synchronous up/down 4-bit binary counter.



U5 — CD4025, SK4025 etc. triple 3-input NOR gate.
U6, U10 — MM74C221, dual monostable multivibrator.
U7 — MM74C08, quad 2-input pos. AND gate with Schmitt-Trigger inp.
U8 — CD4093, quad 2-input NAND Schmitt Trigs.
U9 — CD4017 CMOS decade counter/divider.

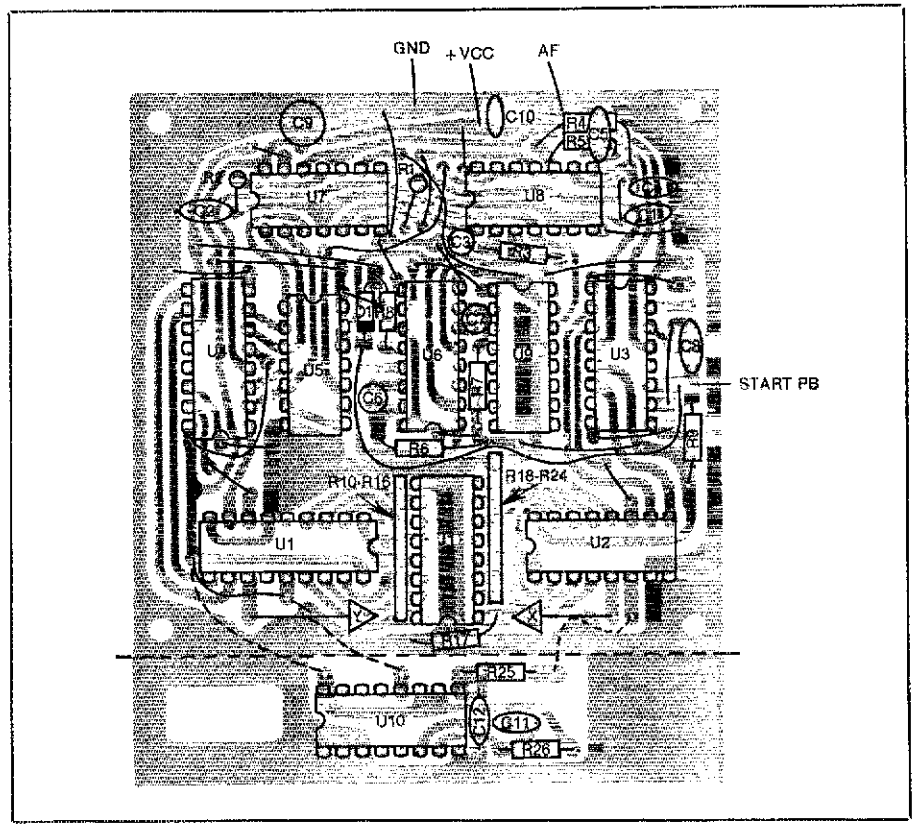


Fig. 2 — Parts layout and wire jumpers for the Digital Display Morse Readout, shown from the component side of the board. The shaded area represents an X-ray view of the copper pattern. The etching pattern appears in the "Hints and Kinks" section of this issue.

U2, is shifted to select the next digit for readout and the process repeats. This continues until all digits have been sent in Morse code. When the last digit has been sent (with U3 on logic 1), the end of the next reset pulse will cause the "borrow" output of U3 to change. The borrow output is then used as a stop signal to halt the Morse readout until the START push button is again depressed.[2]

Morse Numeral Generator

Several methods are available for generating Morse digits. Among them are storing the dits and dahs in an ROM or a preloaded shift register, and coding them with diode arrays and counters. The method used here involves a binary counter, U4, and three gates, U5A, U5B and U7A. These are set up to generate the truth table shown in Table 1. Any time the output E of this combination is *low*, a dah will be sent and any time it is *high*, a dit will be produced. The number from the U1 decoder, now coded in BCD, is used to preset the U4 counter. A dit oscillator, U8A, causes this counter to count downward. If voltage E is high (Fig. 1) each pulse is sent as a dit. Whenever E is low, the other half of monostable U6 is used to stretch the output to form a dah. It can be seen from Table 1, for example, that if a "5" is set on the U4 counter, five dits will be sent as it is counted down. If a "7" is set, two dahs will be sent (one at "7," another at "6"), and the rest will be dits. For a "2," two dits will be sent (one at "2," another at "1"). On reaching "0" a dah will be sent. At the next count down, the counter will recycle back to "15" and continue sending dahs. In this way all of the Morse numerals can be formed. Since all Morse numerals consist of five total dits and dahs, another counter, U9, a CMOS decimal counter, is used to trigger the reset to stop the dit-dah transmission after five total dits or dahs

Table 1

Truth Table for the Morse Digit Generator

Decimal Digit	*Binary*	*E*
0	0000	0
1	0001	1
2	0010	1
3	0011	1
4	0100	1
5	0101	1
6	0110	0
7	0111	0
8	1000	0
9	1001	0
10	1010	0
11	1011	0
12	1100	0
13	1101	0
14	1110	0
15	1111	0

have been sent for each digit displayed. Fig 2 is a parts layout of the circuit.

Leading Zeros and the Decimal Point

Note that when a blank occurs (all digit segments, *a* through *g*, turned off) U1 generates a "15." Since a "15" setting will cause the Morse generator to send a zero, blanked-out "leading zeros" in the display will also be sent as Morse zeros. (If your display blanks leading zeros instead by turning off the strobe, this may not work; circuit additions not covered here would have to be made to handle the leading zeros.[3])

No provision has been made to handle the decimal point, since it was assumed that a user would know the correct decimal position in his display. A circuit to detect the decimal position and send R or other appropriate symbol should be a straightforward addition; reader suggestions are invited.

Interconnection with the Display

Connections from the display are brought into the Morse readout circuit board via a 16-pin DIP header connector. Flat tape cable is convenient for making the hookup. There are seven leads for the display segment voltages, *a* through *g*, and up to seven strobe lines, one for each digit, plus a common ground, on the DIP connector. These are connected to the corresponding points on the digital display. Be sure to make the connections above the display dropping resistors. It's a good idea to connect each lead (except the ground) through a resistor (say a few thousand ohms) at the digital display. Thus, in case of a short, no damage will be done to the display drivers. As noted later, these resistors can be a part of the voltage divider used to get the correct input voltage to U1 and U2.

While cable length ordinarily would not be critical, there might be a problem with rf pickup around transmitters, especially if the cable is routed outside the equipment cabinet. In addition, long, unshielded leads from your display could radiate hash into your receiver from the switching of the multiplexed digits. In either case, shielding the cable or bypassing the leads, or both, might be needed. Small bypass capacitors can be connected across the pull-down resistors near the DIP header socket if required. The impedance of the bypass capacitors should be large at the display strobe frequency. With typical strobe frequencies, however, this requirement is easily met and bypass capacitors of a few hundred pF can be used.

Your digital display may use either common cathode or common anode LED displays. The 74C915 decoder U1, can operate with either type. With the common-cathode type, the segment voltages will be high (close to the supply voltage) when the segment is on and low (near zero) when it is off. The strobe voltage on the LED display cathodes will then be low when the digit is on and high when it is off. For common-anode displays, the opposite is true — segment voltages are low when the segment is on; stobe voltage is high for the digit to be on. Arrange the jumpers on U1 and U2 as shown in Fig. 3.

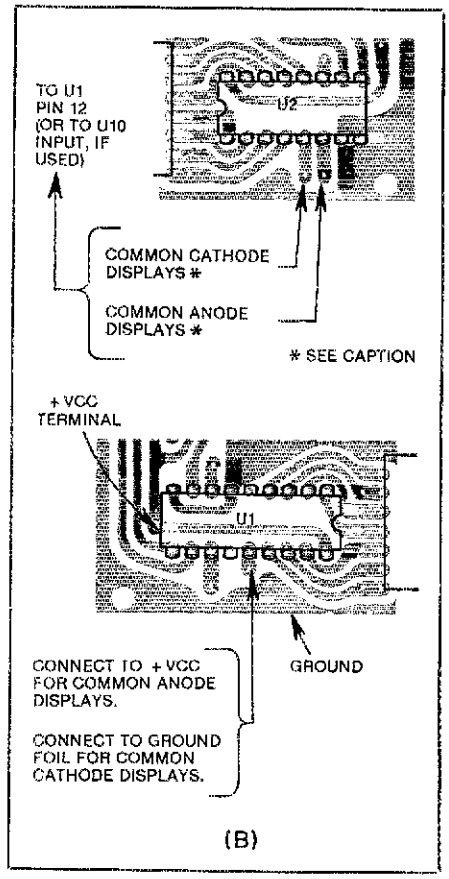


Fig. 3 — The method of selecting strobe polarity is shown in A. Reverse the common-cathode and common-anode display connections if inverting transistors are used on the strobe lines (with display strobe connections made above the transistor base resistors). B illustrates the selection of digit voltage polarity.

In most displays, buffer transistors are used on the strobe lines. It is generally better to make the Morse readout strobe connections on the base side of these transistors, but above any resistors which might be in series with the base. If these transistors invert the strobe signal, remember to use the opposite set of connections for the strobe polarity shown in Fig. 3.

The CMOS decoder, U1, and the multiplexer, U2, operate best when the high input voltage is within about 90 to 100 percent of the CMOS supply voltage. Depending on the particular display, these voltages could vary widely. If the manual for your display does not give the operating voltage levels, you can measure the peak values using a calibrated oscilloscope. Fortunately, the CMOS ICs in the Morse readout can operate over a wide voltage supply range — about 5 to 15 volts. Just select a supply voltage that is equal to or a little less than the maximum voltage coming out of the display. A Zener diode or one of the small IC regulators can be used to set the supply voltage for the Morse-readout circuit. The next step is to select the value of input resistors for the Morse readout to get the input voltage between 90 and 100 percent of the supply. For example, Fig. 4 shows how this might be done for a case in which the peak voltage out of the display was found to be 11 volts and the Morse readout is operating on 9 volts.

Using the Morse readout with certain digital displays resulted in occasional readout errors. The problem was traced to the fact that these displays simultaneously turned off the digit segments and the strobe voltage. Since the strobe voltage is used to operate the latches in U1, the digit segments were changing just as they were being stored by the latches.

A quick check with a triggered-sweep oscilloscope will let you know if your display will cause this problem — just compare the traces for the segments and strobe, with the scope synchronized to one of them. If they turn off at the same instant, you have the problem. A simple circuit addition also shown in Fig. 1 can be used to eliminate the problem — it inserts a one-shot multivibrator, U10, in the strobe line (between points X and Y on Fig. 1) to shorten the strobe pulse.[4] The values used for R26 and C11 worked well with a 130-Hz strobe frequency. The values can be adjusted for other strobe frequencies, if required — just change R26 or C11 until a reliable readout is obtained. At the one-shot multivibrator input, R25 and C12 are used to eliminate any short false-strobe pulses which might otherwise trigger the multivibrator. A supplement to the added circuit is shown in the etching pattern in the "Hints and Kinks" section. If your display doesn't need it, the board can be cut along the line "C" shown in the figure.

Use with Other Types of Displays

Nonmultiplexed (continuously "on") displays are not usable with the Morse readout unless separate ICs are used to multiplex the digits going to it. Because of the large number of connections involved (for example, 43 wires for a 6-digit display), it may not be too practical. In case BCD outputs are available in addition to the 7-segment outputs, U1 and U2 can be eliminated in favor of multiplexers on BCD outputs (now, only 25 wires for a 6-digit display). If you have room to build in the multiplexing on the display, you can get by with only nine leads (four BCD leads, four multiplex address leads and a ground). Multiplexing can be done easily with some of the new Tri-State buffers driven by a BCD-to-decimal decoder. The

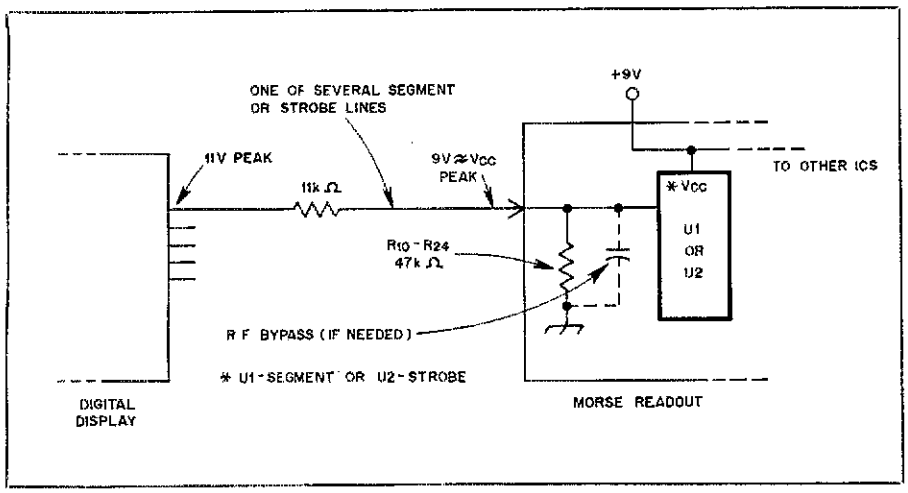


Fig. 4 — An example of a voltage divider for setting the Morse Readout input voltage.

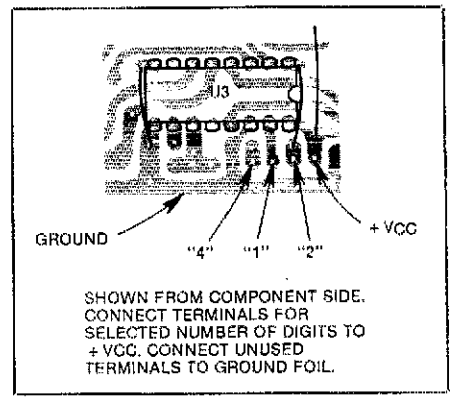


Fig. 5 — Jumpers to select the number of digits for the Morse Readout. When changing these jumpers, be sure to observe precautions to protect the CMOS IC from damaging stray voltages.

author has not attempted any of these approaches but would appreciate hearing from any amateurs who try it.

Construction and Checkout

Construction is straightforward using the circuit board and parts layout of Fig. 2. The compact circuit board will be much easier to assemble if a soldering iron with a small tip is used. Since the CMOS integrated circuits can be damaged by static electricity and other stray voltages during assembly, the usual precautions should be taken. The soldering iron and perhaps other tools should be grounded as well as the ground foil and supply lead on the circuit board. Keep in mind that the jumpers on the board for selecting signal polarity and number of digits require the same precautions any time the jumpers are changed. Of course, all connections should be made with power *off*, including connection to the display.

All resistors used in the circuit can be 1/4- or 1/8-watt sizes; it will be difficult to find room for any larger ones. For small size, good stability and low leakage current, dipped-tantalum capacitors have been used for the electrolytic capacitors, with 50-volt ceramic capacitors at other locations in the circuit. (Note that for the signal-conditioning RC circuits, R1-C1 and R2-C2, only single holes had been drilled in the board; hence the connection between R and C must be made on top of the board.)

The inputs to U1 and U2 from the display are connected to ground through pull-down resistors, R10 through R24. These resistors may be omitted for permanently wired installations but are recommended for static-electricity protection in case the input plug is removed. Since LED displays have low impedance, loading the display driver is not a problem and values between 10 kΩ and 1 MΩ are usable. (47 kΩ was used in the prototype circuit.) As noted before, the pull-down resistors can serve as one leg of a voltage divider to set the correct input voltage. The boards are designed to use single in-line package (SIP) resistor networks for these resistors. Two Bourns-type 4308-101 (seven resistors each with a common ground) can be used. Separate 1/8-watt resistors have been used instead on one of the test boards; they work just as well but do not look as neat.

The number of digits to be read out is selected by jumpers near the U3 counter. The three connections brought out use the 4-2-1 BCD coding (the terminals on the board, as shown in Fig. 5, are actually arranged in the order 4-1-2). To select the number of digits, just connect the appropriate terminals having the total value equal to the desired number of digits to the positive terminal near them. Then ground the unused terminals to the ground foil at the edge of the board. For example, to read out five display digits, connect the "4" and "1" terminals to the positive supply and ground the "2" terminal. When changing these jumpers, be sure to observe precautions to protect the CMOS IC from stray voltages which might damage it.

Before operating, first install the jumpers for polarity and number of digits. Then after carefully checking over the board, connect the ground and positive supply lead to a 5- to 15-volt power supply — current drain should be small (say 0.5 mA at 9 volts, if all is well). Using shielded wire, connect the audio output across the audio volume control on your audio amplifier. When power is turned on, a Morse digit readout will occur or can be started by momentarily grounding the START push-button lead. Without the 7-segment input plug connected, all digits will be read out as either 0 or 8, depending on which input polarity was selected. With all power off, make the plug-in connection to your display and then turn the power on. Assuming correct connections, voltage levels and logic polarity, operating the START push button should give you a Morse readout, left-to-right, of the displayed numerals. (If readout is right-to-left, you have reversed the order of the strobe leads.)

The 47-kΩ series resistor, R5, used in the audio output should give more than adequate audio level in most transceivers. To reduce the level, just add more series resistance at the transceiver end.

RC values used in the dit oscillator (R3-C3) and dah monostable (R6-C6) were selected for operation at about 15 wpm. To change the speed, just change these RC values in the same proportion — lower RC values will give higher speed. Space between Morse digits is set by R7-C7.

Note that to get the proper 3:1 dah-dit ratio, R6-C6 must be selected so that the U6 dah output ends up between two and three dit lengths. Otherwise, short or long dahs will result. While the author has had no problem with this, it might occur as a result of tolerances on the tantalum capacitors or use of a different supply voltage. (The single-Schmitt-Trigger dit oscillator is slightly voltage sensitive.) It can be corrected by trimming the RC value in either the dit oscillator or the dah monostable circuits. QST

Notes

[1]Wry comment to the reader — but it may give some ops their only opportunity for Morse code practice.

[2]Note that this design can handle seven digits at most since the "borrow" output from the counter is used to stop transmission after position "1." The multiplexer "0" position is thus unused. The circuit can be modified to read out eight digits by using the "8" bit on U3 (pin 7) through an inverter, instead of the "borrow" output, but this will require adding an inverter to the board. The "zero" multiplexer lead has been brought out to J1 to facilitate this change, if desired.

[3]U1 also provides an *error* output for improper 7-segment combinations. This feature has not been used here.

[4]Faulty triggering of U10 has occurred on some boards. A change from the inverted input, pin 9, to the pin 10 input on U10 has cleared up the problem. To make this change, clear the foil around pins 9 and 10 on U10. Then insert wire jumpers from pin 9 to ground and from pin 10 to the pad where R25 and C12 terminate. Also reverse the connection from U2.

Build a Ragchew Clipper

Want to remain on friendly terms with other repeater users and avoid purchasing a round for the ever-present silent majority? This little unit provides an economical answer. Build it and still have time to mow the lawn this weekend!

By Howard Hudiburg,* KB5NW

With increasing 2-meter participation, more and more hams find themselves embarrassed — and some of their compatriots aggravated — by overrunning or "timing out" repeaters. Such operation is, of course, truly inadvertent, as we all know that no ham could ever be accused of being long-winded! [Ahem! — Ed.] However, if there are any in our fraternity who may subconsciously realize that they may, on very rare occasions "tell a long tale," they may feel inclined to change the name of the device described below from "Ragchew Clipper" to "Bull Shutter."

A Solution

Many 2-meter rigs have an auxiliary or accessory jack that has, among other inputs and outputs, a dc supply voltage output which is switched on when the microphone is keyed for a transmission. Those units which do not can be modified rather easily. Others may have access to the keying line, which may be used to complete the supply circuit of a Ragchew Clipper built with an internal battery.

The keyed power can be used to activate a timer automatically with some form of signaling means (visual, aural or both) to alert the guilty party that he is about to exceed his time limit. He can stand by or open the microphone key momentarily to reset the repeater.

Since repeaters are set to time out at different intervals, the "black box" should be adjustable. If you're not acquainted with time-out spans for a particular repeater, ask someone when you are on the machine, then set the timer to keep yourself from hosting all those listening with cool 807s.

Construction

You can build the timer in a few hours and at a cost of a few dollars, dependent, of course, upon your junk-box resources. All parts are readily available as indicated in the parts list. The author used point-to-point wiring on perf board and encased the circuitry in a plastic box.[1]

The Circuit

The timing circuit is rather conventional. The start pulse or trigger is generated by R1, C1 and Q1 when the

[1]The builder may choose to adapt one of the popular Radio Shack IC experimenter pc boards (RS 276-0241 to contain the required components. — Ed.]

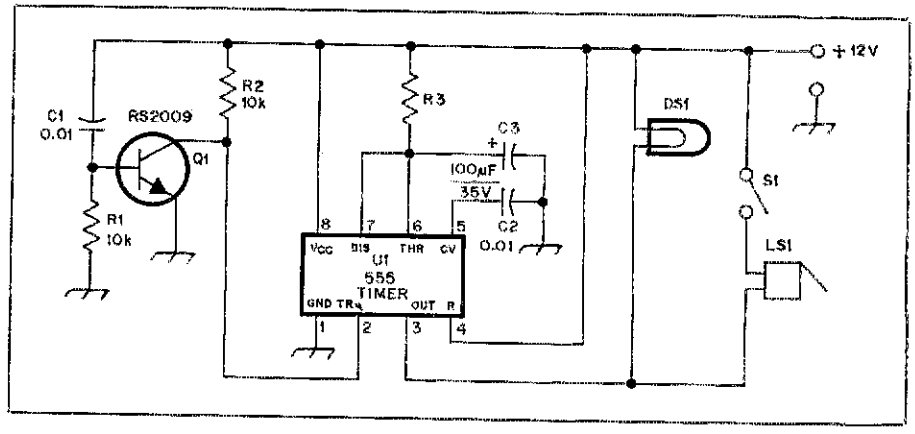
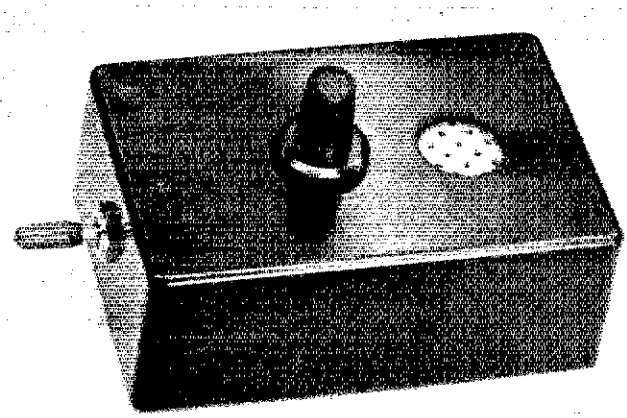
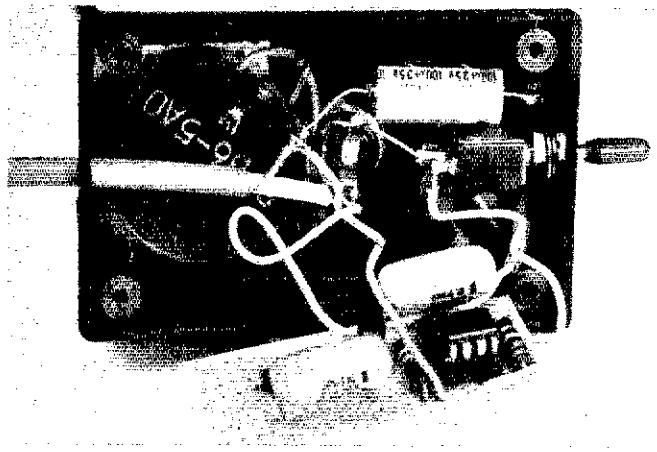


Fig. 1 — Circuit diagram of the Ragchew Clipper. Resistances are in ohms; k = 1000; capacitances are in µF. Part numbers in parentheses are Radio Shack.
C1, C2 — 0.01-µF Mylar, 50 V (RS 272-1065).
C3 — 100 µF, 35 V (RS 272-1016).
DS1 — Lamp assembly, 12 V (RS 272-323).
LS1 — Buzzer (RS 273-060).
Q1 — General-purpose npn switching transistor, RS2009 or equiv. (RS 276-2009).
R1, R2 — 10 kΩ, 1/2 watt (RS 271-034).
R3 — 220 kΩ, 1/2 watt (RS 271-049) or 1-MΩ, 1/2 watt pot (RS 271-211).
S1 — Toggle, spst (RS 275-612).
U1 — 555 timer IC (RS 276-1723).
Misc. — Enclosure (RS 270-230).

*302 Guadalupe River Dr., Seguin, TX 78155



The completed Ragchew Clipper ready to go. The buzzer grille is made from a piece of perf board.



Parts placement both in the box and on the perf board can be seen here. All the components fit comfortably inside the plastic enclosure.

microphone is keyed. The end of the timing cycle or reset is signaled by releasing the microphone button either momentarily or at the end of the transmission. The circuit shown in Fig. 1 is one which works well. With S1 open, a purely visual indication is provided by DS1. Closing S1 places the buzzer, LS1, in parallel with DS1, creating an audible reminder that your time is up. R3 can be a 1-MΩ potentiometer to provide timing adjustment from a few seconds to several minutes. The fixed version used here has a delay of about 45 seconds, keeping me out of trouble with local repeaters. QST

Strays

ENERGY CONSERVATION, ON THE AIR WITH VE6SUN

Billed as the "Greatest Outdoor Show on Earth," the Calgary Stampede hosted some 900,000 visitors in Calgary, AB, this past summer. The theme for this year's stampede was "Wind and Solar Energy" with many varied displays presented by government and business. In the forefront was a solar-powered Amateur Radio station sponsored by the Calgary Amateur Radio Association. A special call sign, VE6SUN, was obtained from the Department of Communications for use during the Stampede.

Solar power supply and tribander at the Calgary Stampede. The solar panels provided enough power to keep the six 105-A batteries stored at the base of the panels always close to full charge. *(VE6MX photo)*

The presentation was rated an outstanding success by the volunteers who manned the booth and also by visitors to the exhibit. The station, which operated 13 hours each day, was run by two shifts of volunteer club members and hams from all over North America and Europe who happened to be visiting the Stampede. Operation was mainly on 20 meters (phone and cw) with some operating also on 80, 15 and 10 meters. Two meters was also used to handle local traffic and provide directions to the Stampede.

The solar equipment used for the station was supplied by the Province of Alberta Research Council and was a commercially built, self-contained unit. Four solar panels, each consisting of 36 cells racked at the top of the unit and elevated at 60 degrees, kept six 105-A batteries charged and provided 25 watts of continuous power to the station. Sunlight conditions were good for the entire 10 days of operation with the maximum voltage drop being a mere 0.19 volts. Readings were taken every morning and evening. The supply averaged 12.65 volts receive and 12.52 volts while transmitting.

VE6SUN operated without a hitch. It took 70 volunteers to erect the antennas, assemble and operate the station and take everything down and cart it away. Many were tired, but all had that feeling of accomplishment that comes with the completion of a job well done. Anyone interested in running a similar project or desiring more details may contact the Calgary Amateur Radio Association, P. O. Box 592, Calgary, AB T2P 2J2, Canada. — Key Klix, *Calgary Amateur Radio Association*

SPECIAL QSL

We all enjoy receiving QSL cards, especially from that rare country or from a new friend. To one ham, a QSL card could mean the beginning of a new life. Jim Delekta, WA2KIY, has been unable to read, remember or speak since a tragic accident in July 1978. Recently, a friend, AF2Y, sent Jim a QSL card. He was able to read the message on the card, a new development. A simple thing, such as a QSL card, could possibly begin to restore Jim's memories, while recognition of the alphabet and numbers in amateur call signs could help Jim to read again. Want to send a really special QSL card this week? QSL to James Delekta, WA2KIY, John L. Deaton Medical Center, 611 South Charles St., Room 217, Baltimore, MD 21230.

A Simple, Accurate RF Wattmeter

E-h-h-h-h, "watts" up, Doc? Looking for an accurate rf wattmeter for low-power measurements? This novel device uses a solar cell and a pair of dial lamps to get the job done.

By James E. Kennedy,* W7MID

The measurement of rf power has been challenging hams ever since the start of Amateur Radio. In the early days of radio (and even today), a flashlight bulb and a loop of wire were used to "see" how much power was being delivered to the antenna feeders. The more daring amateur might even try using a pencil to pull arcs from the transmitter tank circuit — although this often resulted in the equipment (and amateur) going up in smoke! Not exactly an accurate way to do things, but it surely was inexpensive!

Today, an accurate rf wattmeter is an expensive item and not found in too many ham shacks. Here's an accurate wattmeter that can be built for just a few dollars. It is capable of measuring power levels of up to 5 watts with an accuracy rivaling that of many commercial units. The 5-watt level makes this meter handy for checking the power output of low-powered transmitters and if you're a *real* QRP operator, you can even adjust the meter for lower power measurements.

Theory of Operation

Earlier articles describing the use of incandescent bulbs as dummy loads led to the design of this little gadget.[1] Here's how it works. As shown in Fig. 1, the two no. 47 lamps (DS1 and DS2) in parallel in series with the fixed resistors (R1-R3), form a load that is very close to 50 ohms. The actual resistance varies from about 50 ohms to 56 ohms. When the output of the transmitter is connected to J1, current will flow through the lamps. The amount of light produced by these lamps is a function of the rf power being delivered to the meter. (So far we haven't progressed

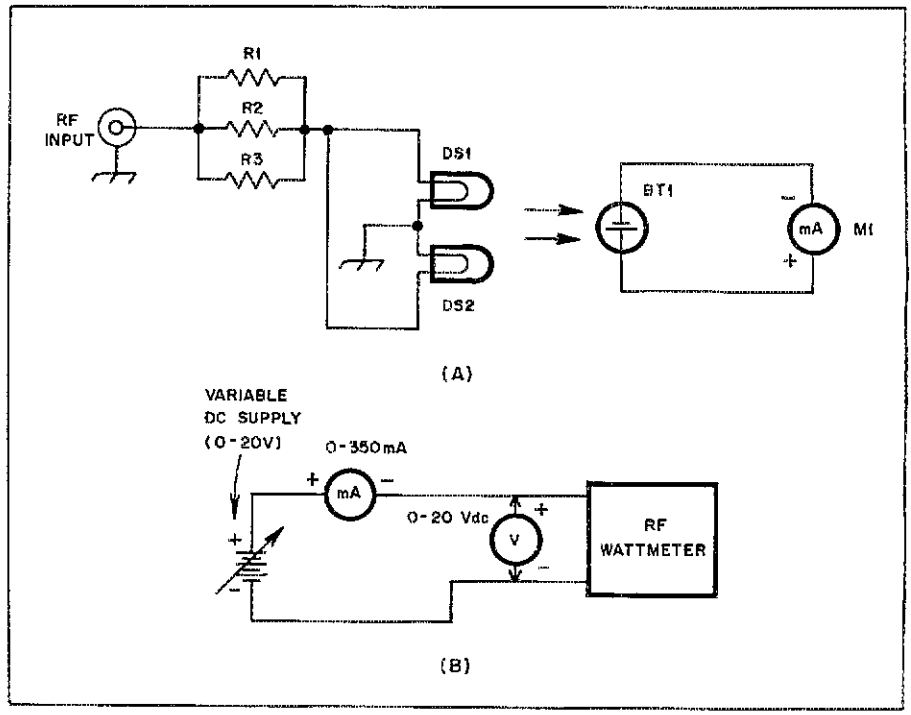
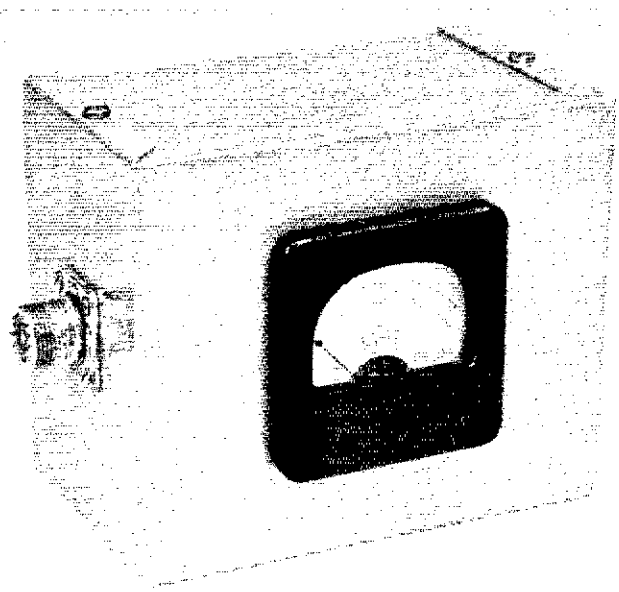


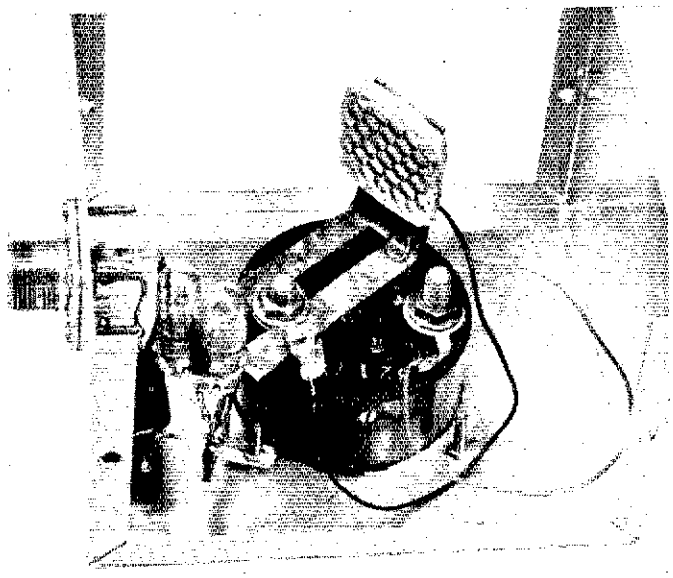
Fig. 1 — The schematic diagram for the simple rf wattmeter is shown at A. A suggested calibration setup is shown at B. Sample data appear in Table 1.
BT1 — Solar cell, IR Experimenter type or equiv.
DS1, DS2 — Miniature lamp, type no. 47.
J1 — Type SO-239 coax jack.
M1 — Dc meter, 0-1 mA.
R1-R3, incl. — 100-Ω, 2-watt, carbon resistor.

*Electronics Instructor, Camelback High School, 349 East Monte Vista Rd., Phoenix, AZ 85004

[1]Notes appear on page 41.



The wattmeter is constructed in a 5 × 4 × 3-inch (127 × 102 × 76 mm) aluminum box. A smaller enclosure could be used depending upon the size of the meter employed.



This inside view shows the simplicity of construction. The solar cell is attached to a bracket secured by one of the meter terminals. The no. 47 lamps are supported by leads soldered to the shells and bases while the three resistors are secured between the coaxial input jack and terminal strip.

much past the light bulb and loop of wire stage.) Also, inside the meter cabinet is a solar cell, which generates a dc potential when light strikes its face. The solar cell is connected to a 0- to-1-mA meter, which produces a reading proportional to the transmitter output power.

The next question is, how do we translate this meter reading into watts? Within limits, the lamps don't care about the frequency of the voltage with which they are supplied; the light bulbs respond just as well to rf energy as they do to dc. So for calibration, a dc potential is applied to the input of the meter, and the resulting current readings are noted. If the value of the dc potential and input current to the meter are known, it is a simple matter of using Ohm's Law to determine the resulting power level.

If, for example, a meter reading of 100 indicates a power of 1.5 watts (as with the original meter), when a transmitter having an output power of 1.5 watts is connected to the meter, a reading of 100 will also be obtained.

Calibration

Calibration is easily accomplished without special test equipment. An inexpensive VOM and a variable dc supply are all the equipment you will need. All calibration is done with dc only, although the instrument will be accurate to at least 30 MHz. A suggested calibration setup is shown in Fig. 1B. The dc supply voltage should be increased to obtain integral readings on the rf wattmeter. For example, on a 0- to-1-mA meter scale, increase the supply voltage until a reading of 0.1 mA is obtained on the rf wattmeter. Record this reading along with the corresponding readings of the external volt and amp meters. Now increase the voltage of the supply to obtain a 0.2-mA reading on the wattmeter and again record the corresponding readings. Repeat these steps until the entire range of the wattmeter has been covered. There is nothing special about moving in 100-μA steps; 25- or 50-μA steps could be used if you desire greater accuracy. The data can be organized in a table similar to that shown in Table 1. My readings went from 100 to 2000 only because I used a meter taken from an old voltmeter and this is how the meter face was calibrated. This table will comprise the conversion data needed to use the meter.

Table 1

Sample Calibration Chart

Wattmeter Reading	*DC Supply Voltage*	*External Ammeter (amps)*	*Watts (E × I)*
100	8.82	0.170	1.50
200	9.21	0.190	1.75
300	10.00	0.205	2.05
400	10.46	0.218	2.28
500	11.19	0.227	2.54
600	11.71	0.234	2.74
700	12.18	0.243	2.96
800	12.48	0.250	3.12
900	12.77	0.253	3.23
1000	13.27	0.260	3.45
1100	13.96	0.265	3.70
1200	13.96	0.270	3.77
1300	14.73	0.275	4.05
1400	15.47	0.278	4.30
1500	15.78	0.282	4.45
2000	16.50	0.300	4.95

The readings you obtain will depend on the sensitivity of the solar cell you use and its distance from the light bulbs. It is well to mention here that the box must be closed when taking these readings or external light will confuse the calibration. In this particular unit the distance from the lights to the solar cell is about 3 inches (76 mm).

It was mentioned previously that the calibration will hold to at least 30 MHz.[2] This represents the upper limit of the tests done on this unit. It is probable that the upper frequency limit is actually well beyond this point, because the power-dissipating part of the circuit does not present much of a reactive load. QST

Notes

[1] *The Radio Amateur's VHF Manual*, Third Edition, ARRL, pp. 306-307.

[2] Checks performed in the ARRL lab at frequencies between 3.5 and 28 MHz proved the unit to be surprisingly accurate for its low cost.

The Adaptamatic Message Keyer

Add iambic operation with dit and dah memories, additional message boards, and other extras to your Micro-TO Message Keyer. . . . or build the Adaptamatic from scratch.

By Chet B. Opal,* K3CU, ex-K3CUW

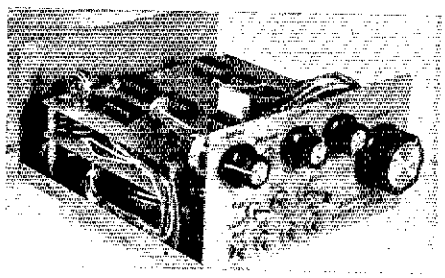
The Micro-TO Message Keyer[1] project has been very popular, probably because the circuit is simple and easy to understand. In the interest of simplicity, however, some desirable features were sacrificed. This article shows how to modify the keyer to incorporate some of these features.

The requests I've received most frequently have been for a modification to provide iambic operation with dit and dah memories. Since there are several different ways of accomplishing this, the circuit presented here has been designed so that it can be adapted in a simple manner to simulate the iambic operation of any popular keyer (with the exception that it doesn't have automatic letter and word spacing). Because the keyer no longer follows the original W9TO design after this addition, I've renamed it the "Adaptamatic."

Also, most people would like more message memories. The board I have been distributing (the "Message II") can be wired to provide one 1024-bit or two 512-bit memories. But even two messages are often not enough (I prefer three in contest work), so a method for adding any number of boards is described.

A number of other frills have also been added. Included are circuits to provide message auto-repeat after a variable delay, an end-of-message indicator, and a modification that restarts the message when one of the message push buttons is pressed.

The additional circuitry for iambic operation, auto-repeat, end-of-message indicator, and the 1024 bits of additional memory are contained on a second circuit board (Fig. 1). Depending on which of these features are implemented, some minor modification to the original keyer board may be required. For those starting from scratch, a new master-board layout including the modifications is shown in Fig. 2.



Front view of the keyer. This unit was built in a Radio Shack (270-253) cabinet recommended for the original Micro-TO keyer. A larger cabinet is recommended for those building the expanded keyer from scratch.

The New Master Board

Dual Memory: The original design uses a single 1024-bit memory. The new main keyer has one additional IC, U8, which makes it possible to have either one 1024-bit or two 512-bit memories. Two message-send push buttons (S2 and S3) are used; pushing either of them changes the start-gate output to a 1, which resets the $\overline{\text{RUN}}$ (not-RUN) flip-flop and starts the message. With the added switch S4 in the SINGLE position, the memory and address counter are wired as in the original version. When set to the DUAL position, S4A routes one of the outputs of the message latch U8A and U8B (either a 1 or a 0 depending on which button was pushe last) to one of the RAM address bits, thu splitting the memory in two. Also, S4 changes the set input to the $\overline{\text{RUN}}$ flip-flo so that the message terminates after 51 bits instead of 1024.

To load a memory, set S1 to the RUN position and push either S2 or S3, depend ing on which message is to be loaded Now tap the dit or dah paddle to reset th address counter, and throw S1 to th LOAD position. Loading will now star when you resume sending. After loadin left-over memory with blanks, throw S back to RUN. Either message can now b called up by pushing the appropriate but ton. This modification has been incor porated into the Message II board.

Instant Restart: As originally designed it was necessary to wait until the entir memory was read out before a messag could be repeated (unless one of the pad dles was tapped). In some situations (such as during Field Day or Sweepstakes) where short CQs at frequent intervals are used, it is desirable to restart the messag even before the time to read out 512 bits of memory has elapsed. A modification that restarts the message immediately upon pushing a message button (or on receipt of a pulse from the auto-repeat cir cuit described below) is also shown. The added parts are R8, R25, C14 through C16, and D4. When a message button is pushed, C16 couples a pulse to the S input of the $\overline{\text{RUN}}$ flip-flop, which sets its Q output to a 1, resetting the address counter. In the $\overline{\text{RUN}}$ mode the input is at 1 even after the pulse has decayed because the button is still closed. This is ensured by the debounce capacitors C14 and C15, so

*5414 Old Branch Ave., Camp Springs, MD 20031
[1]Notes appear on page 47.

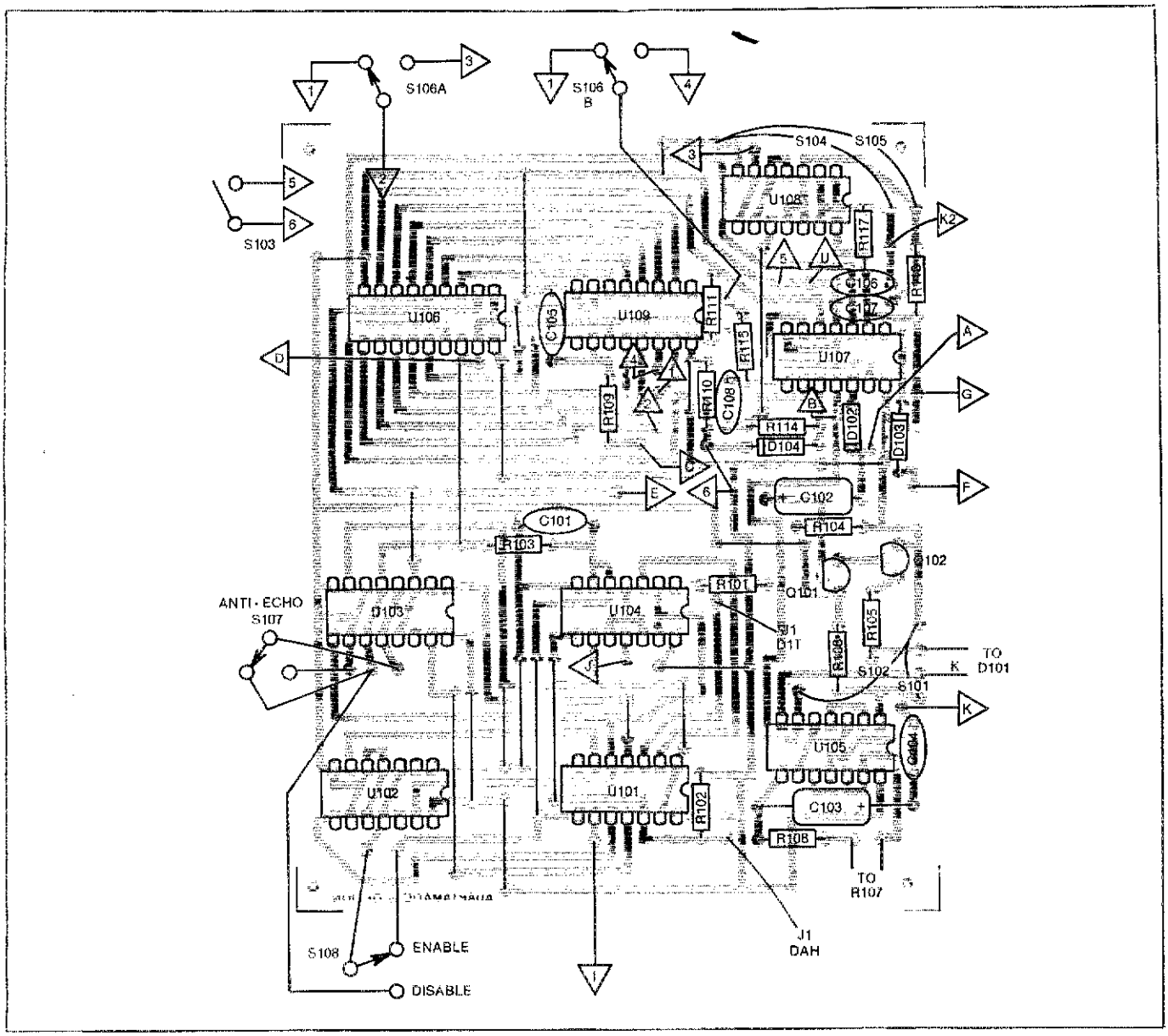


Fig. 1 — Parts-placement guide for the options expansion board, as viewed from the component side. The shaded area represents an X-ray view of the copper pattern. The etching pattern appears in the "Hints and Kinks" section of this issue. Wire jumpers are indicated by unmarked straight lines. Printed-circuit boards are available from the author (see note 3).

the $\overline{\text{RUN}}$ flip-flop resets and starts the message over. In the LOAD mode, this I is shorted out by D4, so the message does not start until the first paddle closure. The latter feature is very handy in the LOAD mode: If you make a mistake, tap the appropriate message button and start over. No cutting of the etched paths is required when adding this feature to the previous board, because R8 and R25 can replace the existing jumpers.

The Options Board

Iambic Modification with Dit and Dah Memories: A deficiency of the W9TO design is that it is not compatible with modern "squeeze" (dpst) paddles. At the time of the TO design, most paddles were made from converted bugs, so it was not possible for both dit and dah paddles to be closed at the same time. When a squeeze paddle is used and both paddles are closed at the same time, the TO keyer will just make dahs. Most recent designs are "iambic," so if both paddles are closed at the same time the keyer makes alternating dits and dahs. For the keyer to be iambic, it must at least remember what character it sent last.

The need for dit and dah memories is most noticeable to even us old-fashioned conventional paddle users when the Message keyer is in the LOAD mode, with the clock free-running. In this mode the character may not start until some time after the paddle closes, so it would help if the keyer could remember which paddle was closed first (so that, for example, some As don't come out as Ts).

In the LOAD mode, dit and dah memory after a sending pause and iambic operation are clearly desirable. As for additional memory features, the solution is not as clear cut, and different designs have evolved. If, for example, the dit paddle is kept closed during the space immediately following the dit, should this closure be remembered and a second dit generated? I don't know of a good term for this, but "echo" gives the general idea. The echoing characteristic requires more critical paddle timing and is, in my opinion, a nuisance, but some operators are accustomed to it. The circuit presented here has the anti-echo feature included as an option. Do not use this option if you like the "echo" feature.

Then there is the question of "insertion" memories. If both paddles are closed at the beginning of, say a dah, should the keyer remember this and insert a dit after the dah? Some characters are easier to send with insertion memories,

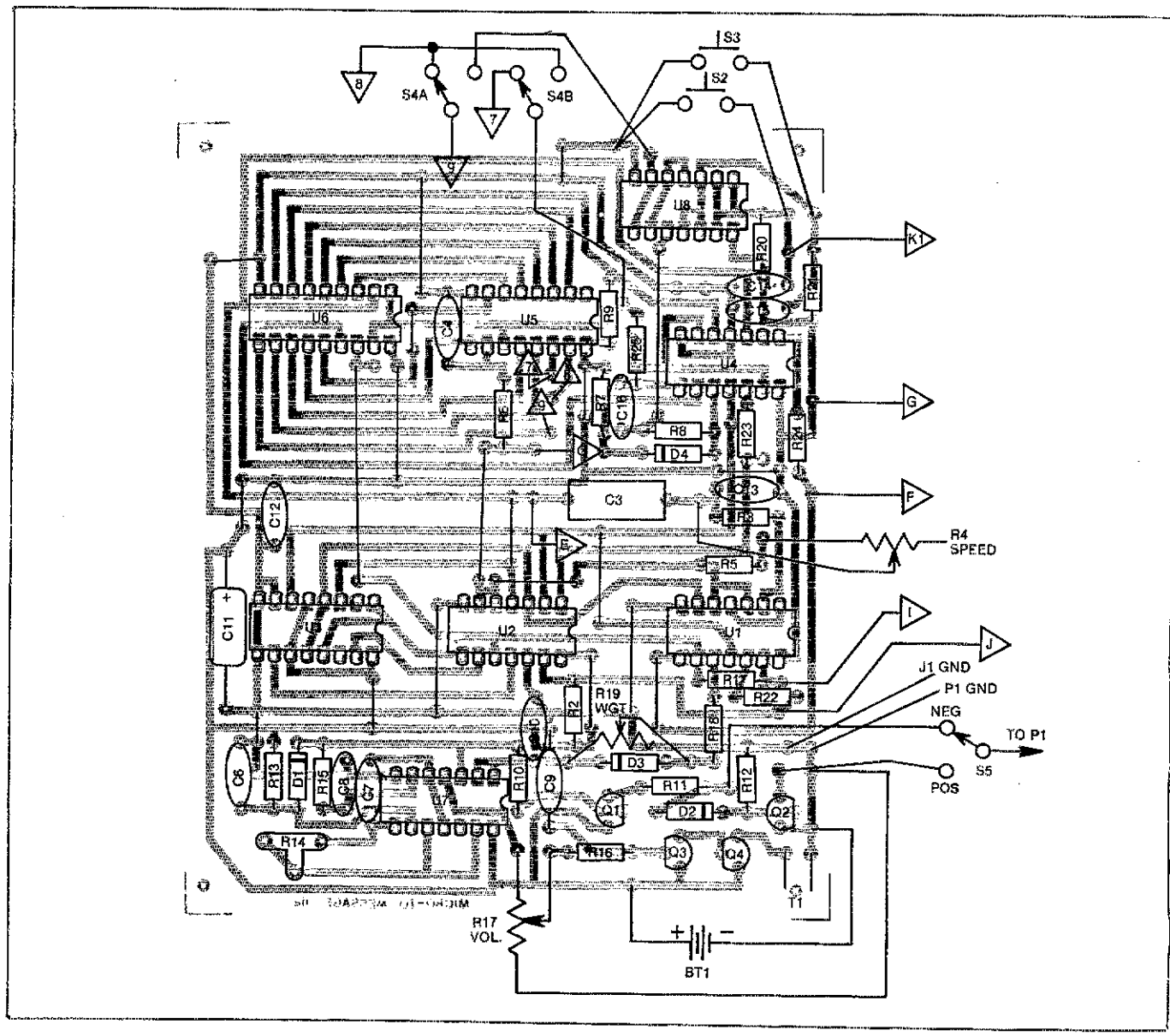


Fig. 2 — Parts-placement guide for the revised master circuit board as viewed from the component side. The shaded area represents an X-ray view of the copper pattern. The etching pattern appears in the "Hints and Kinks" section of this issue. Wire jumpers are indicated by unmarked straight lines.

but others are not. Dit and dah insertion is also implemented as an option in the circuit described. In any case, the keyer should remember that the dit paddle was closed at the end of the dah, and go on to make a dit even if the dit paddle is released.

If you use a conventional paddle, I recommend setting up the keyer with the anti-echo and insertion memories enabled. This is also the way the popular Accu-Keyer[2] is set up. If you wish to experiment, lend your keyer, or use the keyer in a multiop station, you could have these features switch selectable.

The iambic modification requires no changes to the original circuit; it merely intercepts the paddle closures and routes more "intelligent" paddle information to the original Micro-TO. The circuit (Fig. 3) requires two inputs from the main keyer (Fig. 4): the clock CL2, and $\overline{\text{MARK}}$ (not-MARK).

Theory of Operation

Here's how the circuit works. Normally all flip-flops are in their reset states and all inputs to the NOR gates are at ground (0) except for the dit and dah paddle leads. Let's assume that the keyer is in the LOAD mode with the clock free-running, and that the insertion and anti-echo features are enabled. If the dit contact is closed, then all inputs to the dit-next gate are 0 and the output changes to 1, setting the dit-next flip-flop. The Q output of this flip-flop goes to 1, closing the dit contact of the original keyer via the iambic dit gate. This sets the dit-recall flip-flop, and inhibits the dah-bypass gate. The Q output of the dit-recall flip-flop is now a 1 and inhibits any further inputs to the dit-next flip-flop via the dit-next gate. The keyer is now committed to making a dit. When the dit eventually starts, $\overline{\text{MARK}}$ goes to ground. This signal is inverted after a slight settling delay (about 100 μs, as determined by R103 and C101) and applied to the clock inputs of the dit- and dah-next flip-flops. Since neither the set nor the reset input of either flip-flop is at 1, and since their D inputs are 0, the D inputs are clocked through and the Q outputs go to 0. Meanwhile, the dit-recall flip-flop is still set, inhibiting the dit-next gate; because the dah-next gate is now no longer inhibited, closing the dah paddle at any time before the next character starts will set the dah-next flip-flop.

All this time, the dit recall flip-flop has

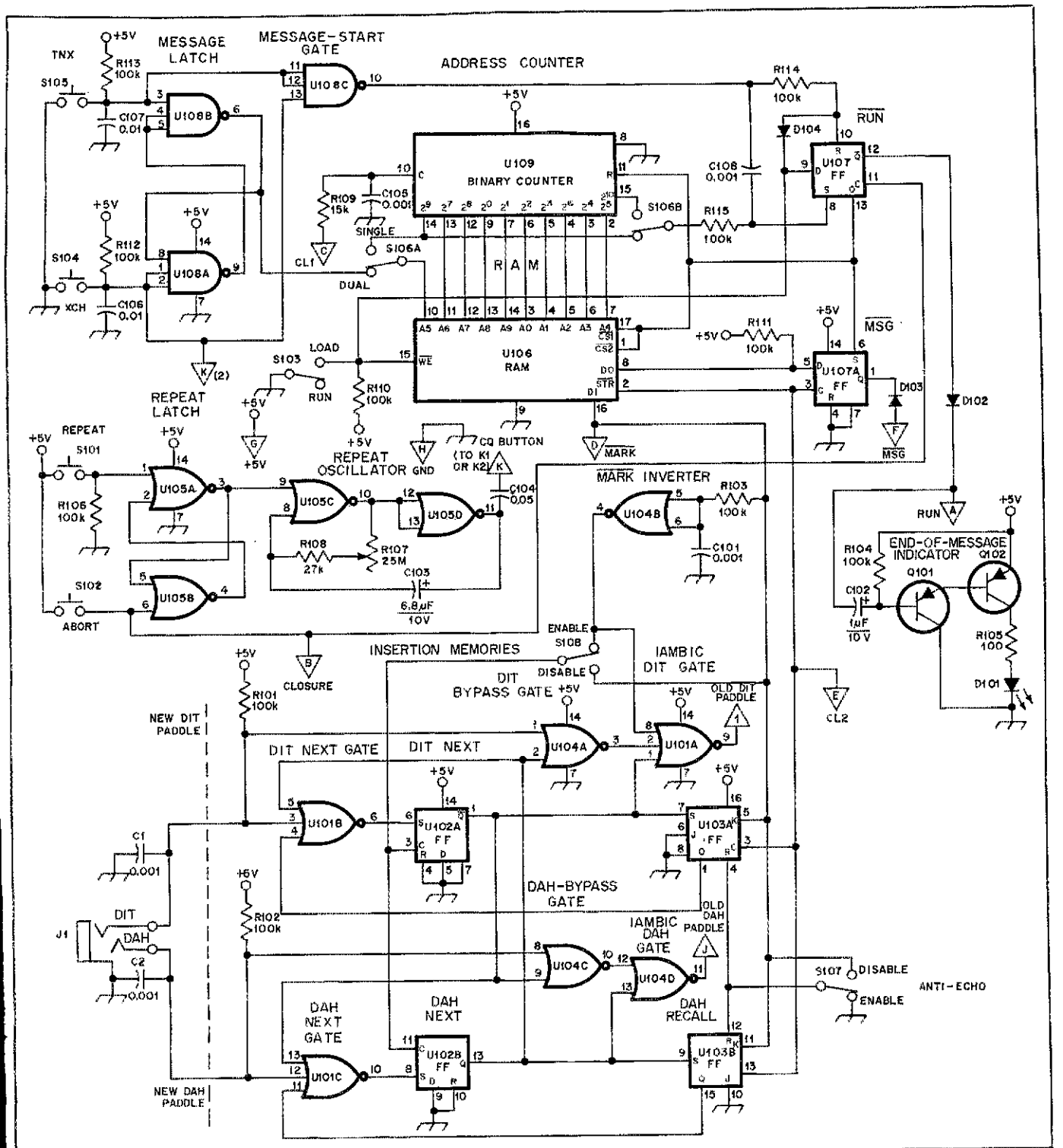


Fig. 3 — Schematic diagram of the options add-on board. Included are an iambic modification with dit and dah memories, provision for automatic repeat of the "CQ" message, an end-of-message indicator, and 1,024 additional bits of memory, which can be wired as one long message or two short messages. All capacitors are disc ceramic unless otherwise specified. Resistors are 1/4-watt 10-percent tolerance; k = 1000, M = 1,000,000. All ICs are CMOS.

C103 — 6.8 µF, 6-V tantalum capacitor.
D101 — LED.
D102-D104, incl. — Small-signal silicon diode, 1N4148 or equiv.
Q1, Q2 — Pnp silicon transistor, 2N3906 or equiv.
R107 — 2-MΩ or 3-MΩ carbon potentiometer, 1/4-watt or greater, any taper.
U101 — Triple 3-input NOR gate, CD4025.
U102, U107 — Dual type D flip-flop, CD4013.
U103 — Dual J-K flip-flop, CD4027.
U104, U105 — Quad 2-input NOR gate, CD4001.
U106 — RAM, IM6518CJN
U108 — Triple 3-input NAND gate, CD4023.
U109 — 12-bit binary counter, CD4040.

been receiving clock pulses but hasn't done anything because, first, the SET input was high, and after the mark started the K input was 0 (a J-K flip-flop doesn't do anything when both J and K inputs are 0). The K input does go back to 1, enabling a clocked reset at the beginning of the space following the mark. As a result, the recall flip-flops are finally reset by the clock pulse following the space. Note that since the anti-echo feature removes any dit-paddle input to the keyer until after

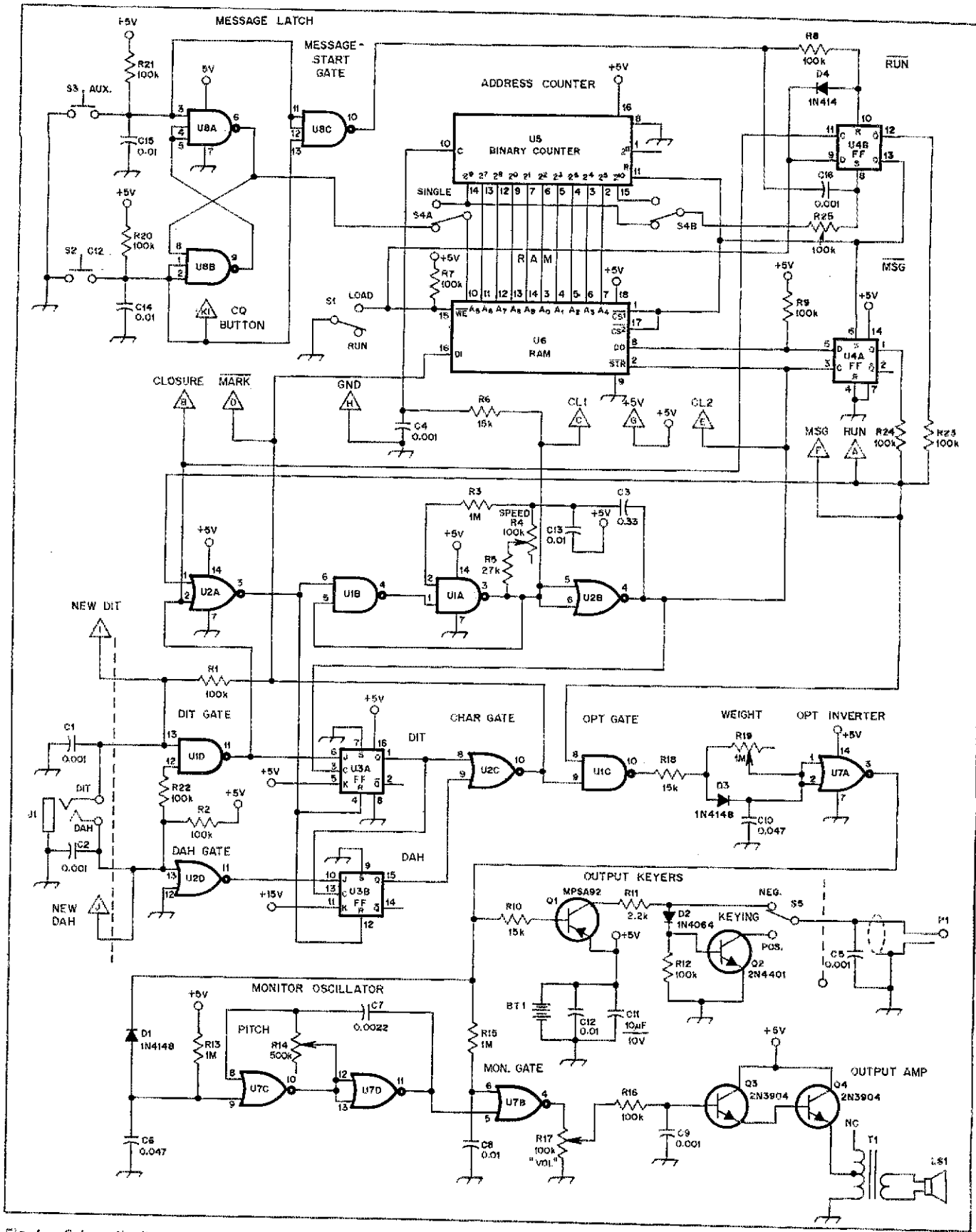


Fig. 4 — Schematic diagram of the Adaptamatic (Micro-TO Message IIA Keyer). Several components have been added to the original Micro-TO circuit to provide dual message capability and instant message restart. Diamonds refer to off-board connections to the options add-on board. All ICs are CMOS.

BT1 — Three type AA cells in series (4.5 V).
C3 — 0.33-µF polystyrene capacitor.
J1 — Two-circuit phone jack.
LS1 — Small 4- to 10-ohm speaker.
P1 — 1/4-in. phone (or other suitable) plug.
R4, R19 — Linear taper, 1/4-watt (or greater) carbon potentiometer.
R14 — 500-kΩ trimmer potentiometer.
R17 — Audio taper, 1/4-watt (or greater) carbon potentiometer.
S2, S3 — Momentary contact push-button spst switch.
T1 — Audio output transformer, 500-ohm ct to voice coil.
U1 — Quad 2-input NAND gate, CD4011.
U2, U7 — Quad 2-input NOR gate, CD4001.
U3 — Dual J-K flip-flop, CD4027.
U4 — Dual type D flip-flop, CD4013.
U5 — 12-bit binary counter, CD4040.
U6 — 1024-bit RAM, IM6518CJN.
U8 — Triple 3-input NAND gate, CD4025.

the clock pulse at the end of a space, there would be no way of making two dits in a row if it were not for the dit-bypass gate. This gate routes the dit-paddle closure through the iambic-dit gate, provided that it is not inhibited by the dah-next flip-flop, which may have been set in the interim. If the dah-next flip-flop is indeed set, the information is passed through the iambic-dah gate to the original keyer, circuitry starting a dah.

The circuit is perfectly symmetrical with respect to dits and dahs, with the exception that the iambic-dit gate has an extra input. This is because in the original Micro-TO circuit, the feedback from $\overline{\text{MARK}}$ to the dit gate (necessary to make characters self-completing) came through R1. The low output impedance of the iambic-dit gate shorts out this feedback, so it must be rerouted through the extra iambic-dit gate input.

The character-insertion memory can be disabled by connecting the clock inputs of the dit- and dah-next flip-flops to $\overline{\text{MARK}}$, so that they are not cleared until the end of the mark interval. This inhibits the dah- and dit-next gates until the following space. The anti-echo feature can be disabled by resetting the dit- and dah-last flip-flop with $\overline{\text{MARK}}$, so the keyer "forgets" (at the beginning of the following space) which character it sent last.

Additional Memories

In my earlier article I suggested that several memory chips could be wired in parallel, with a particular chip enabled through the $\overline{\text{CS}}$ inputs. Unfortunately, this would require running some 17 leads to each of the additional chips. Rather than doing this, I decided it is better to cut down on the number of interconnections and simply duplicate the whole message section on the expansion board (the additional cost is small). In this way, any number of boards can be hooked up for additional memory expansion. While a separate LOAD/RUN switch is required for each board to load the messages, any one of the messages can be called up in the RUN mode by pushing a single button. Each board can be independently wired for single 1024-bit or dual 512-bit messages.

The master board needs to accept a run command not only from its own $\overline{\text{RUN}}$ flip-flop, but also from any of the slaves. This is done by inserting an isolating resistor, R23 of Fig. 4, in series with pin 1 of the RUN gate U2A (on the older boards an etched path must be cut to do this). The other RUN inputs are routed to pin 1 via isolating diode D102 (Fig. 3) on the slave boards. The clock, power and message data are sent in parallel to all slave boards. Playback from the $\overline{\text{MSG}}$ latches is routed to the output gate via isolating diode D103 (Fig. 3). Here again an isolating resistor, R24 of Fig. 4, is needed on the master board (but this can replace an existing jumper on older boards).

Automatic Repeat and End-of-Message Indicator

A handy thing to have for contest work is the automatic repeat feature. This is great for sending CQs at regular intervals. It can be done (See Fig. 3) by adding U105 and associated components (R106 through R108, C103 through C105, S101, and optional S102). The combination U105C/U105D forms a slow oscillator with its frequency determined by the "delay" control R107. The oscillator triggers the "CQ" button via C104 once each period. The other two gates, U105A and U105B, form a flip-flop which enables the repeat oscillator. The message begins when the "repeat" push button is depressed, and stops when either paddle contact or the optional ABORT push button is tapped. The ABORT push button also stops any message currently being sent.

The circuit consisting of Q101, Q102, R104, R105, D101 and C102 (shown in Fig. 3) provides for a brief flash of light-emitting diode D101 when the message is completed. This is a useful indicator when zeroing the memory prior to loading it, or when waiting for it to fill up with zeros after entering a brief message.

Construction

The options board is the same size as the original Micro-TO message board, and is designed to nestle beneath it.[3] If the auto-repeat feature is not implemented, it should be easy to expand already-built Micro-TO keyers by adding push buttons and a single-pole toggle switch. In order to implement all the features (including switchable insertion memories) and not to have the front panel look kludged, I decided to start over with a new box the same size as that used in the original Micro-TO. Construction is otherwise identical. I recommend running all the interconnect wires to one edge of the board and lacing them into a single cable to provide a "hinge" for the board during servicing. This is even more important when two boards are used. It is probably obvious from the pictures that a larger box would make life much simpler.

I wired the SINGLE/DUAL switch and the CQ and AUX push buttons to the options board, since the CQ message tends to be the longest (on vhf in particular) and sometimes the extra message length is needed. The main keyer board was permanently wired for dual messages. On another keyer, I wired a foot switch in parallel with the TNX button. The TNX message acknowledges the receipt of an exchange while giving time to record the contact. With that keyer I also used a paddle on which two push buttons are mounted. These are connected in parallel with the CQ and XCH buttons. In contests where it is necessary to insert information in the middle of the exchange, I load the first part in the AUX memory and the second part in XCH. After entering the information, I tap XCH to finish the exchange.

Troubles

The only recurring problem with the keyer has been that occasionally the memory does not play back the message that was loaded. This can happen if the new "B" series CMOS gates are used in the clock circuits. Apparently the higher gain of this series can lead to parasitic oscillations; these can be calmed down with the addition of C13 (this capacitor was incorporated into the Message II circuit board).[4] Most of the other memory problems have been cured by reducing the battery supply to three AA cells instead of four. Proper operation of the IM6518CJN memory chip is only specified over a 4.5- to 5.5-volt range, while four new AA cells can supply almost 7 volts! I have tested several hundred memory chips at 4.8 volts (four nickel-cadmium batteries) with nary a problem.

Yaesu FT-101 transceiver owners may need more keying current, so a value of 1 kΩ for R11 is recommended. This condition can be spotted quickly because the Yaesu cw monitor will work fine, but the transmitter won't key properly.

With the original circuit, one could occasionally get a dit while tapping the dah paddle. To cure this, the threshold of the dah gate has been lowered by grounding pin 12 of U2D, and a small delay time (R22 and the input capacitance of U1D) has been added between the dah paddle and the dit gate.

The earlier article specified a 100-ohm to voice-coil transformer for T1. A more readily available 500-ohm ct or 1000-ohm ct transformer will work if the monitor output is wired to the center tap instead of across the whole transformer. Also, 2-watt carbon potentiometers were recommended for use in the original Micro-TO — here 1/2-watt units are acceptable.

Final Remarks

I would like to thank all those who wrote describing their experiences with the Micro-TO keyer. I am particularly indebted to N2EQ, who sent a circuit diagram which started me on the right track in developing the iambic modification. Also, special thanks to K3RA who has served as a sounding board in developing the keyer and its enhancements. QST

Notes

[1] Opal, "The Micro-TO Message Keyer," *QST*, February 1978. Also see Feedback in *QST*, August 1978.

[2] Garrett, "The WB4VVF Accu-keyer," *QST*, August 1973, and Garrett and Contini, "The Accu-Memory," *QST*, August 1975. The Accu-keyer will not work with a free-running clock, so it is not compatible with the Adaptamatic design.

[3] The author has printed-circuit cards for the revised master board and the Adaptamatic options board available, as well as some other parts such as the memory chips. Please send an s.a.s.e. for a current price list.

[4] Omit this capacitor if you use "A" series gates.

Technical Correspondence

Conducted By Doug DeMaw,* W1FB

MORE THOUGHTS ON RECEIVER PERFORMANCE SPECIFICATION

☐ With the present popularity of contesting and other competitive forms of operating, interest continues in the design and specification of receivers with high dynamic ranges. I offered one definition of dynamic range in an earlier *QST* paper.[1] That article detailed how two-tone dynamic range relates to receiver noise figure, bandwidth and receiver input intercept. Since publication of that paper, the ARRL has included results of such measurements in its new product reviews.

Some manufacturers (and "homebrew" fans) have begun to specify their products more closely. For the most part this is to be applauded. However, some have been less than realistic, specifying only an "intercept point" with no relation to dynamic range. Others have published input-intercept, noise-figure and dynamic-range numbers which are not self-consistent. Still others have performed component measurements with quality instrumentation and then assumed that the same performance is maintained in a receiver. Clearly, problems still exist.

The "intercept point" has been touted as a useful description of a receiver, being indicative of the level of intermodulation distortion (IMD) created within the front end. The utility is beyond dispute. Like noise figure, it is bandwidth invariant, while two-tone dynamic range is not.

On the other hand, some workers tend to use the term "intercept" a bit casually. It is usually well understood when speaking of a receiver that "intercept point" means *input intercept*. This is not the case when a component such as an amplifier is considered. When working with individual stages the plane of definition (input or output) is extremely critical and should not be ignored. The general practice is to describe amplifiers by an *output intercept* while using the input intercept for mixers.

Other problems of a more fundamental nature exist. One is a lack of appreciation for the role of input attenuation upon noise figure, input intercept and dynamic range. This is well illustrated by an example: An active amateur designer told this writer of his measurements on a recently introduced commercial hf transceiver. He stated that he had measured an "intercept point" of +12 dBm. However, measurements at ARRL, as well as those by this writer, and by the manufacturer of the transceiver, all showed input intercepts much lower than this. All of the later measurements were consistent with the others. It was finally concluded that the +12-dBm measurement resulted when the 20-dB front-panel-mounted attenuator was activated. While the +12-dBm measurement was probably quite accurate, it was accompanied by a noise figure of over 25 dB! Intercept is a viable specification only when it is compared with the system sensitivity.

An additional problem with the intercept concept is that it does not always apply in the accurate way we would like. Implicit in the concept is the assumption that a 1-dB increase in input test tones will produce a 3-dB increase in the amplitude of the third-order distortion products. Such a change indicates a "well-behaved" device. While most amplifiers and mixers are well behaved, there are some exceptions, especially with high-level diode-ring mixers.[2] Generally, when a departure from the normal exists, it is in a direction to make the IMD ratio climb at a less dramatic than expected rate, leading to a higher inferred intercept when measured at high levels. For receiver work the measurements should be made at levels close to those *encountered by the receiver*. This is exactly what is done during a direct dynamic-range measurement. It is interesting to note that many mixer manufacturers do not describe their products with an intercept; instead an IMD ratio is given for a specified input.

There is some question about the validity of using intermodulation distortion as a means for specifying receivers in any way. The argument is that two strong, equal-amplitude signals are rarely encountered in practice. This only represents a "worst-case" condition. However, the mathematics apply for nonequal signals. Additionally, those efforts devoted to reducing IMD are usually effective in reducing other undesired phenomena such as blocking caused by gain compression. Finally, IMD measurements are easily performed.

Anzac Electronics, a manufacturer of mixer and amplifier modules, has described a most useful parameter, the "Dynamic Range Number."[3] This is used to describe components, and is the output intercept in dBm minus the gain in dB, minus the noise figure in dB. A well-behaved nature is presumed in the definition. A similar system parameter, the "Receiver Factor," could be defined as the receiver input intercept in dBm minus the noise figure in dB. Unlike the dynamic range in present use, the Receiver Factor would be invariant with bandwidth. For example, the writer's present receiver has an 8-dB noise figure and a +12-dBm input intercept, yielding a Receiver Factor of +4 dBm, independent of bandwidth. The two-tone dynamic range is just over 100 dB for a 500-Hz bandwidth. For the previously mentioned commercially manufactured transceiver, the Receiver Factor would be −13 dBm.

The exact set of parameters used is of little consequence. It is important only that we are consistent in our definitions and that the results are applied and interpreted carefully.

In a modern, well-designed receiver, IMD problems rarely occur during on-the-air use. Similarly, blocking from gain compression is not common. The first practical problem usually to become evident is reciprocal mixing, leading to what might be termed "early blocking." Here, incoming signals separated slightly from the frequency to which the receiver is tuned, beat in the mixer with noise sidebands from the local oscillator. The phenomenon is by no means new.[4][5][6][7] However, it has not been given sufficient attention during receiver evaluations. In principle, the measurement is easily performed.[8] All that is required is the receiver under test with an output indicator (audio voltmeter), a clean signal source and a wide-range step attenuator. First, the minimum detectable signal (MDS) of the receiver is measured. Then, the attenuator is decreased with the receiver tuned away from the generator frequency until an output response equal to the MDS is observed. The ratio of the power available from the generator/attenuator to the receiver MDS is a measure of the power in the LO sidebands. It is a function of the frequency separation between the receiver and the signal generator. The result is usually normalized to a 1-Hz bandwidth. For example, in my receiver the LO noise sidebands are measured to be below the carrier by 148 dB/Hz (not root Hz!) at spacings down to 3 kHz.[9]

This measurement is often more easily described than performed. An accurate measurement depends upon an i-f filter which has excellent ultimate rejection, usually well over 100 dB. This is rarely found in amateur gear. Additionally, the signal generator used must be extremely clean. This is best realized by placing a selective multiple resonator crystal filter in cascade with the output of the generator. Data on my receiver are in doubt from the lack of such a filter.

It is interesting to note the effect of filter shape factor upon reciprocal mixing. As in most communications applications, amateur receiver designers strive for as low a value of shape factor as possible. However, this represents a worst-case situation for the observation of reciprocal mixing. The nature of this compromise has long been appreciated by the designers of rf instrumentation.

Some experimenters and users have suggested that the ARRL establish standards of performance for receivers. I am generally opposed to this, for it would discourage the design and construction of relatively simple and inexpensive equipment. Many of the seemingly esoteric details of receiver performance never become significant in routine amateur communications. It is only in severe competitive situations where these details are

*Senior Technical Editor, ARRL.

[1]References appear on page 49.

important. Minimum specifications should be applied only for the case of signal outputs which could cause interference to other communications services.

There is much more that may be done to improve receiver performance. Measurement and evaluation techniques must also evolve. Present trends are encouraging. However, great care must be exercised in applying the measurement results. The intercept concept should be used only if it is applicable. Measurements should include an evaluation of reciprocal mixing as well as IMD related effects.

References

[1]Hayward, "Defining and Measuring Receiver Dynamic Range," *QST* for July 1975.
[2]An excellent review of diode mixer problems is given by P. Will, "Uncover Mixer Intermod With Swept Measurements," *Microwaves* for November 1978.
[3]"The Amplifier Factor," application note from Anzac Electronics, Waltham, MA.
[4]Sabin, "The Solid-State Receiver," *QST* for July 1970.
[5]Hayward and DeMaw, *Solid-State Design for the Radio Amateur*, Chapter 6, ARRL, 1977.
[6]Hayward, "A Competition Grade CW Receiver," *QST* for March and April 1974.
[7]An up-to-date review of oscillator noise is given by D. Scherer, "Today's Lesson — Learn About Low-Noise Design," *Microwaves* for April and May 1979.
[8]Rohde, "Evaluating Noise Sideband Performance in Oscillators," *Ham Radio* for October 1978.
[9]The oscillator circuit is that designed by L. Gumm, K7HFD, as described on p. 126 of ref. 5.

— Wes Hayward, W7ZOI, ARRL TA, 7700 S.W. Danielle Ave., Beaverton, OR 97005

[Editor's Note: The technique suggested in W7ZOI's letter is one which may soon be adopted by the ARRL technical staff for receiver-performance evaluation. Our present method is based on the Hayward paper in ref. 1 of his letter. It is constrictive to the extent that our reporting on dynamic range, to date, has been somewhat dependent upon the receiver under test containing an i-f filter with a 500- or 600-Hz bandwidth. Some receivers have no provision for two i-f filters, such as the Ten Tec 544 and Swan 100-MX, and come equipped with ssb-bandwidth filters. Measurements at 2.4 kHz under the old system would yield dynamic-range numbers that might mislead some readers if their thinking has been keyed to the reports we've given for receivers with cw filters. The Hayward technique described here would enable us to measure all receivers and report our findings.]

ZIP-CORD ANTENNAS — SETTING THE RECORD STRAIGHT

I Joe Rice's (W4RHZ) comments in *QST* for August 1979 ("Technical Correspondence") contained many questionable statements. I feel compelled to respond to them.

Mr. Rice was referring specifically to the excellent article by *QST* Technical Editor Hall, K1TD, which appeared in the March 1979 issue. It was entitled, "Zip-Cord Antennas — Do They Work?"

First off, Mr. Rice states that the technical editor could have found the impedance of the zip cord from $Z_0 = 276 \log b/a$. This is incorrect, as the equation is valid only for air when the dielectric constant is 1. Zip cord has a rubber or plastic type of dielectric and hence, a higher dielectric constant. This would change the value of impedance materially.

Secondly, Mr. Rice decries the mathematical content of the reference article. Actually, there were no mathematics in the article. Only the results of careful laboratory measurements were shown.

Thirdly, he stated (Rice) that you can't measure the impedance of 100 feet (30.5 m) of lamp cord, and that at least 1000 feet (305 m) of wire would be needed to obtain meaningful measurements. This is completely incorrect: Even a simple rf resistance bridge will give meaningful measurement results with relatively short pieces of cable, as any experienced amateur knows. For example, a piece of zip cord at 29 MHz, cut to a quarter wavelength, is only 5.9 feet (1.8 m) long. A good measurement can be made with so short a length. So, his claim that at least 1000 feet of cable are needed is unfathomable.

Mr. Hall mentioned in his article that the impedance of the zip cord was 105 Ω, and that a representative dipole would have a resistance of 40 Ω, giving an SWR of 2.6:1. Joe Rice stated that the SWR could be corrected by means of a simple quarter-wavelength stub. Apparently, Mr. Rice does not realize that a stub correction would only correct the antenna-to-line impedance, which was 105 Ω — not the 50 Ω generally required of today's transmitters. His correction would show an SWR of 105/50 = 2.1:1. Hence, you would still require a matching network at the transmitter to bring your impedance seen by the transmitter down to 50 Ω.

His fear that the inductance of the electrician's knot would be a large lumped inductance is incorrect from theoretical calculations and from my own measurements, which showed the effect to be negligible at the frequencies for which the zip cord was used.

Rice's statement that twisting the zip cord could lower the impedance seems contrary to theory: Twisting the entire cord would increase the inductance per unit length. This in turn would increase the impedance in accordance with the equation $Z = L/C$, where L is the inductance per unit length and C is the capacitance per unit length.

So without going further, perhaps Mr. Rice's criticism of the technical competence of *QST* articles should be judged by my analysis of his remarks. In my view, if *QST* has any faults, technical competence is not one of them. — *William Vissers, K4KI, 1245 S. Orlando Ave., Cocoa Beach, FL 32931*

BALUN OBSERVATIONS

I Thanks to Doug DeMaw, W1FB, for his article, "Antenna Accessories for the Beginner" (*QST* for February 1979). Had *QST* arrived a month sooner it might have saved me the cost of a balun transformer.

I offer two observations to supplement W1FB's article. My first attempt at an antenna was an "inverted V." The antenna was cut initially to 67 feet and 2 inches (20.4 m), with the goal of achieving an acceptable SWR on both the 15- and 40-meter Novice bands. Allowance was made for end effects. (Note that 468/7.1 = 65 feet, 11 inches.) The ends were tied to an insulator, which was affixed to roof-mounted eye bolts by means of 2-foot (0.6-m) lengths of wire. The end effects were reduced by using 2-foot lengths of nylon rope between the insulators and eye bolts.

The second observation concerned two-band operation while using a commercially made balun. With the balun installed it was not possible to obtain an SWR of less than 2:1 on both bands. The antenna had to be shortened to less than 64 feet (19.5 m) for 40 meters and 67 feet was too *short* for 3/2-wavelength use on 15 meters. However, with no balun, and feeding the antenna directly with 75 feet (22.8 m) of RG-58/U (75 Ω) coaxial cable, a length of 66 feet (20 m) provided compromise performance on both bands. The SWR was 1.6:1 across the Novice segments of both bands.

My final point is that not only is a balun unnecessary for wire antennas on the lower bands, but depending on the balun design and quality it may make the performance *worse* if multiband operation is desired with the same antenna. — *Jim Pearson, KA4GMG, 12171 Captains Landing, North Palm Beach, FL 33408*

JA-USA TRANSISTOR CROSS-REFERENCE

I At your request I have done some research on Japanese power transistors and their specifications. There are hundreds of different types with a variety of package configurations. But, the ones I am listing here are probably the most common ones. Many are devices I have evaluated in our laboratory and am familiar with.

My main attention was given to the electrical characteristics. In some instances the pin arrangements are not the same as the suggested Motorola equivalents. This is only with regard to plastic-cased transistors, where the Japanese are using BEC (base-emitter-collector), BCE and ECB arrangements. The first two are the most common.

I hope this information will be useful to amateurs who own imported rigs and wish to replace defective power transistors with equivalent Motorola parts. Hf and vhf transistors are contained in Table 1.

Table 1

Japanese Type	VHF Plastic Nearest Motorola Equivalent
2 SC 1589	MRF227, MRF229 (isolated case TO-39), MRF260
2 SC 1590	MRF260
2 SC 1591	MRF262
2 SC 1970	MRF227, MRF229 (isolated case TO-39), MRF260
2 SC 1971	MRF260
	50-MHz Plastic
2 SC 1306	MRF340
2 SC 1307	MRF485, MRF342
	27-MHz to 30-MHz Plastic and TO-39
2 SC 1239	MRF8004
2 SC 1678	MDS1678
2 SC 1760	MPS-U31
2 SC 1816	MRF742, MRF482
2 SC 1909	MJE1909
2 SC 1945	MRF342, MRF485
2 SC 2092	MJE1909
2 SC 2166	MRF472, MRF482
2 SC 2207	MRF342, MRF485
	Other Motorola Plastic Transistors Available or to Be Introduced:
2 MHz-50 MHz	MRF476, MRF477, MRF479, MRF497, MRF486
VHF	MRF264, MRF344
UHF	MRF660
	High Power SOE
2 SC 2097	(6-lead pkg.) Use MRF245, MRF247. These parts have internal base matching, but its effect is negligible at low frequencies.
2 SC 2100	MRF412, MRF454, MRF458
2 SC 2290	MRF421
2 SC 2395	MRF433

— Helge Granberg, K7ES, ARRL TA, Motorola Semiconductor Products, Inc., Phoenix, AZ 85008

Product Review

Conducted By Paul K. Pagel,* N1FB

Macrotronics M800 RTTY System

RTTY enthusiasts who own Radio Shack TRS-80 microcomputers are in luck. The Macrotronics (formerly Microtronics) M-80 ham interface reviewed in May 1979 *QST* provided the TRS-80 owner with a means of using the computer to transmit and receive RTTY and cw. Now Macrotronics has introduced a new hardware and software package that is used in conjunction with the M-80 interface board to provide what is called a "deluxe RTTY system." Deluxe, it is! Not only has Macrotronics improved on the features of the M-80, but the number of features has been quadrupled. Everything imaginable that a RTTY operator could ask for is included and everything works as advertised.

The M800 hardware consists of a small kit that is used to modify the M-80 interface board. It takes approximately 10 minutes to assemble the handful of parts, and then you are ready to load the software and run.

The machine-language software is on cassette and fills approximately 14 kilobytes of memory. You'll need at least a 16K version of the TRS-80 as well as Level II BASIC in order to load and use the program. Once you have loaded the software, there are 38 commands from which to choose. A description of the program highlights follows.

The first thing the program does is ask the user his or her name and call sign. Once entered, that information is appended to all of the program functions that include the identification of the station. For example, to call CQ, the user hits the SHIFT and Q keys simultaneously and five lines of CQs are sent, each line ending with DE, the user's name and call sign. After the CQ, the user hits SHIFT and W and his call sign is sent in cw. If someone answers the CQ, the name and call sign of that station can also be entered. Each time the user hits SHIFT and Y the name and call sign of the other station, DE and the user's name and call sign are sent.

In the receive mode, the video monitor display is split. Lines 2 through 11 display whatever text is being received; lines 13 through 15 display the text that the user is typing (and editing). These data enter the system's buffer to be stored until the user is ready to transmit. The amount of text that can be stored in the buffer depends upon the amount of RAM in the computer — the more RAM, the more buffer storage space. If the other station breaks to ask a quick question ("Are you still copying?") while the user is typing into the buffer, the user can break away from the buffer, answer the question and return to the buffer. All of the text entered into the buffer before the break is undisturbed.

With the M800 hardware modification installed, the transmitter is controlled from the keyboard of the TRS-80. In the transmit mode, the transmitter is automatically keyed by means of a "PTT module"; beyond the transmit mode, the transmitter is unkeyed.

The M800 has a "who are you" (WRU) function; if a station comes on frequency and sends your call sign immediately followed by the letter Z, the M800, in the WRU mode, will respond by keying your transmitter and acknowledging the other station. After acknowledgment, the M800 will copy whatever is sent by the other station (copying will cease when a series of four Ns is sent). After the message is copied, it is recorded on tape to be played back whenever the user desires. Meanwhile, the M800 will remain in the WRU mode waiting to copy any other messages sent its way (the number of received messages is displayed on the video monitor).

Normally, the M800 will output text at whatever speed is chosen (60, 66, 75 or 100 wpm). Few people can type at full speed; therefore, typed transmissions usually come in erratic spurts. A UT-4-like function is available to smooth out these spurts. This is accomplished by inserting delays between the characters that are still sent at full speed.

Five messages may be stored in the system to be transmitted whenever the user desires. Four are limited to 255 characters each, while the "big" message is only limited by the size of RAM in the TRS-80. If your TRS-80 has 32 or 48 kilobytes of RAM, RTTY art can easily be stored in the "big" storage area. Included in the M800 package is a cassette with a sample "big" message that details the functions of the program.

User machine language programs can be called from the M800 program. Using this feature, games can be played and programs can be exchanged over the air; RTTY contests can be automatically logged. The possibilities are limited only by the user's imagination.

Some of the other features of the M800 include the ability to replay your previous transmission, retransmission of received text, automatic line numbering, carriage return and line feed; hard copy from a line printer; built-in RY and QUICK BROWN FOX test messages; and ASCII output at 110 wpm.

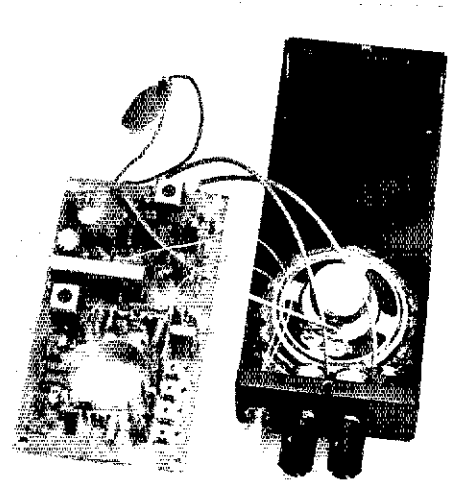
It took only a half-dozen QSOs to master enough functions to carry on a QSO without having to refer to the manual. And, once you have reached that plateau, you'll find the M800 such a joy to use that you have to force yourself away from the keyboard; the M800 is addictive!

All of the functions of the M800 were used a number of times and no difficulties were encountered; the program is "glitchless." These days, it is rare to take a new program (or even an old program) off the shelf and not encounter some problem. The Macrotronics folks made sure all the bugs were gone before they began selling. So, if you are looking for a complete RTTY system without reams of paper, miles of paper tape and decibels of noise, the M800 is what you are looking for. It is available from Macrotronics, Inc., P. O. Box 518, Keyes, CA 95328; its cost is $99. — *Stan Horzepa, WA1LOU*

ELECTRONIC SIGNAL PRODUCTS VHF 144-5A 2-METER FM RECEIVER KIT

There are a number of reasons you might want to be able to listen to one repeater frequency all the time . . . perhaps you're a control station or on the technical committee. The difficulty lies in convincing yourself to buy or build an additional fm receiver just to have it sit on a table or hang on your belt, tuned to one frequency forever. If your Amateur Radio budget is small, then perhaps you'd have these feelings even regarding the purchase of a receiver to monitor four or five frequencies! The new VHF 144-5A fm monitor receiver by Electronic Signal Products seems to be just what the fm op ordered. It's a five-channel, crystal-controlled receiver kit that exhibits respectable sensitivity and selectivity for its price class — only $130 with a six-pole crystal filter in the i-f section; $70 without the crystal filter.

Much of the receiver circuitry is contained in a single IC — a Plessey 1003 chip, which provides the i-f amplifier, squelch circuit, quadrature detector and audio amplifier stage.



The ESP VHF 144-5A 2-meter receiver kit, shown in completed form with an optional case, controls and speaker. The receiver board contains a voltage-regulator circuit permitting use with operating voltages of 10.5-20 volts. If a 9-volt transistor battery is used to power the receiver, the regulator should be bypassed. The board dimensions are 2-3/8 × 4 inches (60 × 102 mm). Approximate weight with all components installed is 2 oz (57 g). The 144-5A kit is manufactured by Electronic Signal Products, Inc., 350 N. Eric Dr., Palatine, IL 60067.

*Asst. Technical Editor, ARRL

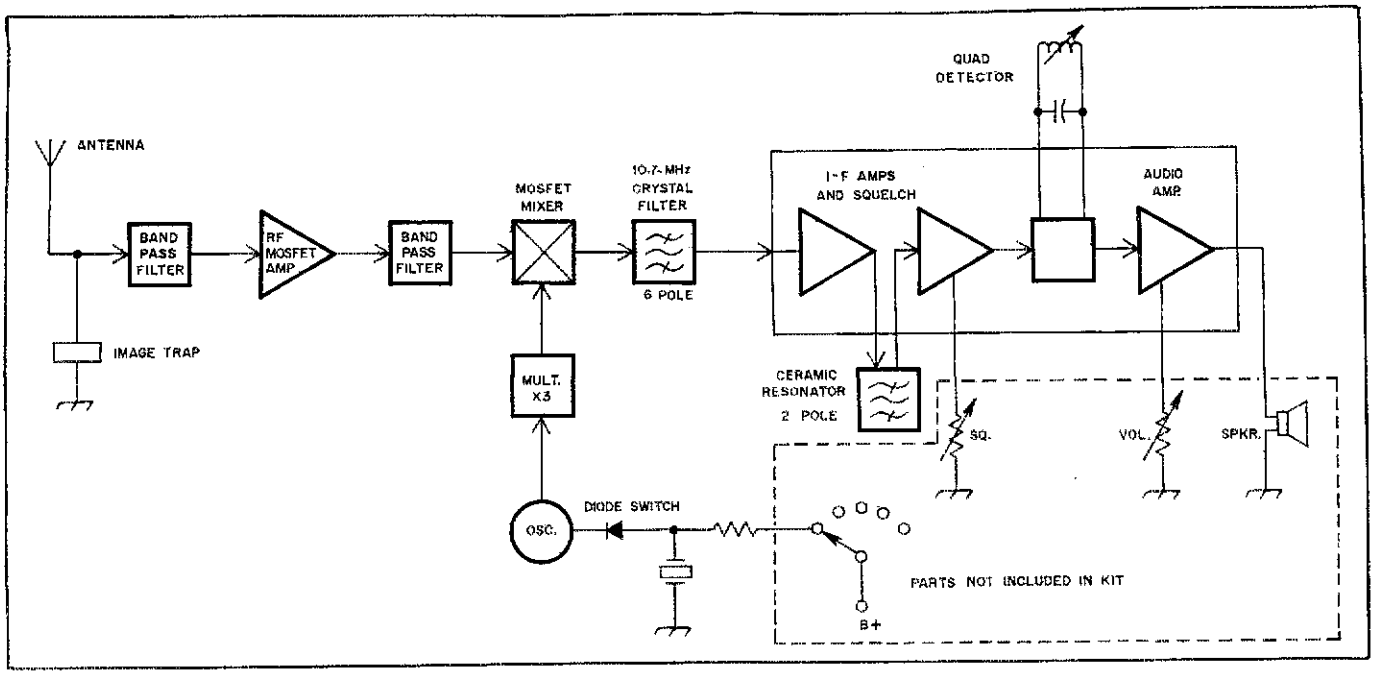


Fig. 1 — Block diagram of the ESP VHF 144-5A 2-meter fm receiver kit. Stages located inside the solid-line box are integral parts of the Plessey IC. (See text.)

See the block diagram accompanying this review for a general view of the entire receiver circuit.

Construction of the VHF 144-5A kit was a fairly simple matter — not like a Heathkit, but still fairly straightforward. A large parts-placement diagram was included with the instruction manual, which was accompanied by an extensive errata sheet. It took this reviewer a good half hour to make all the necessary changes in the manual, but once these were completed the assembly was finished in rather short order — one evening, to be exact.

The entire receiver assembly, contained on one pc board, isn't much larger than that you might find in a pocket transistor radio. The two MOSFETs were supplied with ferrite beads for use on the drain and gate-2 leads. One crystal is supplied with the kit. The one in the review sample was 45.4133 MHz (for 146.94 MHz). Electronic Signal Products claims a sensitivity of 0.12 μV for 13 dB SINAD. Although we could not verify this specific claim in the ARRL lab, we were able to obtain about 20 dB of quieting with 0.15-μV signal input. The finished receiver has a reasonable amount of audio. That audio sounds crisp, not muffled. If a dedicated monitor for 2-meter fm interests you, perhaps this product will fill the bill. ESP also makes the receiver kit in 28-, 50-, 220- and 440-MHz versions. — *Jim Bartlett, KITX*

DATA PRECISION MODEL 938 DIGITAL CAPACITANCE METER

When the Product Review editor asked me, "How about doing the review on the Data Precision 938 capacitance meter?", I practically wrenched the unit from his hands! Not only was I interested in the circuit of this 3-1/2 digit meter, I had a selfish motivation: I could finally test and grade out those unmarked and used capacitors I'd been hoarding in my workshop for many years. If that sounds familiar, then perhaps the model 938 is just what you've been looking for.

First off, the instrument has eight range scales to permit full-scale values from 200 pF to 2000 μF in decade steps. There are corresponding resolutions from 0.1 pF to 1 μF — hence the usable range is actually from 0.1 pF to 1999 μF. Certainly, that should handle most any practical assignment in the modern ham workshop.

Accuracy is rated for one year at ± 0.1 percent reading + one digit + 0.5 pF, with the exception of ± 1 percent reading + one digit on the 2000-μF range. Furthermore, the tester is protected by means of a 0.25-ampere fuse against input-current overloads.

Readout is accomplished by easy-to-read 0.5-inch (13-mm) LCD (liquid-crystal display) digits. An external thumbwheel control permits quick calibration of the instrument for accuracy under various operating conditions, such as with stray capacitances. An internal calibration trimmer can be used to set the unit accurately over all of the ranges.

How It Works

The circuit contains a dual-slope analog-to-digital converter which digitizes the ratio of the change in charge to the change in voltage of a given capacitor. The charge reduction is accomplished through connection to a circuit that permits current to flow. This current is averaged over an integral number of cycles as a measure of that value of the change in charge. The voltage differential between the values across the capacitor at the start and end of the discharge cycle is the denominator in the ratio measurement. The A/D converter develops the digitized value of this ratio and presents it in the liquid-crystal display. Fig. 2 illustrates the principle under discussion. During capacitance tests, a maximum of 2.8 volts of internally derived excitation is applied to the component under test.

Operating power for the tester can be obtained from an internal 9-V battery or by means of an external ac-operated supply which plugs into the case of the tester. When the operating voltage drops below the critical level

Data Precision Model 938
Digital Capacitance Meter

Specifications

Size (HWD): 1.5 × 3.5 × 6.75 inches (38 × 89 × 170 mm).
Power requirements: 9 V dc, battery or battery eliminator.
Battery life: Approximately 200 hours on an alkaline unit and 100 hours on a carbon-zinc type.
Reading rate: 2.0 readings per second.
Case: High-impact plastic.
Color: Three-tone brown.
Price class: $150.
Manufacturer: Data Precision Corporation, Electronics Ave., Danvers Industrial Park, Danvers, MA 01923.

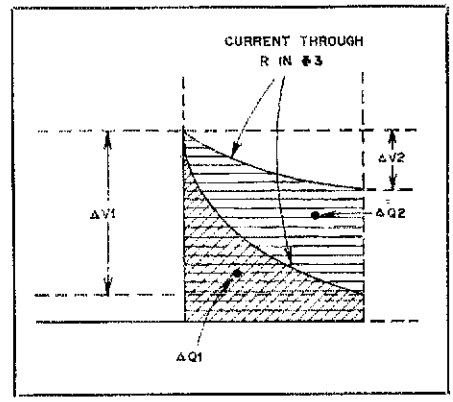
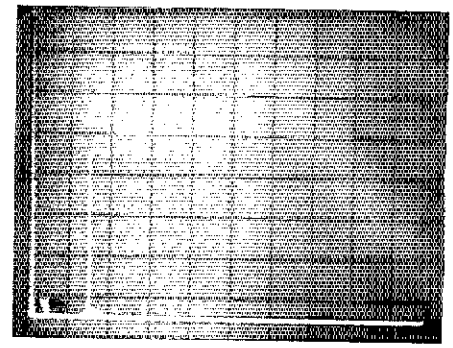


Fig. 2 — Relationship of capacitance to the change of charge and change of voltage. Φ3 indicates that phase of signal conditioning in the tester during which the capacitor under test (CT) is discharged through a range-selected resistor. The resulting current is averaged over a number of cycles of this interval and converted into a voltage by an RC filter in the tester circuitry.

The Data Precision Model 938 digital capacitance meter. It's probably one of the handiest pieces of test equipment you'd want to own!



Spectrum analyzer display of the NDI HC1400 transmitter output. Vertical divisions are each 10 dB; horizontal divisions are each 100 MHz. The pip near the left side of the photo is the fundamental which is attenuated approximately 33 dB by a notch filter to prevent analyzer overload distortion. The second harmonic is just visible at about 72 dB below the unnotched fundamental. The NDI HC1400 complies with current FCC regulations regarding spectral purity. All tests were made in the ARRL lab.

(7 V), the LCD display reads LO BAT to indicate that approximately 20 percent of the battery life remains.

Apart from determining the capacitance values of unmarked capacitors, one should find the tester especially valuable when selecting matched values of capacitance for a critical circuit such as a filter. Tests can be performed also to grade out defective capacitors and test new ones before placing them in the storage bin. Not only has the '938 been extremely useful to me since it's been in my care, I have found it to be a real "fun" gadget to use in measuring the capacitances of various objects which weren't intended to be capacitors, such as lengths of coax cable, twisted wires (gimmick capacitors) and the like. — *Doug DeMaw, W1FB*

NDI HC-1400 2-METER TRANSCEIVER

"Impressive" is an adjective which aptly describes the NDI HC-1400 2-meter transceiver. The exterior appearance of the ruggedly built unit reassures you that the PLL/CPU-controlled unit is a capable performer. The '1400 boasts such features as dual-speed tuning, selectable 25/5-watt power-output levels, full four megahertz/800-channel coverage, selectable +5-kHz shift, three memories and a unique additional memory feature, CROSS operation, which bestows virtually unlimited flexibility upon the '1400. More on that later.

Mechanical Features

The physical construction of the HC-1400 defies abuse. Blue-toned, heavy-gauge, die-formed metal covers protect the interior circuit components and are easily removed for complete access to the innards. The companion mobile mounting bracket permits quick and easy removal of the transceiver through use of mating side-mounted slide brackets that make positioning the unit a "breeze." Two large, knurled knobs lock the radio securely in place. A fold-down leg assembly provides comfortable access to the front panel controls during fixed station operation. The six-pin microphone connector is keyed to prevent misalignment and accepts a screw-on mating plug. The rear panel sports a finned heat sink, SO-239 antenna receptacle, external speaker jack, two-pronged power input connector, and a five-pin DIN jack for accessory connections.

Front panel appearance is uncluttered and efficient, with all frequency-determining controls within finger reach of the main tuning knob. An easy-to-read "S-RFO" meter provides incoming signal strength and relative power output indications. A 10-dB rf attenuator may be switched in by simply pulling out on the squelch knob furnishing front-end protection from overload under strong signal conditions.

Frequency Selection and Display

The operating frequency of the HC-1400 is indicated by three LED displays. The "tens" and "hundreds" of MHz are not shown, thus simplifying the display; it is assumed we *know* we are operating in the 144- to 148-MHz spectrum! In this case, 146.88 MHz would be displayed as "6.88" on the three readouts. If +5 kHz is selected by the associated push-button, it is so indicated by a separate LED provided for that purpose at the bottom right of the frequency display panel.

There is no stop on the main tuning knob since it is not an ordinary rotary switch but the photo-interrupter/opto-isolator type of selector in use in other equipment of this type reviewed earlier in *QST*.[1] Once the upper band limit at 147.99 MHz is reached, the unit automatically returns to the lower band edge at 144.00 MHz, and vice versa. The '1400 is programmed to prevent transmission out of band under any circumstances.

Memory Operation

As mentioned earlier, two types of memories are employed in the HC-1400 — standard and CROSS. Each will be discussed separately. The three standard memories are an asset to quick and/or frequent repeater changes. Three favorite repeater frequencies may be stored and recalled for use simply by touching the appropriate memory selection button. With the exception noted under the description of the CROSS memory function, the initial storing of the repeater frequency is accomplished as follows. The receive frequency (repeater output frequency) is first dialed up. Next, the STORE button is depressed and its activation noted by the related LED. Then, any of the three memory buttons is depressed. Storage and selection of the appropriate memory is indicated by a flashing LED above the memory button. The STORE function may be cleared by a second depression of the STORE button. All three memories may be selected, used and altered at random. Any memorized frequencies will be retained as long as an active dc voltage source is connected to the transceiver whether or not it's turned on — a small memory retention current is drawn from the supply even when the transceiver is switched off. If either the power plug is removed or an ac-operated supply is switched off, the memories will be lost. Any time the unit is turned on after dc power loss, the display will show "5.00."

CROSS Operation

Some discussion of CROSS operation is necessary. An addendum to the original operating manual provides further clarification of this memory usage. Under normal operating conditions with the transmitter offset switch in

[1]Notes appear on page 54.

The NDI '1400 is shown here with the optional RM1400TT microphone. The frequency-changing buttons can be seen at the right-hand side of the microphone. The tactile Touch-Tone pad is on the rear of the microphone and not visible in this photograph.

NDI HC-1400 2-Meter 3-Channel Memory Transceiver

	Claimed by Manufacturer	*Measured in ARRL Lab*
Power output (at 13.8 V):	25 W (high) 5 W (low)	30 W (high) 1 to 25 W (low) (see text)
Spurious radiation:	−60 dB	−73 dB or greater
Harmonic radiation:	−60 dB	−72 dB
Maximum current drain at 13.8 V dc:	5.5 A (tx)	5.3 A (tx)

Size (HWD): 7-1/8 × 2-1/2 × 10-1/8 in. (182 × 66 × 258 mm)
Weight: 7-1/2 pounds (3.4 kg)
Price class: $385
Importer: ND International, Inc., 22125-1/2 S. Vermont Ave., Torrance, CA 90502

NORMAL, the '1400 transmits 600 kHz *higher* than the receive frequency *above* 147 MHz and 600 kHz *lower* than the receive frequency *below* 147 MHz; the opposite is true with the offset switch in the REVERSE position. There is one "catch" to frequency selection, however, in that a reverse-split (transmitting 600 kHz *lower* than the receive frequency *above* 147 MHz) cannot be made by simply flipping the offset switch to REVERSE. This is where the CROSS memory comes into play. To work a reverse-split, the offset switch is placed in the SIMPLEX position, the transmit frequency chosen on the dial and the CROSS button depressed. This stores the transmit frequency in the CROSS memory. Next, the receive frequency is selected. When the mic button is pressed, the stored transmit frequency should be displayed. Shifting the offset switch from SIMPLEX to either NORMAL or REVERSE positions erases the memory. This will also occur if the dc power source is removed from the transceiver as described earlier. Note that the CROSS memory may be utilized for any type of "odd-ball" split no matter how wide the frequency difference between transmit and receive frequencies. The data of the CROSS memory cannot be entered into any of the other three memories.

The Microphones

With the optional HC-1400TT microphone, shown in the accompanying photo, the operator has frequency-changing capabilities and a Touch-Tone pad literally at his or her fingertips. The front of the mic has an array of three push-button switches which control up/down and 10/100-kHz steps of frequency shift. The transceiver 10/100-kHz switch on the front panel should be placed in the 10-kHz position (button out) to enable proper use of the mic. To increase the frequency in 10-kHz steps, the top button is depressed. Constant pressure permits the transceiver to keep advancing. To decrease frequency, the lowest button is pushed. This results in 10-kHz decrements of frequency. If quicker frequency changing is required, 100-kHz steps may be taken by depressing the middle button in conjunction with either the upper or lower button. The procedure takes longer to explain than it does to perform! In no instance did the presence of the buttons cause inadvertent frequency changes during operation. You'd really have to be "ham-handed" to botch it up here.

The rear of the '1400TT contains the Touch-Tone pad. This is a tactile pad which keys the transceiver without the need for squeezing the PTT lever.

It should be noted that in order to use the optional Touch-Tone mic, a small amount of "surgery" must be performed on the microphone connector. This involves the rearrangement of a couple of wires. Once this is done, however, the standard mic cannot be used without reverting to the original wiring configuration. The audio response of the optional '1400TT mic is of good communications quality. Reports received while using the standard microphone revealed that it had a somewhat better response — described as "more hi-fi."

Performance

The receiver sensitivity could not be measured in the ARRL lab because of test equipment outage, but the performance suggests that the manufacturer's claims are accurate. No intermod problems were encountered and the receiver performed excellently. Although the audio output is plentiful, in situations where the unit must be mounted in awkward places (i.e., far from the operator), an external speaker may be plugged in and conveniently located to overcome road noises encountered while mobile.

Tests performed in the ARRL lab while feeding a dummy load showed the high-power position provided a maximum output of 34 watts as measured on a Bird model 43 wattmeter while using a 14.5-V dc input source. At the rated 13.8-V dc input, the power output was 30 watts — a comfortable margin above the manufacturer's rating of 25 watts. The low-power position yielded outputs from 1.5 watts to 25 watts dependent upon the setting of the internal adjustment pot. A spectral display of the transmitter output is shown in the accompanying photo. The VSWR protection circuit *is* effective — and protective. This was proved on two occasions. Once the transmission line braid connection on the PL-259 connector broke. Naturally the transmitter keyed "funny," but once the faulty connection was repaired, normal operation continued. No final-amplifier transistor damage resulted. Some time later, it was noticed that the output meter wasn't indicating proper output level. Since no difficulty was being encountered in accessing the local repeaters, we weren't overly concerned. When we finally got around to investigating the problem, we discovered that a section of the 5/8-λ whip on the roof of the car had loosened (probably from hitting the garage door once too often!). Once tightened, the meter indication returned to normal. A check in the lab proved the heart of the '1400 was still beating soundly — again with no transistor damage. That kind of performance is better than an insurance policy!

Some difficulties were encountered during the review period. In areas of high ambient light, it was almost impossible to read the LED display. Many times, the sunlight would obliterate the display and it was necessary to shade the panel area in order to read the frequency being used or sought. This is, however, not unique to this unit.

Another disturbance concerned an intermittent problem which caused the transceiver T-R relay to buzz and rendered the unit temporarily inoperative. When the factory was notified of this problem, they suggested tightening a particular pc-board mounting screw at the rear of the board near the T-R relay. This problem had been noted with a couple of other units, we were informed, and although the screw was only slightly loose, tightening it resolved the chattering once and for all.

Very infrequently, after the dc input source had been removed, the transceiver frequency display would show alpha-numerics instead of the proper "5.00" indication when initially turned on. It was discovered that the only way to restore normal operation was to again remove the dc source until the problem cleared. We discussed this with the importer who verified our findings, explaining that this was due to the clock in the CPU getting out of step. Again, this only occurred after the dc source was removed from the transceiver entirely, such as when taking it from the car to the house or shutting down an ac operated supply.

When the optional mic was installed, we were troubled by a poor ground connection between the mic cable and the transceiver. Since all six pins of the connector are used for various functions, the ground return is made

through the shell of the mic connector. To eliminate this intermittent ground, it was necessary to file a flat on the Bakelite body to allow passage of the mic cord braid up to the ring of the plug. This created a tight fit between the connector body and the shell and ensured good grounding.[2]

The NDI 1400 was a pleasant companion. When it is returned to the importer, this reviewer will miss the convenience of the memory functions most of all. After having been absent from 2-meter operation for some time, the novelty of having a 2-meter transceiver with all the "bells and whistles" on it was thoroughly enjoyed. The NDI HC-1400 is destined to be a tough contender for a share of the amateur 2-meter fm market. — *Paul K. Pagel, N1FB*

Notes

[1]Bartlett, "Yaesu CPU-2500RK 2-Meter FM Transceiver," *QST*, September 1979.

[2]The manufacturer has added a washer to the mic connector on current production models to provide a tighter fit and eliminate the possibility of a faulty ground.

New Books

[ ] *Handbook of Electronic Communication*, by Gary M. Miller. Published by Prentice-Hall, Inc., Englewood Cliffs, NJ 07632. Hard cover, 9-1/2 × 7-1/4 inches, 338 pages, $14.95.

This text is aimed not only at amateurs, but anyone who is presently working in the field of electronics and those who have a need or desire to know more about communications basics. Beginning with a discussion of noise and bandwidth, the nine chapters cover amplitude modulation, single sideband, fm, communications techniques, digital communications, and television. These are followed by another section devoted to questions and problems involving the information presented in each chapter, thereby giving the reader a chance to test his comprehension. Each chapter is liberally sprinkled with drawings, graphs, charts, oscilloscope displays and photographs which provide a welcome enhancement of the material presented. Various analyses requiring mathematical description are handled in a straightforward, easy-to-follow manner. The book may also be used as a ready source of "refresher" material. There are even some circuits which may be transformed into working models following the data given in the text. These may prove of interest to the experimentally inclined reader. — *Paul K. Pagel, N1FB*

[ ] *Owner Repair of Amateur Radio Equipment*, by Frank W. Glass, 2nd edition. Published by RQ Service Center, 14910 Los Gatos Blvd., Los Gatos, CA 95030. Soft cover, 8-1/2 × 11 inches, 71 pages, $7.95 plus 75 cents shipping.

When gathering the various pieces of equipment together to furnish a station, most amateurs attempt to make their dollars stretch as far as they will go. But "the buck doesn't stop here" — or maybe we should say, the *outlay* doesn't stop here. Later additions, updating, and maintenance costs have to be considered as well. Maintaining and/or repairing the station equipment can be *very* expensive if it is done for you. One way to save here is to do it yourself. This not only has its reward in financial savings, but you'll also derive a great satisfaction from doing your own repairs and learning something along the way. This book is geared toward the average amateur to help him do just these things. It starts out describing the individual components used in radio equipment and their functions. The following servicing chapters are divided into various sections — power supply, audio, receivers, transmitters, transceivers and antennas. The servicing chapters are broken down into six different steps: functions, limitations, failure modes, troubleshooting tips, component replacement and checkout. Digital servicing, safety and test equipment chapters follow. The publication reviewed was the second printing, which included supplemental information covering the reading of schematic diagrams and testing of components which make up the station. Helpful hints and pictorial diagrams clarify each procedure. While the pictorials had the appearance of being hand-drawn, this did not detract from the usefulness they provided. The only piece of test equipment it is assumed the repairer has is either a VOM or VTVM. The author has stated that he believes this is all that is needed to solve 80 to 90 percent of equipment problems. The price of the book is about one-third the hourly charge for repairs today. With this manual in hand, you might think twice before shipping your ailing rig to the repair shop. — *Paul K. Pagel, N1FB*

Strays

BE SAFE — NOT SORRY!

[ ] Two recent incidents show that safety must be a prime factor to be considered when working on antennas. As Edmond (Chip) Schoenherr, VE3JLL, of Metcalfe, ON, was climbing down a tree after checking his antenna and coax, the safety belt he had been using gave way when he was about 15 feet from the ground. He hugged the tree for dear life and slid down to the ground. A torn shirt and scrapes and burns on his chest and arms were the result, but it could have been worse. He was using a borrowed safety belt and *assumed* that it was in good condition. In a second incident a Los Angeles area two-way radio dealer fell about 45 feet from an antenna tower and received serious injuries. He was using a surplus leather safety belt.

Most experienced climbers use nylon web strap belts. Some amateurs and commercial installers use surplus leather safety belts. These are subject to rot and cracking, which may be overlooked by the inexperienced climber. Nylon web belts cost about $125, a small investment when compared to injury, large medical bills or even death that could result from using a worn or damaged safety belt. (Thx *Rats Tales*.)

Heed the ARRL safety code: While there's no reason for you to be involved in a ham-related accident, that possibility always exists if you are not thinking safety. Following the ARRL safety code will make your ham experience more enjoyable. Read it and practice it.

1) Kill all power circuits completely before touching anything behind the panel or inside the chassis or the enclosure.

2) Never allow anyone else to switch the power on and off for you while you're working on equipment.

3) Don't troubleshoot in a transmitter when you're tired or sleepy.

4) Never adjust internal components by hand. Use special care when checking energized circuits.

5) Avoid bodily contact with grounded metal (racks, radiators) or damp floors when working on the transmitter.

6) Never wear headphones while working on gear.

7) Follow the rule of keeping one hand in your pocket.

8) Instruct members of your household how to turn the power off, and how to apply artificial respiration. Instruction sheets on the latest approved method of resuscitation can be obtained from your local Red Cross office.

9) If you must climb a tower to adjust an antenna, use a safety harness. Never work alone.

10) If you must climb into a tree, or work on a roof, remember that you're not standing on the ground. That first step down can be a very long and painful one. Never work alone.

11) Develop your own safety technique. *Take time to be careful. Death is permanent.*

Hints and Kinks

Conducted By Stuart Leland,* W1JEC

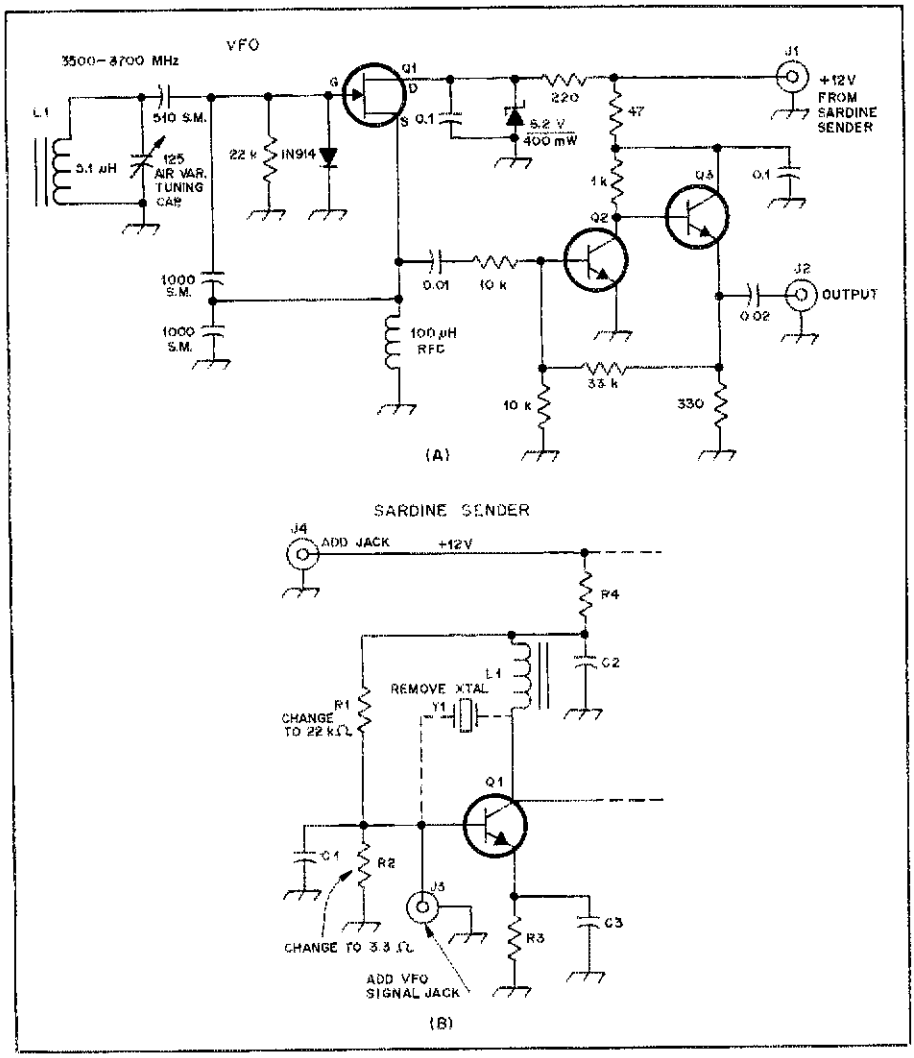
AN 80-METER VFO FOR THE SARDINE SENDER

When I received my October 1978 *QST*, the picture of the Sardine Sender caught my eye. After reading the article I decided to give it a whirl. A few days later, with a dummy load and a borrowed crystal, I gave the little rig the smoke test. To my surprise, it worked fine. It provided a half-watt of output. I was rewarded with an even greater surprise when VE3HKJ in Elora, ON, came back to me with a 589 report.

*Assistant Technical Editor, *QST*

The restriction of crystal control led me to constructing the VFO described in the ARRL publication *Solid State Design for the Radio Amateur*. Components are mounted on a piece of perforated board and housed in a salmon can (Should we now call this the "Salmon Solid Sender"?). When I first coupled the VFO to the Sardine Sender, the transmitter produced only 1/4 watt of output. To obtain more power from the Sardine Sender, I changed R1 from 47 kΩ to 22 kΩ and R3 from 220 ohms to just 3.3 ohms. These modifications, which change the first stage biasing, do not affect operation when using a crystal. I key the power to the VFO. There is no evidence of chirp or instability. I do notice that if the VFO is placed close to the transmitter, rf gets into the VFO, resulting in a raspy sounding cw note. Putting a top cover over the VFO, or placing the units a foot apart, solves the problem.

To date, I've worked 15 states and three provinces with QSLs received from most of the stations. The total investment in the Sardine Sender and VFO is $12. Not included is the price of the sardines and the luxurious salmon. After all shouldn't those be charged to the XYL's food budget? — *D. Richards, VE3IDS, Hepworth, ON*



The popular Sardine Sender (October 1978 QST) is no longer "rock bound," with the addition of this VFO. The configuration is taken from the ARRL publication *Solid State Design for the Radio Amateur*. Interconnection of the VFO and the Sardine Sender is accomplished by means of two short lengths of RG-174/U cable, or equivalent, with appropriate connectors for mating with coaxial jacks J1 through J4. J1 is connected to J4 and J2 to J3. Do not confuse these *new* jacks with those shown in the original Sardine Sender diagram (October 1978 *QST*). Resistances are in ohms. Capacitances are in picofarads except for decimal values which are in microfarads.

L1 — Type T-68-2 toroid core wound with 30 turns of no. 22 enameled wire.
Q1 — Motorola MPF102 JFET or equiv.
Q2, Q3 — Type 2N2222 general-purpose transistor or equiv.

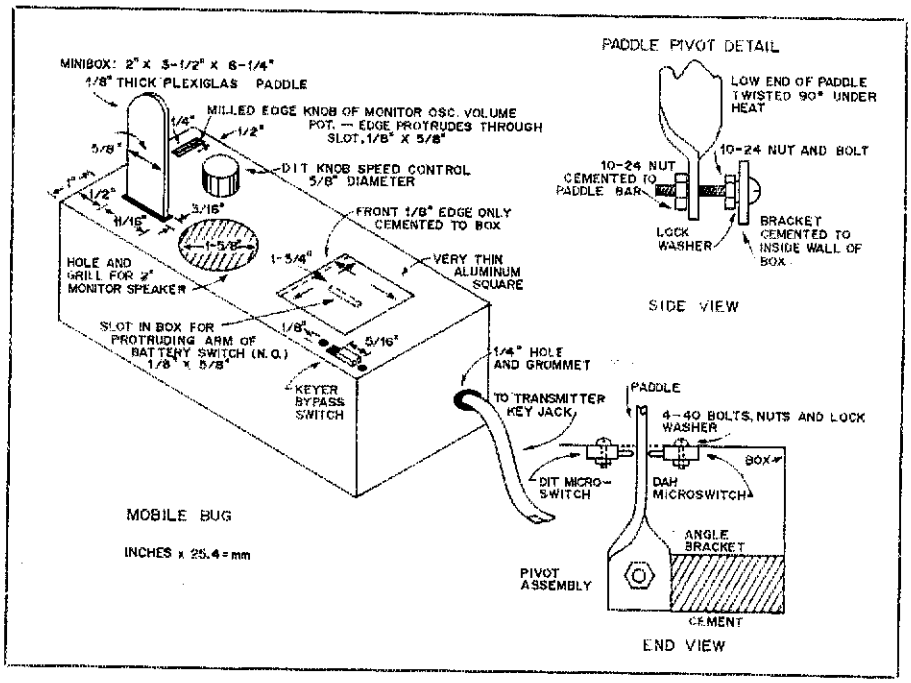
MOBILE CW AT 25 WPM

Mobile cw at 25 wpm or more is easy when the keyer is built so that the paddle extends vertically from the far end of the chassis-box surface. In this way, the heel of the keying hand, resting on the box, and the fingers that move the paddle remain in the same position relative to each other regardless of the tilt or slope of the surface or the stability of the support.

In practice, the keyer chassis box may be placed on a knee or on the resilient surface of a bench-type auto seat. The keyer, after a little use, is soon operated with precision at a good clip.

The pictured unit uses a paddle made of 1/8-inch (3-mm) Plexiglas. Width of the paddle is 5/8 inch (16 mm) and the length is 3-3/4 inches (95 mm). Two inches (51 mm) extend above the box surface. This length permits moving the keying thumb and fingers up and down the paddle and opposite or not, as desired, to achieve the most comfortable feel for keying by varying opposing pressures on the paddle and amount of travel for those digits. The bottom end of the paddle is drilled and twisted 90 degrees under soldering-iron heat so that it may be mounted and swiveled on the axis of a 2-inch (51-mm) 10-24 machine screw mounted rigidly inside the box. Contacts for both dits and dahs are common, small microswitches that are mounted carefully on the underside of the box surface at the sides of the hole through which the paddle passes. Several mountings, made from furniture-type brass angle brackets (1-1/2-inch or 38-mm size) are used to mount the interior components of the keyer. These brackets may be soldered using a technique for soldering to aluminum, or they may be secured to the chassis with the aid of a glue gun and thermal gluing sticks.

Any of a variety of electronic-keyer circuits may be used for such a keyer. The useful "kink" is the paddle positioning in construction. In operation, this prototype keyer performs in a manner comparable to the "Bug." It provides automatic dits and solid-keyed dahs. A 555 IC timer serves as the dit generator while another 555 af tone generator operates as the keying monitor. Both are based on designs in "Simple Electronic Keyers," *Ham Radio* magazine for March 1973, page 38. Controls for varying the dit speed and for adjustment of audio volume (a means of minimizing battery drain) are visible on the box surface as is the



K6TP enjoys operating mobile cw with a keyer enclosed as shown in this illustration. It can be placed on his knee or on a bench-type seat in a car. The device is also suited for use in a boat, airplane or wherever the classic "arm-on-the-table-top" position for keying is impossible. The heel of the keying hand rests on the 1-3/4 inch square pad allowing easy finger manipulation of the vertical paddle. Weight of the hand on the pad activates an internally mounted power switch. Inches x 25.4 = mm.

face cover of the 2-inch monitor speaker.

One 9-volt battery has a good life span in this keyer, but a normally open microswitch beneath a pressure plate is used as a precaution against unnecessary current drain. When the heel of the keying hand rests on this plate, the switch is closed. The battery is connected only as long as the hand is there.

If the 9-V battery ever expires in the field, far from a source of replacement, a small dpdt switch on the box will switch the dah side of the paddle directly across the keyed line to keep the unit in operation. A small relay seems preferable to a keying transistor since stray rf affected the transistor in initial trials. — *Robert F. Franklin, K6TP, San Francisco, CA*

ON UPGRADING YOUR SB-220 LINEAR AMPLIFIER

☐ As far as "surge protection" is concerned, I find some fault with the subject article on page 20 of the February 1979 *QST*. The instructions in the article may be proper for 117-V operation but not for 230-V use. [Editor's Note: See Feedback in April 1979 *QST*.]

After completing the wiring and the installation of the relay, the test run would not produce the results described in the article. A dull-red filament color is supposed to be followed by full brightness after the time delay pulls in. I could detect no difference in color before or after pull in.

I discussed the difficulty with WBØTAQ who pointed out what he thought was a strong possibility. He was right. Because of the added resistance (the 100-ohm resistor) between points C and F, the current apparently was dividing at C and most of it was going to point E via point D and the lower-resistance leg. Points C and D are actually terminals 2 and 3 of terminal strip AE as shown in the manual. These are connected together for 230-V operation, whereas Fig. 1 of the magazine article shows all the transformer primaries connected for 117-V operation. The solution of the problem is to break the common connection between filament and high-voltage transformer windings at points C and D as illustrated by X in the drawing.

To implement Dave's suggestion, I rearranged the filament transformer wiring as follows. If future 117-V operation is contemplated, the original wiring must be replaced. See the accompanying diagram.

1) Remove the black-green lead from terminal 3 of strip AE.

2) Remove the black-yellow lead from the connector at terminal 3 of the mode switch.

3) Solder a lead to relay coil terminal B.

4) Twist together, solder and tape the free end of the relay lead and the two transformer leads referred to in steps 1, 2 and 3.

5) Remove from the multiple connector AW, the black lead extending from grommet AK.

6) Connect the lead in step 5 to one end of R (a 200-ohm, 50-watt resistor). Don't solder yet. You probably will have to splice this lead to obtain sufficient length.

7) Connect a lead from the same end of resistor R as in step 6 (now solder both leads) to relay terminal no. 4. Solder.

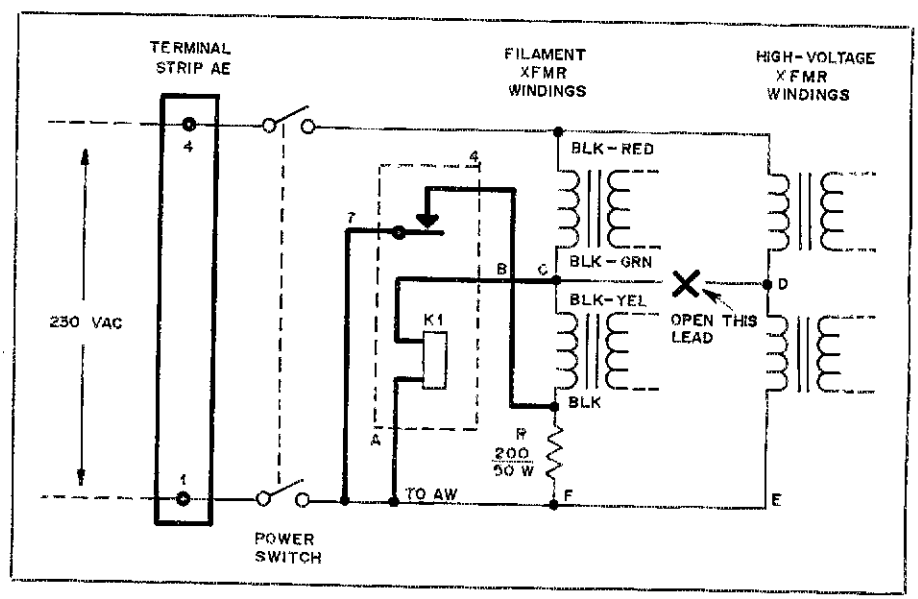
8) Connect and solder a lead from relay terminals no. 7 and A to the other end of resistor R. Don't solder yet.

9) Connect a lead from the same end of resistor R as in step 8 (now solder both leads) to connector AW. Solder.

This wiring arrangement places a 200-ohm, 50-watt resistor and both halves of the filament transformer primary in series across the 230-V line, places the relay coil across one filament winding for 117-V operation and arranges the relay terminals to short out the resistor. Most important, however, is the elimination of the common connection between filament and high-voltage windings at terminal strip AE. This ensures that all filament-transformer primary current will flow through the resistor to produce the required initial voltage drop. Of course, it is necessary to double the resistance value to 200 ohms when operating from 230 V. This method produces approximately a 100-V drop across the resistor until the relay pulls in and provides the surge protection objective. — *Fred G. Alden, W8JTD, Colorado Springs, CO*

☐ In the July 1979 *QST*, Pete Marsh, W3MJ, had a great idea about inrush-current protection for 3-500Z tubes. My alternative to that

W8JTD uses this method of providing surge protection for his SB-220 linear amplifier. Note that the circuit is arranged to handle 230 V ac at the input. K1 is a dpdt 10-A time-delay relay (see page 20, February 1979 *QST*).



arrangement is to place a Workman type FR191 Globar resistor in each leg of the 230-V ac line or in one leg of the 117-V ac line where the lower line voltage is used. The FR191 has a cold resistance of 120 ohms. Each thermistor I use is mounted on a two-lug terminal strip. For the sake of cooling, the Globar leads are not trimmed. So far, I have not lost a diode in the power supply.

My hf amplifier, employing a pair of Eimac 4-400As, is protected with a Globar in the ac line to the primary of the filament transformer. The filaments come slowly up to a nice glow with no apparent drop in voltage after a few seconds. — *Joel Olsen, WBØTTW*

RECEIVING SHIP AND SHORE RADIOTELEGRAPH ON THE KENWOOD R-300

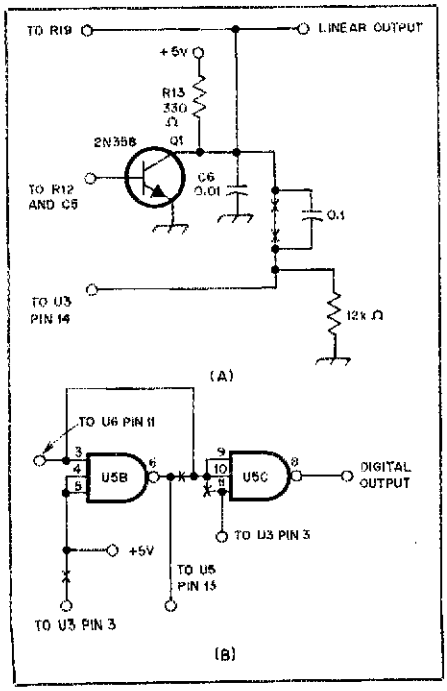
The Kenwood R-300 general coverage receiver covers from 170 kHz to 30 MHz in six bands. However, Band A stops at 410 kHz and Band B begins at 525 kHz, leaving a gap from 410 to 525 kHz. I wanted to copy the ship and shore radiotelegraph stations on 500 kHz, the international calling and distress frequency. Therefore, I looked for a simple modification but found that none was needed. The receiver is furnished with a 500-kHz marker and all you have to do is tune to the bottom of Band B, activate the 500-kHz marker, then tune the bandspread down to approximately number 10. With the marker in, you can then tune the R-300 to exactly 500 kHz. — *Ed Hayden, K3OKL, Hayden Associates, Washington, DC*

THOUGHTS ON THE CW FILTER-LIMITER

Here are some hints on "The CW Filter-Limiter" (January 1979 *QST*) furnished us by Milton Trzaska, WA2QIQ. Some builders have reported a steady tone at the digital output of the filter even when a cw signal was not present at the input. This appears to be caused by an excessive voltage present at pin 14 of U3, caused by manufacturing variations in Q1. To correct this problem, a 0.1-μF capacitor should be inserted in series with the lead coming from C6 and going to pin 14 of U3. Also, a 12-kΩ resistor should be added from pin 14 of U3 to ground.

The builder also might have noticed that the digital output signal is *not* a pure 1-kHz tone, but rather a modulated signal. If a pure 1-kHz signal is desired, the wiring changes shown in the accompanying diagram can be incorporated. — *Garry F. Bartels, WB1CPM*

Modifications for the CW Filter-Limiter. Shown at A are the changes needed to prevent false triggering of the VCO. The changes shown at B will allow a pure 1-kHz tone at the digital output, rather than a modulated signal.



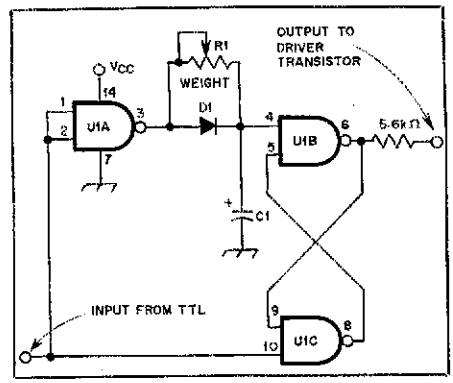
IDEAS FOR THE HD-1410 AND OTHER KEYERS

As I saw the description of the weight control in January 1979 "Hints and Kinks" written by Hardy Landskov, N7RT, it seemed odd to me after years of IC keyers being built, that there should be two ideas along the same line. I refer to changing the weight of the cw signal after it has been generated.

I've been using the following circuit in my Microlog keyboard for eight months now with good results. It also has been used in several Accu-Keyers. Like Mr. Landskov's circuit, mine should be readily adaptable to any keyer using the 7400 TTL series of ICs, including the popular Heathkit HD-1410.

The timing capacitor can be as high as 15 μF for slower operators, but should be 6 to 8 μF for QRQ amateurs. This allows the control to work across the full rotation. Also, the potentiometer should be linear and no more than 1 kΩ in value. The sidetone keying can be taken from pins 11 and applied to Z3 pin 4 in the Microlog keyboard. I don't do this, however, because I prefer the transceiver sidetone. U1C is added to the circuit for proper square-wave keying.

My weight control is not built on a pc board, but nevertheless it's a great performer, is inexpensive, and is easy to build and install. There are four wires to the keyers: +5 V, ground, input and output. As Mr. Landskov did, I removed the appropriate resistor, using the holes for the in-out wires. In the Microlog keyboard, the resistor is R14 or R12, depending on the keying output used. In the Accu-Keyer it is R8. I should point out that this circuit does not affect the speed or normal weight, but can only make the weight lighter if desired. — *Robert Heydt, W3BF, Mertztown, PA*



Electronic weight-control circuit with W3BF's Microlog keyboard. [Editor's Note: To modify the Microlog or the HD-1410 keyer for weight-adjustment control of positive or negative keying, write to the ARRL Technical Department for the W3BF modification. Include an s.a.s.e. This information arrived too late for inclusion here.]

C1 — 15-μF capacitor for up to 40 wpm; 6 to 8 μF for up to 100 wpm.
D1 — 1N914 or equiv.
R1 — 1-kΩ linear-taper potentiometer.
U1 — Type 7400 quadruple two-input NAND gate.

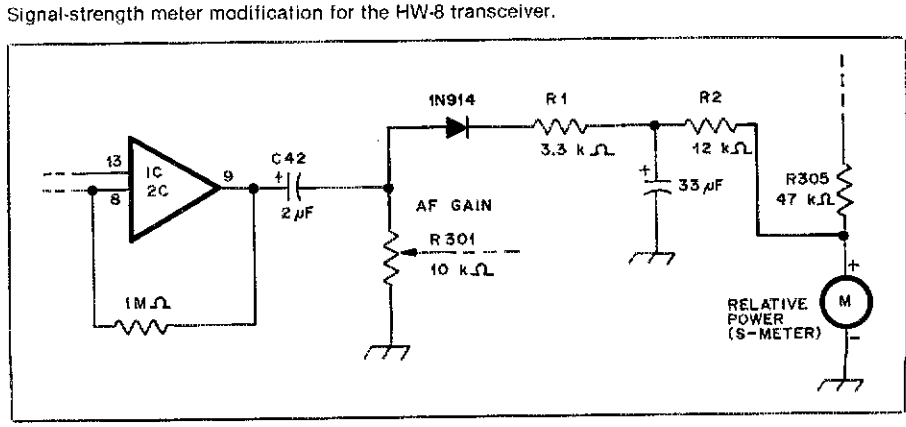
☐ For the Heathkit HD-1410 electronic keyer, owners who have new solid-state transceivers that cannot be normally keyed with this unit, place a jumper across D5 and another across R27, and the problem is solved. This modification was provided for me by the Heath company. It works fine with my new FT-101ZD. — *Bob Pecot, WB5RWM, Ennis, TX*

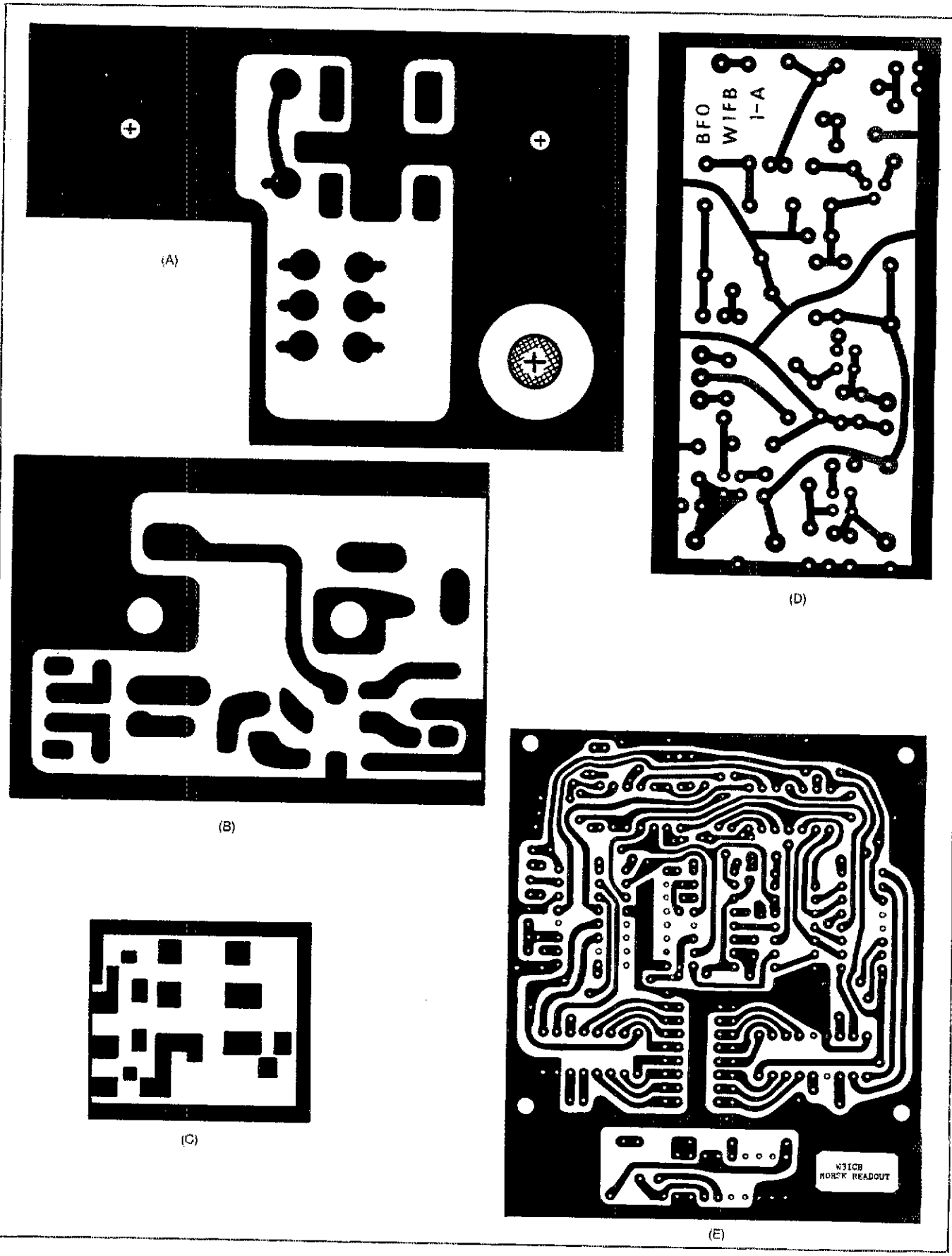
AN S METER FOR THE HEATH HW-8

In my experience, I've found the HW-8 an excellent little QRP rig. Because in the original form, this set lacks an S meter, I made the following modification which may be of interest to other HW-8 owners.

The circuit shown in the accompanying drawing is connected directly to the existing relative power meter, allowing it to function as a relative signal-strength meter in the receive mode. The modification does not affect the operation of the meter in the transmit mode. A value of 12 kΩ for R2 was selected to bring the meter near full scale when receiving the strongest signals. Varying the value of the capacitor will vary the damping action of the meter. Now there is nothing lacking for relative signal reports! — *Kenneth W. Watters, WB7OVJ, Bellevue, WA*

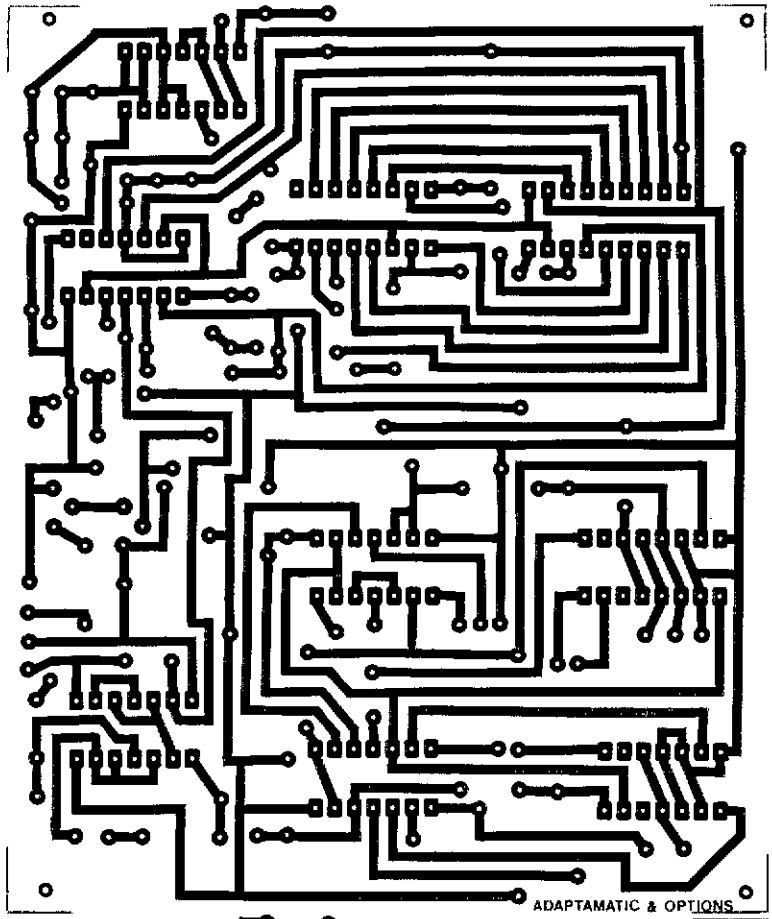
Signal-strength meter modification for the HW-8 transceiver.



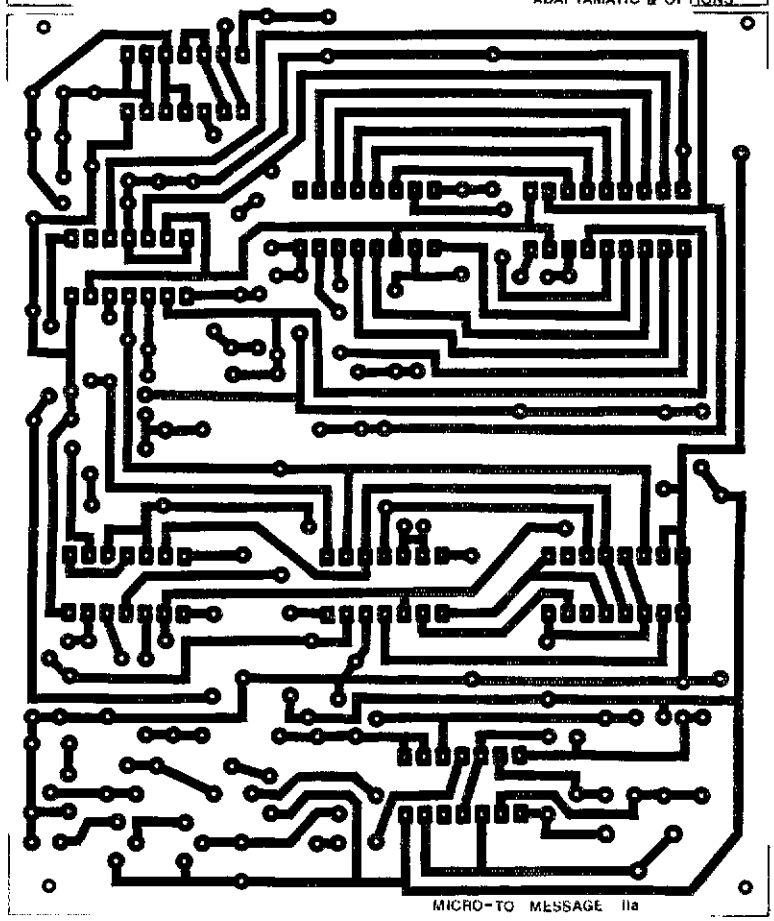


Circuit board etching patterns for projects in this issue of *QST*. Patterns are shown at actual size from the etched side of the board; black represents copper. Those at A through C are for the operating impedance bridge (see page 11 of this issue), and are for the bridge-circuit switch board, the null detector board, detector board and the bridge-circuit component board, respectively. The large hole in the lower right portion of the bridge-circuit switch board is for the mounting of R_A. The large centrally located holes in the null detector board are for the meter studs; their size and spacing will depend on the meter used. The pattern at D is for the three-oscillator BFO (see Fig. 2, page 31 of this issue, while that at E is for the digital-display Morse readout (see Fig. 2, page 35 of this issue).

(F)



(G)



Circuit board etching patterns (continued). These two patterns are for the Adaptamatic Keyer with options (at F) and for the Micro-TO Message Keyer IIA (at G). See Figs. 1 and 2 of the article beginning on page 42.

WAS Minus One

A resolute ham sets his sights higher after a struggle for WAS that lasted two decades.

By John Gilbert,* VE3CXL

On June 26, 1955, with the ink barely dry on my amateur ticket, I loaded up an old converted Command set to its full 60 watts and carefully called W4GKW DE VE3BOH. Back he came with a 599; I had worked my first state! I reasoned that if I could work one state, I could work them all. Gradually, the total mounted from 10 to 20 to 40 states. I finally had all but one state — Utah.

At this point, my employer decided that my services could be put to better use in Resolute Bay, Northwest Territories. Armed with a new call (VE8OW), a new DX100 (yes, they were once new) and a noise-free QTH, I renewed the search for states. Three months later, with occasional breaks for work, food and sleep, I had filled two log books and stuffed a shoe box with QSL cards. But I was still one state short of WAS — Utah.

Fate Strikes

In two weeks, I was to be transferred to Eureka, NT, 50 miles beyond the 25-mile limit allowed for WAS credits. I had 14 days to contact Utah! Dozens of sympathetic hams combed the bands in search of a Utah station to arrange a sked with me, but to no avail. The week before the move to Eureka, fate struck the final blow. An ionospheric storm had caused a complete radio blackout, short-circuiting WAS attempt number two.

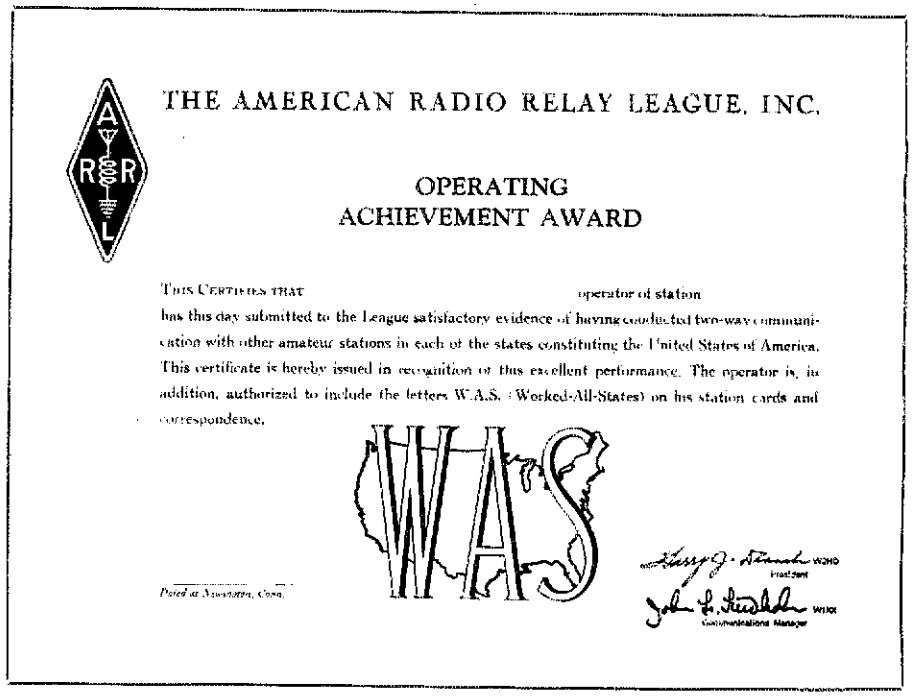
After settling in Eureka and erecting 2000 feet of copperweld wire shaped in the form of multiple V-beams up in the air where it belonged, WAS attempt number three began in earnest. More log books stacked up. More shoe boxes filled with QSLs, many of them stained with tears of joy ("My *first* Zone 2; the *only* VE8 worked in 30 years!"). Still, there was no trace of Utah.

I made one more halfhearted attempt at WAS in the late '50s as VE3BOH from

The ARRL Worked All States (WAS) Award

The WAS award is available to all amateurs worldwide. To earn this award two-way communications must be established with each U.S. state. ARRL Operating Aid CD-217 (free of charge from ARRL hq.) provides details and information on fees, along with a convenient application form.

WAS endorsements are available for particular bands or modes — all cw, all phone, QRP (10 watts or less), etc. You must submit confirmation for each award.



THE AMERICAN RADIO RELAY LEAGUE, INC.

OPERATING
ACHIEVEMENT AWARD

THIS CERTIFIES THAT _____ operator of station _____ has this day submitted to the League satisfactory evidence of having conducted two-way communication with other amateur stations in each of the states constituting the United States of America. This certificate is hereby issued in recognition of this excellent performance. The operator is, in addition, authorized to include the letters W.A.S. (Worked-All-States) on his station cards and correspondence.

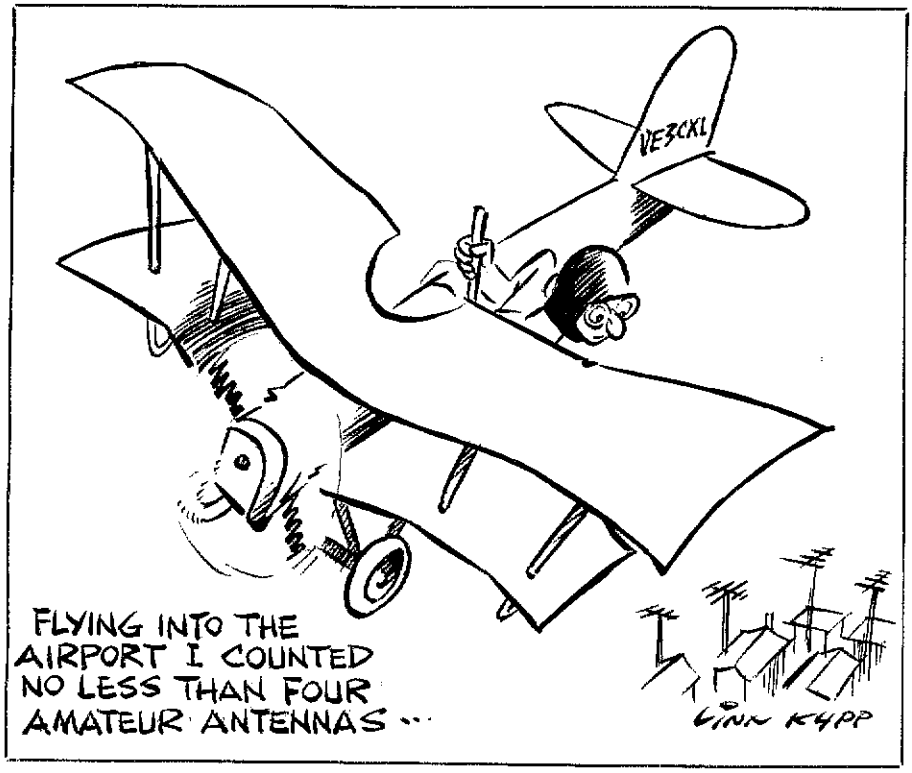
Dated at Newington, Conn. _____

WAS

_____ W1HO President

_____ W1KH Communications Manager

*714 Highland Ave., Ottawa, ON K2A 2K7



Sarnia, ON. The results seemed preordained — WAS minus Utah — *again!* The shock was too great. I buried my log books and shoe boxes deep in an old sea chest never to be looked at again.

There *Are* Hams in Utah

Time is a great healer. By 1975, I had begun to forget my disappointment from WAS failures one, two, three and four. At this critical point, I had to attend a conference near, of all places, Salt Lake City. To my amazement, I counted no less than four Amateur Radio antennas as we descended into the airport. There really *were* licensed amateurs in Utah! Arriving back home (I was now in Ottawa as VE3CXL), I fought the WAS fever for months before finally succumbing.

For the fifth attempt, there were no tear-stained QSLs or pileups searching for the rare VE8. This time, the strategy was different. It became a matter of spending hours listening, tearing pages of the *Callbook* in feverish haste to find that W7's state before he signed off, and sending dozens of self-addressed stamped envelopes to hams who value a VE3 card less than last year's calendar. Wonder of wonders, the new techniques worked. Last year I proudly hung my WAS certificate in a place of honor in the shack.

A New Project Forms

What about Utah? Well, I was so sure that the five stations from Utah I worked would not QSL that I sent cards to all of them. They all acknowledged the contact; I had Utah confirmed on five bands! Reasoning that if I could work one state on all five bands I can work them all, my current project is Five-Band WAS. My conclusions to date are that the hams who are now living in Utah must have moved from Vermont, Rhode Island and Alaska. Those states are almost devoid of amateur activity! Perhaps something will show up in the next 20 years or so . . .

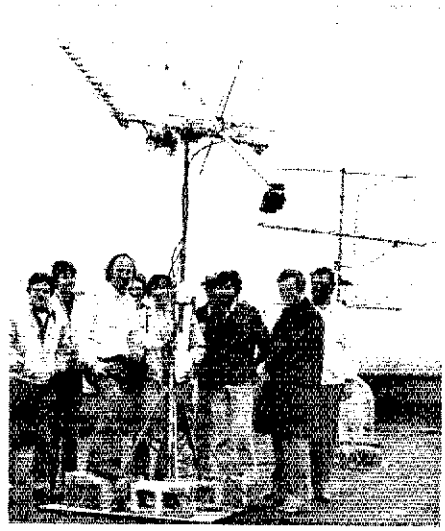
Oh, one last thing. If anyone can tell me how to contact a VE8, I will be able to send him or her a special tear-stained QSL which I have already partially filled out with "My *first* Zone 2, *first* VE8 since 1958!" DST

[This article originally appeared in *The Groundwave*, the official bulletin of the Ottawa (ON) Amateur Radio Club. — Ed.]

Strays

OSCAR 8 VISITS RICHLAND COMMUNITY COLLEGE

☐ Second-year electronics students at Richland (IL) Community College have been working on a satellite communications earth station. Their efforts paid off recently with four successful two-way ssb communications experiments using OSCAR 8, Mode J. The electronics course is titled "Communications Systems." Thanks to OSCAR 8, we were able to have a live demonstration of satellite communications right in our own electronics laboratory. The satellite was switched to the A-J mode by Bernie Glassmeyer, W9KDR/1, at ARRL headquarters, so that Mode J could be used for the demonstrations. Power-line and other manmade interference common to urban areas made reception of the satellite on 29.4 MHz unsuitable for a good demonstration. Using Mode J, the 435.1-MHz signals were loud and clear in our downtown Decatur, IL, location.



The electronics class at Richland Community College, Decatur, IL, has learned a great deal about the practical applications of electronics and the Doppler shift by using OSCAR 8, Mode J in their electronics class!

OSCAR is a great teacher. The effect of Doppler shift on the signals coming from a rapidly moving satellite was dramatically demonstrated on each pass. Soon an abstract and theoretical concept only vaguely familiar from the changing sound of automobile and train horns was a familiar space communications phenomenon. An OSCAR demonstration helps to motivate students to explore the world of electronics outside the classroom, as well as to recruit new people to Amateur Radio and the satellite program in particular.

The loud and clear signals you will hear while using Mode J are well worth the time spent in lining up a sensitive 70-cm converter and setting up a fully steerable antenna. Consistently good signals are the key to any successful satellite demonstration; and at Richland College we are convinced that OSCAR 8, Mode J, is the way to go. — *Frank M. Wiesenmeyer, K9CIS, Decatur, IL*

● *Basic Amateur Radio*

Things Your Elmer Forgot to Tell You

Want to improve your on-the-air performance? (Don't we all!) Here are a few hints to help overcome some less-than-ideal operating habits.

By Lee Aurick,* W1SE

Within the past year, my son, K3QAF, was relicensed as a Novice. We keep skeds and make occasional spontaneous contacts on the air. When I can't find him by combing the entire band a few times, I usually settle down and answer someone who is calling CQ. This has brought me into contact with dozens of Novices for the first time in many years. While many are excellent operators, many others tend to make mistakes that call attention to the fact that they are beginners. I find that the mistakes made by today's Novices aren't much different then they were 20 or more years ago. Perhaps hams aren't learning enough about operating techniques.

Now that the Novice license is a permanent ticket, we're sure to see people staying at that level for a longer time; some may even spend their entire amateur careers at the first plateau. Previously, there was the prospect that Novices eventually would learn how to be better operators when they graduated to the General bands. Now the outlook is that some of the less desirable operating habits many newcomers have will be ingrained by the time they reach a higher class; hams who remain Novices are likely to perpetuate these faults. To help avoid this

The on-the-air mistakes made by today's Novices aren't much different than they were 20 or more years ago. An experienced ham offers some hints to help Novices, like the ones in these photos, operate like "old pros."

*Manager, Advertising Department, ARRL

prospect, here are a few hints to improve your operating technique.

Anticipation Can Hurt

One operating problem I often encounter is the deafening silence that greets a response from a station with a two-letter call. Talk about confusion! Despite taking great care to leave a large space between my call each time I send it, the response from a Novice station is often QRZ? or WISEW. The first thing a good operator should learn is *don't anticipate*; copy only what you hear. After about 45 years of copying code and working thousands of different operators, one is almost able to read the other operator's mind and understand his or her thought processes. But it's different for beginners. "Let's see now. I heard the W and the I. But what happened to the letter in between? Did I miss it? Was it an A, B or D?" The fact that there was no letter between the W and the I does not keep some Novices from inventing one.

Punctuation

Another area that some Novices could stand to improve is the use of punctuation. Good operators don't use a period after a statement or thought because most transmissions are not composed of sentences; they are brief, terse statements. Use BT. For the preservation of my mortal soul, please don't use the comma, dahdahdididahdah. The improper use of procedure signs (prosigns) and punctuation immediately marks an operator as inexperienced or indifferent. If you are reading this, you most likely care; it's just a case of not knowing the procedure.

Time-Savers

At the end of a transmission, many Novices send something like WELL BK TO YOU NOW or WHAT IS NEW WITH YOU? Instead of all this time-wasting verbiage, why not say what most experienced operators say: HW? It means the same thing and is much shorter. I've used this ending with countless Novices, but have not had one send it back to me on the next transmission.

The signal report is one of the most important things you want to get from the other station. Our reports are based on the RST system of grading readability, strength and tone quality. Did anyone ever tell you that you shouldn't send RST? A minor point, perhaps, but when sending at five wpm or so, it is important to delete all unnecessary transmissions. So it's a good idea to just send the signal report without RST.

A Few More Hints

Send at the speed at which your on-the-air contacts are comfortable. How will you determine that speed? By the speed at which they are sending. It is a principle that was established in the era of Marconi: Always send at the speed of the operator you are working. The other night, I heard a Novice calling CQ at about 18 wpm, using an electronic keyer. I answered him at the same speed; he came back to me, still at 18 wpm. My next transmission also was at 18 wpm, and now he was in trouble. He confessed that he could only copy about 8 to 10 wpm. I told him I would be happy to send at that speed, but that he had misled me into thinking he was looking for faster company.

Everyone should know what good cw sounds like. Many keys are too widely spaced. Check that little screw at the back of the key. It gives a jerky sound when the gap is too great. Try sending in unison with an instruction tape of W1AW (off the air!). Get the feel of what it should sound like. Don't try to send faster than you are capable of sending. There is little point in sending at 10 wpm only to hear the other operator ask for fills, when he could have copied you 100 percent at five wpm. All things come with time and practice; so will your speed.

Hams use many abbreviations other than Q signals; it's called *QST* English. Learn the most common ones. Generally, they are English words with the vowels left out. Whatever you do, don't make them up yourself. The other operator doesn't have time to think about what you meant by a particular abbreviation. If it doesn't fall right into place in his mind, he's going to blow the next few words. Then you'll be in worse shape than if you had spelled out the entire word. He's probably going to want repeats. Or else he'll pretend he's copied it, and a fine QSO will come to a grinding halt. Abbreviations are important at any speed, but at five wpm they are a necessity. Just be careful not to use abbreviations with less experienced operators unless they do. (Check *Tune in the World with Ham Radio*, 2nd Edition, page 77, for a list of standard cw abbreviations.)

So, if you hear me calling you, don't panic. I'll be sending at the same speed you are, won't be using periods, will use only the abbreviations you use, and will be sending as accurately as my electronic keyer and advancing years permit.

Oh yes. Listen for the HW? at the end of my transmission. It will signify that I'm about to turn it over to you, wondering how you made out with my copy, if you are still awake, whether the band went out while I was transmitting . . . BK

A Bit Rusty on Code Shortcuts?

Operating an Amateur Radio Station, available free of charge from the ARRL, contains a section on abbreviations beginning on page 28. Becoming familiar with them will make your operating easier and more enjoyable. *Tune in the World with Ham Radio*, also available from the ARRL ($7 postpaid), contains listings of the standard Q signals, prosigns and abbreviations that you will hear on the bands, as well as a student workbook and a code-practice tape.

A New Novice Makes a Contact

I recently had the chance to be present when a new Novice attempted to make his first live cw contact. Because he did not yet have his own equipment and was anxious to work someone, I told him to come over and use my station. I took him into my shack, tuned the rig up on the Novice frequency and turned it over to him after briefing him on the correct procedure for holding a QSO. I told him to dial around the band and listen for someone calling CQ. After a while he found a spot where he heard a CQ and proceeded to get himself ready to transmit.

The big moment had arrived! After months of preparing for the Novice test and the agonizing wait for the license, the day was finally here. Panic set in rapidly. I put my hand on his shoulder to calm him down and said, "OK, old man, go back to him." He sent WB2... DE KA2.../WB2... KN. Back came R R WB2.../KA2... DE WB2... At this point I noticed drops of perspiration forming on his forehead. He received his RST report, QTH, name, rig and antenna. Then came BK TO U, WB2.../KA2 . DE WB2 .. At this time I told him to return with the RST report, QTH, name, etc. and also tell the other station that it was his first contact. His hand was vibrating without ever touching the keyer. He gritted his teeth and went back to the WB2 station. The transmission was sporadic, with letters bunched together, fast and slow. I felt sorry for the OM on the other end. In fact, the WB2 station came back with SORRY OM, HEAVY QRM, 73 CUL.

After watching him log in the information, I told him to take a break and review his QSO. We discussed the erratic transmitting. He turned to me and said, "I'm glad that's over. Boy, what a difference actually sitting down and transmitting over the air rather than just listening and copying." I told him that the first few contacts are the hardest and not to be discouraged. I also told him to review in his mind the format of a good QSO and to try and send at an even pace, even if it was slower than he really wanted to send. After a few more QSOs he seemed to be improving and gaining confidence.

This experience was an eye-opener for me too. There are a lot of us out there on the bands who are not very tolerant of new Novices. If you come down on the Novice bands it should be with the understanding that they do not have the experience that you do; you should be patient and try to guide them along instead of being tempted to run off to another contact. Our Novices need reassurance. The best place for them to get it is by going on the air and getting the rest of us to guide them along. So come down on their bands, give them the support they need and, above all, be patient.

Remember back to your own Novice days and the help you received from someone out there when you were trying out your newly earned ticket. — *Jerry Sussman, WB2UCV, Bellerose, NY*

Some Contest Mysteries Unraveled

Perplexed by contest rules and regs? This should help.

By Tom Frenaye,* K1KI

From time to time, the Contest Branch receives letters and telephone calls asking for clarification of various contest rules. As with the FCC regulations discussed in the "Washington Mailbox" column, rules don't usually provide for every possible situation. Here are some of the most common contest questions, and their answers.

Duped Again

Q. How do I begin to check for duplicates when there are so many new prefixes to worry about?

A. Use the way that works best for you. We have a duplicate checking sheet available for an s.a.s.e. that is adequate for a few hundred QSOs at most. If you make more than 500 QSOs in a contest, you probably have your own way of doing it anyway. Any method of duping a log involves putting the call signs in some sort of alphabetical order. There are many variations of the dupe sheet, but most sort the call sign by the prefix (N1, W1, KA1, etc.). Some people seem to like to sort them by last letter of the call (there are only 26 possibilities using this method — K6OYE goes in the E section). All we ask is that whatever method you use be understandable to those checking the logs.

Dean, WDØFEW, put many hours of contest operating under his belt during the Novice Roundup. The NR experience will be put to good use in an upcoming contest.

*Assistant Communications Manager, ARRL.

Always check the log after the contest, even if you've kept track of duplicates during the contest, because a few always will slip through. Using a computer is fine with us, as long as you send in an alphanumeric listing of the call signs by band/mode.

Misprint

Q. You printed my score incorrectly in QST. The VHF SS results said I had 209 QSOs and 18 multipliers but my entry had 230 QSOs. What happened?

A. Twenty-one of your QSOs didn't have the complete exchange received. To be valid, your entry form had to list the serial number and section for each station worked.

Modus Delecti

Q. In the June VHF contest, I heard one of the multioperator stations on both 2-meter ssb and fm at the same time. I didn't think that was allowed.

A. It isn't, though some stations have the capability to switch back and forth pretty quickly.

Nit-Picking?

Q. When I asked you why I lost a multiplier in the November Sweepstakes, you told me that I had copied the check (year of first license) incorrectly. How can you delete the QSO and multiplier? It is obvious that the QSO was made, since the other station had me in his log.

A. A valid contest QSO requires that you get the call sign *and* complete exchange correct. Unlike horseshoes, close is not enough.

Long-Delayed Echoes

Q. Why do results of ARRL-sponsored contests take so long to appear in print?

A. The results appear as soon as we can process the logs, usually five to seven months after the contest. For example, the mailing deadline for Field Day entries is July 23. Most logs will arrive by the first week of August. The logs have to be checked, the scores typed and proofread, and the article written by September 10 in order to meet deadlines for November *QST*.

First Place

Q. I was first in my section in last year's 10-Meter Contest but haven't received my certificate yet. Have they been sent?

A. Certificates are normally mailed (first class) about the 15th of the month the *QST* article appears. If yours doesn't arrive within 30 days or so, let us know and we'll send a replacement.

Contest Forms

Q. Why did I receive only one summary sheet, one dupe sheet and three log sheets when I asked for enough forms for 1000 QSOs on each mode during the November SS?

A. You didn't send enough postage. Figure that 15 cents will cover the postage for five sheets of paper; add 13 cents for each additional multiple of six sheets. We prefer that you ask for one each of the necessary forms and make your own copies.

Advisory Committee

Q. Why doesn't our representative on the Contest Advisory Committee ever show up at our state convention?

A. Contest Advisory Committee members are all volunteers appointed by the Board of Directors to advise both the Board and Headquarters on contest matters. They are not paid for their travel expenses. Some of them do travel extensively to receive input from the contest community. Others rely on letters and phone calls for their input. If your CAC representative isn't ever around, write or call him, or have your convention committee offer to pay for his transportation to the convention.

Don't hesitate to call or write if you have a question. The only way we know something is confusing to you is if you tell us! QST

Transmitter Hunting for Beginners

Skill, ingenuity and luck are the keys to a successful hunt. Here's how to go about it.

By Breckinridge S. Smith,* K4CHE

If your club or local repeater group needs a catalyst for activity or is searching for a repeater jammer, then transmitter hunting may be the answer. Homebrew construction and a little Yankee ingenuity will provide many hours of entertainment and possibly a close encounter with the great outdoors.

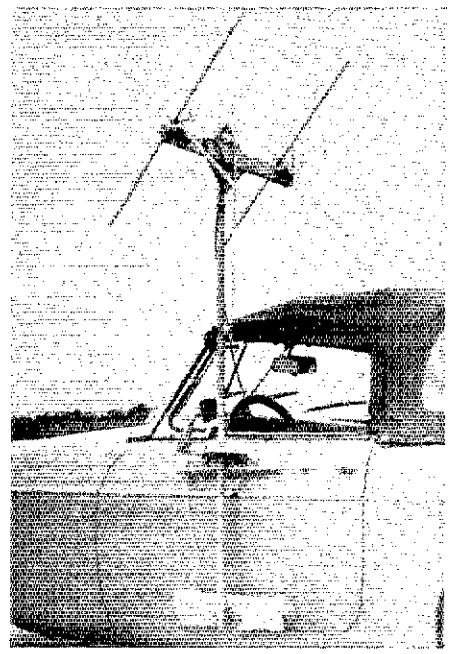
Choosing an Antenna

Many types of antennas can be used for transmitter hunting. Which to select will depend on the type of signal measurements to be made and the degree of complexity you wish to achieve. Both the maximum signal-strength and minimum signal-strength methods will indicate directions relative to hidden stations. Doppler shift detection systems are also being used for rapid direction finding, but these systems are rather complex and costly.[1]

The minimum signal-strength method uses a single loop antenna to obtain a "null." This method may prove inadequate for weak signals and can provide the beginning hunter with false bearings unless a "sense" antenna is used.[2]

Overall, the "turn the antenna for maximum signal strength" procedure, using a simple two-element quad antenna, is recommended for beginning hunters. The quad antenna offers ease of construction, excellent front-to-back ratio and high gain. It can be mounted on a vehicle, and the small turning radius is ideal. Still another advantage of the quad is that it can also be used as a transmitting antenna. This is convenient if transmissions are necessary for hunt coordination or for conversations between hunters. Using the same antenna for detection and transmission eliminates the need for a coax switch or panic switching of coax connectors while driving down the highway.

Fig. 1 illustrates the basic construction and dimensions of a two-element quad with a reflector and a driven element. The quad arms or spreaders are constructed of 3/8-in. (10-mm) wooden dowels with eyelets on the ends to hold the copper wire elements. Heavy rubber bands hold the elements in place on the 1- by 2-in. wooden boom. Removing the rubber bands allows for quick disassembly and storage.



The completed antenna system is a two-element quad featuring changeable polarization.

Tuning stubs are used on each element to peak the antenna for the best front-to-back ratio to eliminate false bearings off the back of the antenna. The tuning stub is initially adjusted on the driven element for the best SWR indication while transmitting. After adjusting the driven element, the stub on the reflector is positioned for minimum strength indication for the best front-to-back ratio. Note that the antenna must be pointed 180 degrees away from the transmitting for the reflector stub adjustment. To ensure accuracy, it may be necessary to use an attenuator or low power to decrease the received signal. The reflector stub adjustment is critical. As much as an inch offset from the correct position on the stub will produce noticeable effects on the receiver strength indicator. During all adjustments fix the antenna in a clear area and be certain of the location of your test station.

The boom spacing between elements can be 0.15 to 0.25 wavelength and was initially made variable. Experimentation with different spacing demonstrated that the effect on gain was negligible, so a permanent 20-in. (508-mm) spacing was adopted.[3]

The antenna boom is mounted on small hinges to allow shifting of the entire antenna from a horizontal to a vertical position. The antenna is fed from the bottom for horizontal or from the side for vertical polarization.[4] The mechanical shifting of the antenna is done with a wooden dowel which is moved up or down the antenna mast and then secured with a clamp. (See Fig. 2.) Changing polarization is necessary because a hidden-transmitter operator may alter polarization of the signal to confuse hunters while bearings are being calculated. A spinoff from the polarization shift feature is that additional attenuation can be created when experiencing receiver overload by adjusting the polarization.

The antenna mast, made from wood broomstick material, is mounted on the side of a vehicle with 1- by 2-in. wooden mounts and suction cups. U bolts hold the mast to the mounts and permit turning the antenna by hand. As a bonus, the entire antenna can be easily removed if the hunter decides to set out on foot.

Attenuation

The basic pi circuit can be used to construct the attenuators. Resistance values can be obtained from the chart in Chapter 4 of the *ARRL Electronics Data Book*.[5]

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[1]Notes appear on page 67.

The pad circuits are mounted in a covered 3- by 6-in. (76- by 51-mm) aluminum box and are switched with toggle or slide switches to step the attenuation. The values in the data book are precise for a definite step in attenuation, but substitutions of resistors can be made to a degree. Overall attenuation, not exact increments, is needed. By substituting the resistors' values, the attenuation for a pi circuit might be 12-1/2 dB instead of 10 dB, but attenuation is still provided. All attenuation must be capable of being switched out for weak signal work and when transmitting. Again, be sure to switch out all attenuation when transmitting, or you risk damaging the pi resistor circuits. Additional attenuation can be obtained on a synthesized transceiver by tuning off the frequency by 1 to 5 kHz. Don't forget that during the attenuation process, the polarization of the antenna can be changed either partially or completely for reduction of signal strength.

If you experience receiver overload when approaching a transmitter, it may be necessary to use a field-strength meter of some type, with or without attenuation. The meters described in the ARRL handbooks using operational amplifiers are easy and inexpensive to duplicate. Constructing them for the 2-meter amateur band without including band switching will simplify the project considerably. When extremely close to the transmitter site, a simple field-strength indicator using just a diode detector without an amplifier can often be used because of the gain produced by the quad antenna. Field-strength meters should be well shielded in a case and constructed so that they can be easily carried.

Getting Your Bearings

A bearing indicator made from an inexpensive protractor is mounted on a piece of aluminum. A hole is drilled through the center of the indicator for the antenna mast. The entire assembly is attached to the top of the suction-cup mount. (See Fig. 3.) A piece of music wire through the center of the wooden mast serves as a bearing pointer. When obtaining a bearing, align the vehicle on a cardinal heading of north, south, east or west using a known road direction or a calibrated compass. Turn the quad antenna for maximum signal strength and read the relative bearing on the protractor scale. Attenuation may be necessary to ensure a sharp peak on the hidden transmitter. Take the first bearing and then check for proper orientation by turning the antenna 180 degrees. With a good front-to-back ratio quad antenna, a noticeable decrease in signal strength should be evident. Once the correct relative bearing is obtained, add or subtract the bearing as necessary to compute the true bearing to the station.* When plotting, refer to true north and plot the bearings from the hunters' known

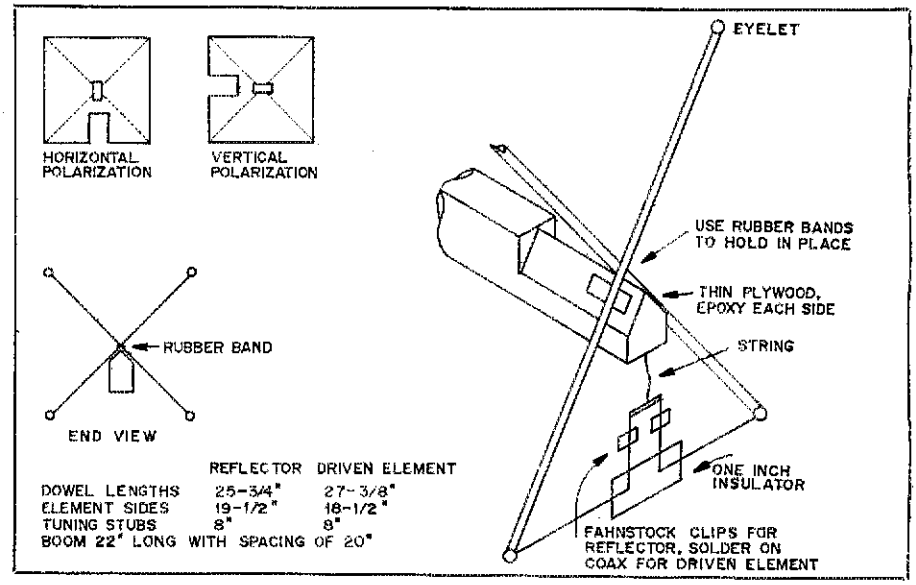


Fig. 1 — The basic construction and dimensions of a two-element quad that is recommended for beginning hunters.

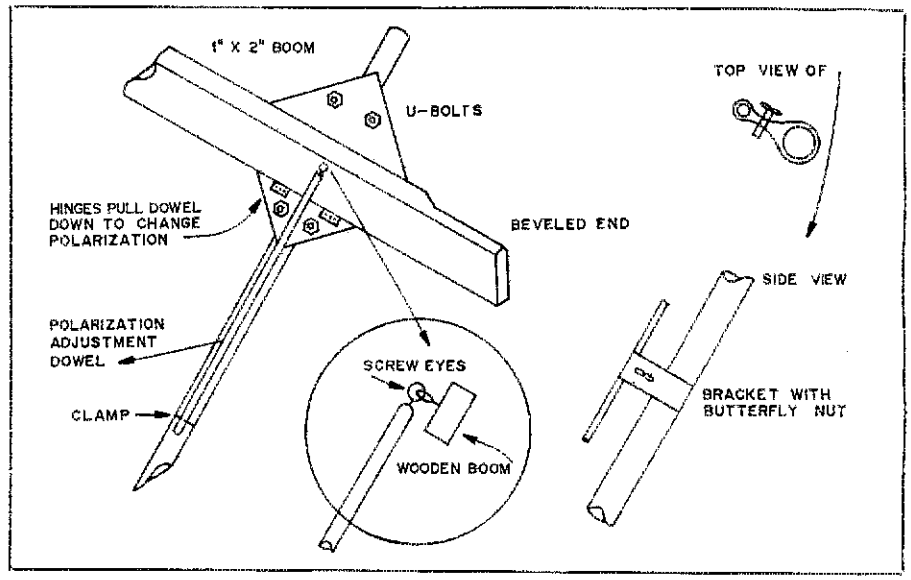


Fig. 2 — Details of the arrangement that allows the antenna to be easily switched between horizontal and vertical polarization.

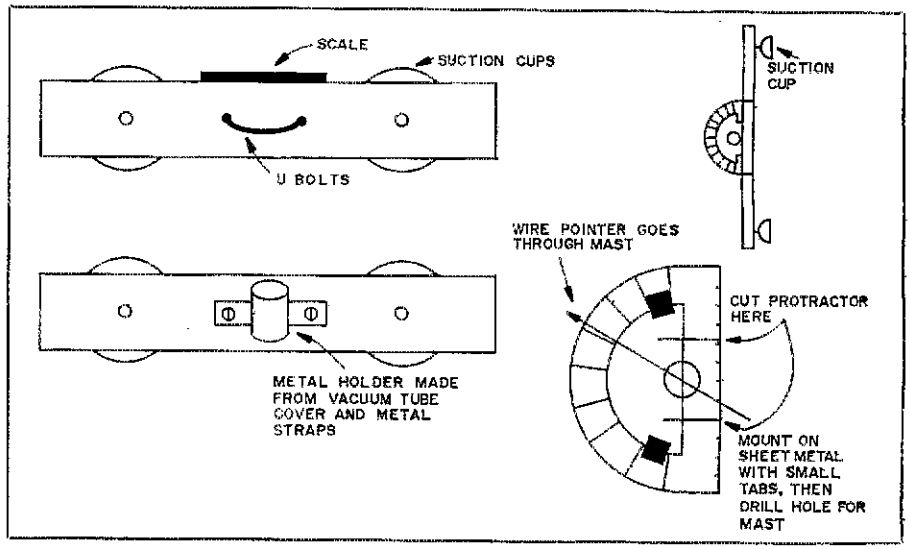


Fig. 3 — An inexpensive protractor makes a fine bearing indicator. The suction-cup mounts permit mounting on a vehicle.

position toward the direction of the hidden transmitter. The object is to obtain and plot sufficient bearings to triangulate and find the approximate position of the hidden transmitter. After the first approximation, move to the new area and obtain additional bearings. Bearings will increase in accuracy as the distance between the search vehicle and the hidden transmitter site is decreased. Bearings obtained while driving are usually quite inaccurate over large distances. It is a better strategy and much safer to stop the vehicle in a clear area, *accurately determine the vehicle's heading*, and take several bearings to be averaged. Try moving the vehicle 100 yards (90 m) and taking another bearing; watch out for reflections and distortion caused by nearby objects.

The author must admit that during the final heated moments of the hunt, the meticulous bearing-plotting process is often abandoned and a "homing-in" process is used while the vehicle is in motion. Good luck, drive safely and happy hunting. QST

Notes

[1]Rogers, "A DoppleScAnt," *QST*, May 1978, p. 24.
[2]Braschwitz, "Directional Antenna for the Transmitter Hunter," *ARRL Mobile Manual*, 1962, p. 214.
[3]*ARRL Antenna Book*, p. 238.
[4]*ARRL Antenna Book*, p. 158.
[5]*ARRL Electronics Data Book*, Chap. 4, p. 32.
[6]*ARRL VHF Manual*.

The Hunt

Everything was ready. The city map and flashlight were beside me on the seat of my dad's '53 Plymouth. The 10-meter, bidirectional loop was mounted somewhat securely on the door. The coax hung down to the floor where I could quickly grab the plug and change from the whip antenna to the loop.

I tuned the Gonset 10/11 converter to 29.4 MHz, which was to be the frequency of the hidden transmitter. I double-checked the large circle drawn on the map of San Diego. The transmitter was to be hidden within a three-mile radius of the Midway Drive-in Theater.

Dad had to do the driving, as I was not yet old enough; we always started a hunt somewhere along the edge of the circle. Starting near the center was an advantage as you could never be more than three miles away from the hidden Transmitter. But with a bidirectional loop, this could mean starting out in the wrong direction; without an S meter, it would take too long to discover the mistake. I had learned this lesson the hard way!

Anticipation ran high as we waited for the hunt to start. Now suddenly, it was quiet on the net frequency. I tuned back and forth around 29.4 MHz, straining my ears. On one sweep of the dial there was a strong carrier, right on 29.4. "He's close," I shouted, lunging for the back of the converter and unplugging the whip. As I excitedly managed to insert the loop, I heard, "QST, QST, QST . . . this is your hidden transmitter . . ." The null indicated a westerly direction. "Mission Bay," I told dad. "Let's go!"

Down onto the freeway, over Pacific Highway, and we were on our way. The hunt was on. On my loop, the nulls were very pronounced and sharp. Even a very strong signal would almost go down to the noise level unless you were quite near the transmitting station.

"Signal's getting stronger, Dad. Make a left turn." Now the null started swinging more and more to the right. It was almost 90 degrees when I admitted that we should have gone straight instead of taking a left turn. "Let's see if we can get back," I told dad. The next right turn, and we were zipping back in the proper direction, at the speed limit, of course. Dad wasn't in as big a hurry as I was. "Come on, Dad, step on it," I begged, even though I knew it wouldn't do any good.

Up a bridge and down the other side. "He's right here!" I yelled. "Stop!" The signal was overloading my converter and all I could hear were some garbled noises. Dad slowed to a stop and I jumped out and ran down to the beach which bordered Mission Bay. I looked under the bridge — deserted, except for two fishermen wearing long coats, rain hats and holding fishing poles above the water. Then I saw the whip, up behind the fishermen near the road. I don't know how I'd missed it before, but there it was. I approached the fishermen cautiously, still a little apprehensive. Then I noticed one of them talking softly, as if into a microphone under his coat.

It was hard to keep from shouting as I announced my call sign and signed the check-in list along with those others who also had uncovered this clever plot. I was the fifth to check in, 35 minutes after the start of the hunt. Not too bad, but I already was thinking about next week. I had just gotten my General class license, finished building a 9-watt, 10-meter transmitter and come up with an old, but working, vibrator power supply. Everything was ready, and only net control and I knew that I was going to be the hidden transmitter next week.

This happened when I was 14 years old, more than 24 years ago. I sincerely hope my three sons will have similar memorable experiences. I can almost hear them saying, "Come on, Dad, step on it!" — *Louis J. Haake, N7BFN, Auburn, WA* QST

The Practical Side of Fox-Hunting

Recently a co-worker, Ed Dabrowski, WB9NLO and I went on a peculiar type of fox hunt. Ed and I are engineers for a Chicago TV station. About two weeks prior to the fox hunt I began noticing a herringbone pattern on TV channel two on my home TV sets. The pattern was relatively weak with no audible modulation and a slight variance in frequency. The herringbone pattern was sometimes on for most of the day and at other times for just a short while. It was enough to make watching channel two frustrating. I asked my immediate neighbors if they were having the same trouble, and they were. I then drove around the neighborhood to see if any new CB or other antennas had been put up recently. Finding none, I checked some of the nearby industries and a nursing home to see if they were using any induction or dielectric heaters or diathermy. Again I drew a blank.

Then, to add to my frustrations, I started getting phone calls blaming me for the disturbance on channel two. Five antennas on my tower and three more on my roof make me a prime target for such blame. I checked all of my receivers to see if I could locate a spur that was causing the problem. Next I connected my 2-meter beam to a TV set and made a sweep of the area. The signal seemed to be coming from within my subdivision.

The FCC was contacted and I explained to one of the field engineers just what was happening and what I had done so far. He suggested looking for a TV booster amplifier that had gone bad. He indicated that they sometimes go into self-oscillation and radiate through the TV antenna.

On that advice I called out the reserves. Ed helped me wire up my Sony 5-inch portable so we would be able to use it in the car. We took a bearing on the signal and plotted it on a map of the subdivision. It was dark as we drove around trying to locate the source of the signal. We pinned it down to a few houses, began knocking on doors and explained the situation. We asked the residents if they had recently bought any new electronic devices or if they had a TV antenna booster amplifier. Ed and I also asked the residents to turn off the main power to their houses to see if the herringbone interference would be eliminated. People were very cooperative as we announced ourselves as TV engineers and Amateur Radio operators. One of the homeowners said, "Oh yeah, I know where the trouble is coming from. It's that guy about two blocks west of here with the big tower in his backyard." He was quite embarrassed when I told him that I was the guy he was referring to and that I was trying to locate the source of the signal.

We checked all of the houses in the suspect area, except one where the people were not at home. We were about to pack up when the owners came home. We showed them the portable TV in the car and asked them to turn off their power. When the power was turned off the interference went away. *We had found it!* The residents indeed had a TV antenna booster amplifier in the attic. It has since been disconnected or repaired and TV channel two is clear and sharp with no herringbone. Our local community newsletter printed a nice word for us and I got off the hook with the neighbors who suspected me of causing the problem. — *Murray Cutler, W9EHQ*

Moved and Seconded...

MINUTES OF EXECUTIVE COMMITTEE
MEETING No. 376
September 15, 1979

Pursuant to due notice, the Executive Committee of the American Radio Relay League, Incorporated, met at 0915 EDST on September 15, 1979, at the Airport Ramada Inn, Windsor Locks, CT. Present: President Harry J. Dannals, W2HD, in the Chair; First Vice President Victor C. Clark, W4KFC; Directors Gar Anderson, KØGA, Richard Egbert, W8ETU, and Larry E. Price, W4RA. Also present were Acting General Manager Laird Campbell, W1CUT, General Counsel Robert M. Booth, Jr., W3PS, and Membership Services Manager Perry Williams, W1UED. Washington Coordinator Harold M. Steinman, K1FHN, joined the meeting at 0928, and Director Max Arnold, W4WHN, joined the meeting at 0953.

Congratulations were offered Mr. Campbell on completion of 25 years services to ARRL. The Chair appointed Mr. Williams as Secretary of the Meeting.

The Committee next proceeded to examine nominations in the director elections, with careful attention to the application of the eligibility rules concerning membership and freedom from commercial radio connections. During the course of the above, phone calls were made to several candidates to clarify details of employment. The Committee made findings and ordered actions as detailed below all by unanimous action of those present:

Atlantic Division

For Director: Jesse Bieberman, W3KT; G. W. "Bud" Hippisley, W2JJ/K2KIR; Harry W. Robinson, W2AZ; Lawrence J. Solarczyk, WA3TSD; Thomas R. Sundstrom, W2XQ; George S. Van Dyke, Jr., W3HK; and Dennis D. Voorhees, AD3O, were found lawfully nominated and eligible, and their names ordered listed on ballots to be sent to Full Members of the Division.

For Vice Director: Alan H. Komenski, AC2K; Harold C. Smith, K2HC; and Hugh A. Turnbull, W3ABC, were found lawfully nominated and eligible, and their names ordered listed on ballots to be sent to Full Members of the Division.

Canadian Division

For Director: Fred Hammond, VE3HC; William W. Loucks, VE3AR; and A. Mitchell Powell, VE3OT, were found lawfully nominated and eligible, and their names ordered listed on ballots to be sent to Full Members of the Division.

For Vice Director: Aaron D. Solomon, VE1OC, H. Gordon Steane, VE3BMG, and Frederick H. Towner, VE6XX, were found lawfully nominated and eligible, and their names ordered listed on ballots to be sent to Full Members of the Division.

Dakota Division

For Director: Garfield A. Anderson, KØGA, was found lawfully nominated and eligible. Being the only eligible nominee he was thereupon declared, pursuant to the By-Laws, to be duly elected as Director from the Dakota Division for the 1980-1981 term without membership balloting.

For Vice Director: Tod Olson, KØTO, was found lawfully nominated and eligible. Being the only eligible nominee he was thereupon declared, pursuant to the By-Laws, to be duly elected as Vice Director from the Dakota Division for the 1980-1981 term without membership balloting.

Delta Division

For Director: Max Arnold, W4WHN, and Malcolm P. Keown, W5XX, were found lawfully nominated and eligible, and their names ordered listed on ballots to be sent to Full Members of the Division.

For Vice Director: John H. Sanders, WB4ANX, was found lawfully nominated, but the Committee was in receipt of a letter from Mr. Sanders withdrawing his name as a candidate. O. D. Keaton, WA4GLS, and Lionel "Al" Oubre, K5DPG, were found lawfully nominated and eligible, and their names ordered listed on ballots to be sent to Full Members of the Division.

Great Lakes Division

For Director: Stanley J. Briggs, W8MPD, was found lawfully nominated, but the Committee was in receipt of a letter from Mr. Briggs withdrawing his name as a candidate. David E. Heil, K8MN; Leonard M. Nathanson, W8RC; and Jack E. Siringer, W8AJW, were found lawfully nominated and eligible, and their names ordered listed on ballots to be sent to Full Members of the Division.

For Vice Director: John M. Bostwick, AC8E, was found lawfully nominated. The Committee was in receipt of a message from Mr. Bostwick withdrawing his name as a candidate. Leonard M. Nathanson, W8RC, was found lawfully nominated and eligible, but his nomination as Director takes precedence in accordance with the By-Laws. Tony W. DePrato, WA4JQS, and George H. Goldstone, W8AP, were found lawfully nominated and eligible, and their names ordered listed on ballots to be sent to Full Members of the Division.

Midwest Division

For Director: Leland L. Bahr, WØVT/W9DRC; Paul Grauer, WØFIR; and W. R. "Randy" Rowe, Jr., NØTG, were found lawfully nominated and eligible, and their names ordered listed on ballots to be sent to Full Members of the Division.

For Vice Director: Robert McCaffrey, KØCY, was found lawfully nominated. The Committee was in receipt of a message from Mr. McCaffrey withdrawing his name as candidate. Claire Richard Dyas, WØJCP was found lawfully nominated and eligible. Being the only elegible nominee he was thereupon declared, pursuant to the By-Laws, to be duly elected as Vice Director from the Midwest Division for the 1980-1981 term without membership balloting.

Pacific Division

For Director: Michael W. Delich, WA6PYN, and William J. Stevens, W6ZM, were found lawfully nominated and eligible, and their names ordered listed on ballots to be sent to Full Members of the Division.

For Vice Director: Wilbur E. Bachman, W6BIP, was found lawfully nominated. The Committee was in receipt of a letter from Mr. Bachman withdrawing his name as a candidate. Robert C. Smithwick, W6JZU, was found lawfully nominated and eligible. Being the only eligible nominee he was thereupon declared, pursuant to the By-Laws, to be duly elected as Vice Director from the Pacific Division for the 1980-1981 term without membership balloting.

Southeastern Division

For Director: Larry E. Price, W4RA, was found lawfully nominated and eligible. Being the only eligible nominee he was thereupon declared, pursuant to the By-Laws, to be duly elected as Director from the Southeastern Division for the 1980-1981 term without membership balloting.

For Vice Director: Frank M. Butler, Jr., W4RH; David Novoa, KP4AM; and Robert H. Reid, W4TK, were found lawfully nominated and eligible, and their names ordered listed on ballots to be sent to Full Members of the Division.

On motion of Mr. Egbert, it was unanimously VOTED that Gar Anderson, Victor C. Clark and John Huntoon are appointed a Committee of Tellers to count the ballots in the current election, with Harry J. Dannals, F. E. Handy and Joseph A. Moskey as alternates.

On motion of Mr. Clark, unanimously VOTED that candidate resumes in the current elections be listed on separate sheets enclosed with the ballots, instead of on the reverse of the ballots as in the past.

The Committee reviewed a first draft of an ARRL response to FCC's Inquiry in Docket 79-140, concerning the possible creation of an additional Personal Radio Service in the 900 MHz range. Comments were offered by members of the assembly, to be incorporated into the next draft, in accordance with the schedule established at Minute 63 of the July, 1979, Board meeting. The Committee was in recess for lunch from 1152 to 1315.

The Committee reviewed, in accordance with Minute 60 of the July, 1979, meeting, the status of requests for amendments to the Communications Act placed before Congress in connection with bills S611, S622, and HR3333. Mr. Booth reported on a meeting of Government personnel and ARRL representatives at which those amendments were discussed.

The Committee reviewed the text of a letter to the President of the United States on the subject of over-the-horizon radar in the USSR ("The Russian Woodpecker") and ordered it sent.

The Committee examined quotations for professional liability insurance coverage for officers and directors of ARRL. On motion of Mr. Anderson, it was unanimously VOTED to accept the proposal underwritten by Lloyd's of London.

On motion of Mr. Anderson, unanimously VOTED that, in order to alleviate a shortage of on-board check-signers during WARC-79, Harold M. Steinman is authorized to sign checks on behalf of the General Manager.

On motion of Mr. Anderson, unanimously VOTED that ARRL file in support of the schedule of fee refunds proposed by FCC as Phase II of Docket 78-316.

On motion of Mr. Egbert, the Committee recognized the names of 123 individuals who had been recently elected to Life Membership, and instructed the General Manager to list their names in *QST*.

On motion of Mr. Arnold, the Committee approved the affiliation with the League of the following amateur radio societies: Beach Cities Wireless Society, San Clemente, CA; Brenham Amateur Radio Club, Brenham, TX; Cayman Radio Society, Grand Cayman, Cayman Islands, BWI; Emerson Electric Amateur Radio Club, St. Louis, MO; Lakes Area Amateur Radio Club, Jasper, TX; Parkersburg Amateur Radio Klub, Parkersburg, WV; Red Stick DX Association, Baton Rouge, LA; Redwood Coast Amateur Radio Club, The Sea Ranch, CA; River Cities Amateur Radio Association, Catlettsburg, KY; Salvation Army Explorer Post No. 477, Chester, PA; South Florida DX Association, Margate, FL.

On motion of Mr. Price, unanimously VOTED to accept, with regret, the withdrawal from affiliation of the University of Saskatchewan Amateur Radio Club, Saskatoon, SK.

(With the above action, the League now has 1819 Class I affiliated societies, 7 Class II, and 332 Class III.)

On motion of Mr. Anderson, the following convention dates were approved: Hudson Division, November 7-9, 1980, So. Fallsburg, NY; and Canadian Division, 1982, Saskatoon, SK., Canada.

On motion of Mr. Egbert, unanimously VOTED that General Manager Baldwin is directed to proceed with an appeal from the decision of the State Referee in the tax status suit of ARRL vs. the Township of Newington.

On motion of Mr. Anderson, it was unanimously VOTED that the budgets of the following divisions be increased by the amount shown: Delta Division — $250, Great Lakes Division — $550, Southeastern Division — $475.

On further motion of Mr. Anderson, it was unanimously VOTED that the budget of the Management & Finance Committee be increased by $1250.

In accordance with previously-established Board policy, the Committee reviewed a report from the General Manager on the status of action taken on motions adopted at the July Board meeting. Action has been completed on Minutes 31, 33, 35, 37, 50, 52, 53, and 63. Action is in progress on Minutes 17, 22, 28, 32, 34, 39/47, 40, 42, 43, 45, 48, 57, 59, 60, 61, 62, and 65.

On motion of Mr. Egbert, it was unanimously VOTED that the General Counsel may take action on behalf of the League in support of the Greenberg case before the Supreme Court, if further study confirms the desirability of this action.

During the course of the meeting, the Committee also discussed, without formal action, the work of the Long-Range Planning Committee and the status of various legal cases involving amateurs.

The next meeting of the Executive Committee is scheduled for 1:00 P.M., Sunday, November 18, 1979 in the vicinity of ARRL Headquarters.

There being no further business, the meeting was adjourned at 1515 EDST.

Respectfully submitted,
Perry F. Williams, W1UED
Secretary of the Meeting

Canadian NewsFronts

Conducted By Ron Hesler,* VE1SH

Customs Duty Relief in Sight for Canadian Amateurs

Over the past several decades, the Canadian Division has made two formal representations to the Canadian government for the elimination of customs duties on Amateur Radio equipment. Unfortunately, both of these submissions were refused and turned aside, with the result that Canadian amateurs continued to pay grossly unfair and inflated costs for their equipment compared with their fellow amateurs south of the border.

Four years ago we began work on yet another submission and we are now pleased to announce that *what the CRRL initiated* has resulted in a recent Tarriff Board recommendation, to our government, calling for *all customs duties to be eliminated on Amateur Radio receivers, transmitters and transceivers.* We are, of course, most grateful for the support received from all other Canadian amateur organizations, as well as many individual amateurs, at the Tariff Board Hearings across the country which has resulted in this important decision.

To slightly digress for a minute, we would like to comment on the fact that if only the unanimity reached on this issue could be achieved on all other government regulatory matters as well, Canadian amateurs "would have it made!" In point of fact, the Tariff Board specifically commented on this matter in their Report, noting "a high degree of unanimity among the petitioning parties." Unfortunately, however, the Canadian amateur community, in other directions, continues to permit itself to become involved in internecine strife, without warranted reason, aside from what can only be considered petty politics resulting from ill-considered, self-centered and self-serving motivations, on the part of a very few, who plead as their cause, national unity and separatism. As we have stated on many occasions, Amateur Radio, by its very nature, should be without defined borders! The recent Tariff Board Report supports this contention although, of course, it was not intended as such.

It is interesting to note that in the report more than three pages were devoted to Amateur Radio equipment, or more than that devoted to any other item on the agenda. It should also be of interest to our members that it was noted that certain of the considerations which enabled the Board to reach "the opinion that a strong case has been made for the special tariff treatment of major items of radio equipment identifiable as being for amateur bands usage and not made in Canada" were dealt with in the geatest detail *in the CRRL brief!*

The recommendation to eliminate duties on amateur receivers, transmitters and transceivers refers especially to British Preferred and Most Favored Nation classifications. The U.S. and Japan, among others, are in the M.F.N. classification. We have it on good authority that the wording used would equally cover transmitter, receiver and transceiver *kits.* There is, at this writing, some question as to whether power supplies for a given piece of equipment would be covered, but there are ample precedents to support the classification of a power supply *designed for a specific transceiver, receiver or transmitter* and imported at the same time as forming an "entirety" and therefore benefiting from the exemption. There are certain other items we shall be requesting clarification on, principally in an attempt to extend the exemption to certain other important ancillary equipment *not made in Canada,* as well as this matter of power supplies, kits, etc.

The Board has made the recommendation that the elimination of duty should be phased in and that for a one-year period after the introduction of the tariff item exemptions there should be intermediate rates of duty applied. The federal sales tax of 9 percent, of course, will not be exempted.

A word of warning — don't immediately rush out and order a new piece of equipment in the expectation that the duty costs will have been removed. Before the Tariff Board's recommendation becomes law, it will have to appear in a future budget of the federal government or by passage of an Order in Council. Until one of these things happens, we have won the first essential battle, but have not quite won the war!

Rest assured, however, that the CRRL shall continue to press for speedy passage of the recommendation . . . one way or the other.

For those who may wish a copy of the complete Tariff Board Report, it is available from Printing and Publishing, Supply and Services Canada, Ottawa K1A 0S9, for the sum of $4.75 ($5.70 in countries other than Canada). The catalogue number to quote is FT4-156.

CARF REPUDIATES AGREEMENT

In a now quite apparent futile attempt to maintain the liaison as well as the other points established in the CARF-CRRL agreement reached last November, the following registered letter was recently dispatched to the secretary of CARF:

"This is an official communication between our two organizations and I would be greatly obliged if you will treat it as such and reply accordingly. In the Agreement reached between our two organizations, last November, one of the points of agreement reached was that the only official channel of communications would be between the two Presidents. The writer and this organization have been careful to honor this obligation as well as all others contained in the Agreement.

In the past few months, I have been dismayed to note so many of my communications to your President going unanswered or not even acknowledged. Our Vice President recently forwarded to me a letter received by him, from your President, in which Wilson stated that he would not communicate with me. This is a direct violation of the Agreement, no matter what reason Wilson might *personally* have. Unless we hear from you, by September 15, 1979, we shall therefore assume that the Federation has repudiated the Agreement aforementioned." Signed by CRRL President Ron Hesler, VE1SH.

We regret to advise our membership that no reply has been forthcoming; therefore, we can only conclude that the agreement is now null and void. As the president of the Radio Society of Ontario recently stated in *The Ontario Amateur,* "It makes one wonder what value can be put in a document signed by the leaders of the two societies."

The South Pickering Amateur Radio Club Inc., has been collecting Dominion Store tapes for the purpose of purchasing an electric wheelchair for member Bill Down, VE3EPM. The club will continue to collect and process Dominion Store tapes for another chair for some needy Canadian amateur. It asks that all clubs throughout Canada submit names of amateurs who are in need of such a chair and to send their tapes to SPARC Inc., P. O. Box 53, Pickering, ON L1V 2R2.

1980 MARITIME RADIO CONVENTION

After an absence of several years, the most popular Labor Day Maritime Ham Convention shall again be sponsored next year. It is entitled "Ham Ceilidh 80 . . . the gathering of the hams." It will be sponsored by the Sydney Amateur Radio Club, August 30-September 1, at the Isle Royal Hotel, Sydney, NS.

According to a recent communication from the Sydney club, "Our convention will be an open convention, meaning that CRRL and CARF will be invited to participate on an equal basis." For further information, write Ham Ceilidh 80, P. O. Box 1051, Sydney, NS B1P 6J7. The CRRL shall be fully participating with a booth, forum, etc., and many League officials will attend.

*Director, Canadian Division

WARC Countdown

Conducted By David Sumner,* K1ZZ

How Does the WARC Work?

This column is being written just a few days before the start of the World Administrative Radio Conference (WARC-79), on September 24. The 10-week conference will be half over by the time you read this; our reports of what happens in Geneva will be in the next two issues of *QST* under this heading.[1] Those reports will be easier to understand if you know something about the committee structure of an ITU conference, and about the way in which issues are discussed and decided.

WARC-79 will open with a plenary assembly that is, with about 1500 delegates sitting in a large hall. The gathering of this many delegates in a single meeting will occur only about once a week for the remainder of the conference; most of the work will be done in much smaller committees. Fig. 1 illustrates the probable committee structure. This is based on preliminary information which may differ in some details from what is actually adopted by the Conference.

As soon as the opening plenary assembly is over, the nine major committees will meet separately. Any delegation is entitled to participate in the work of any committee; however, many committees will be meeting simultaneously and it will be quite impossible for a small delegation to cover them all. Most of the interest will be in Committee 5, Frequency Allocations. Committee 5 will have approximately six working groups, broken down primarily by frequency, as shown in Fig. 1. Here again, frequently the meetings of the various working groups will conflict with one another. The conference center is equipped to handle more than a dozen meetings simultaneously, and its facilities will have to be used to the fullest if the conference is to complete its work on schedule.

What happens within the working groups? You guessed it: Most of them will break into at least one more layer of subgroups, to address the more narrowly defined issues. These issues may be defined by region, by frequency band, or by service. In 1959 there were two dozen such subgroups dealing just with allocations matters, seven of which were of some interest to the Amateur Service. Now, you may begin to see why the International Amateur Radio Union has sent such a large team to Geneva! (The team members were introduced in the two previous months' columns.)

During the past year, the ITU has translated and distributed a two-foot-high stack of paper containing several thousand proposals for changes in the Radio Regulations. Each of these proposals will be assigned to the

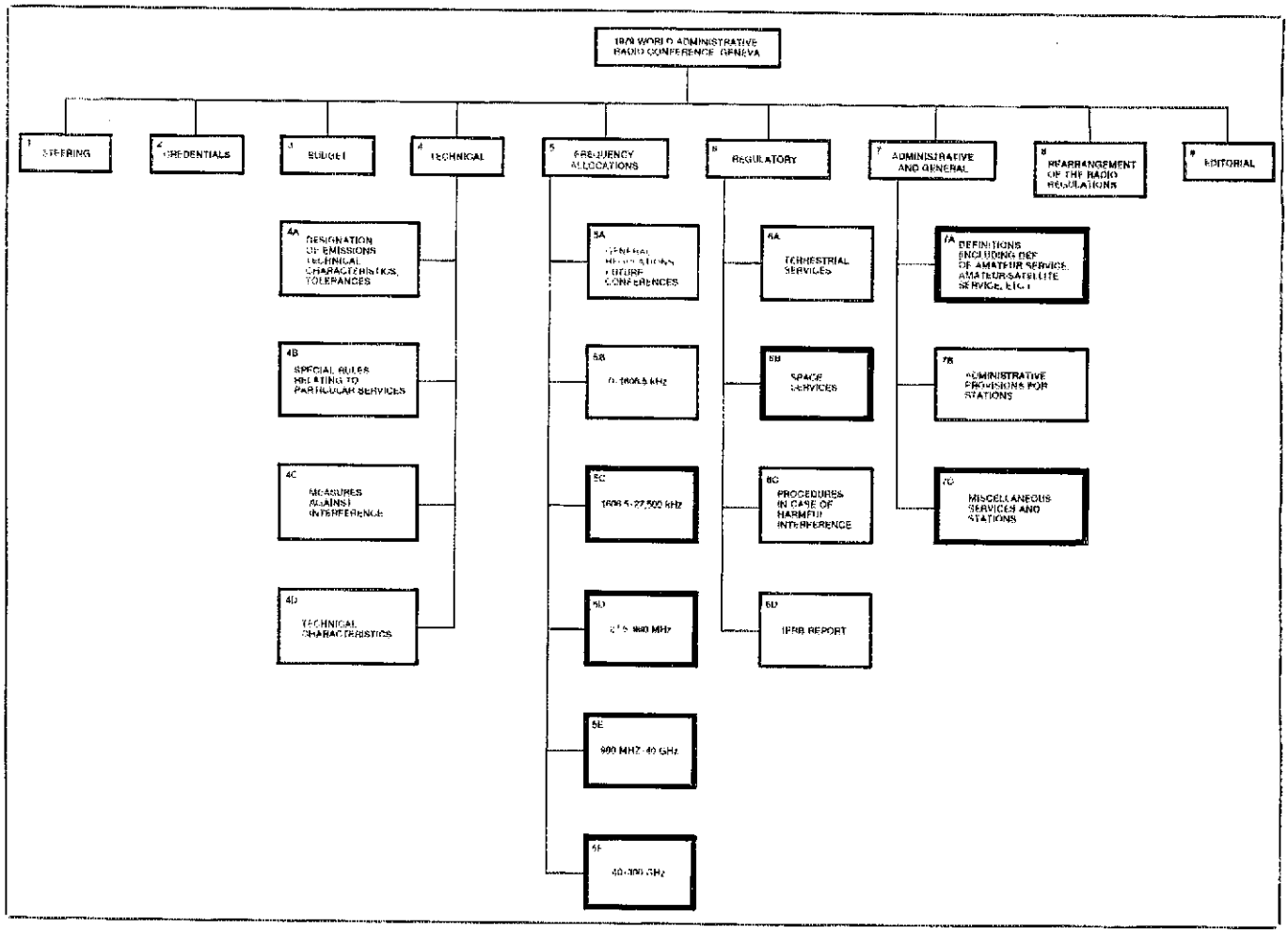


Fig. 1 — Probable committee structure of the 1979 World Administrative Radio Conference. The seven working groups with heavy borders are of particular interest to the IARU Team. In addition, each of the working groups of Committee 5 will have several subgroups. This chart is based on preliminary information; the actual structure of the Conference may differ slightly.

*Assistant General Manager, ARRL.

[1]For an update, see "League Lines," page 10 of this issue.

appropriate committee. The committee chairmen will break them down into assignments to the working groups. Then, if there are still too many proposals to be handled in one group, smaller subgroups will be formed to deal with proposals of a similar nature. Not every delegation will be represented in each of the subgroups. Most of the smaller delegations will find it impossible to cover everything of interest, and the larger delegations will have no interest in those issues which do not affect their part of the world.

Whether the issues are discussed in a subgroup or in a full committee, the objective of the chairman is the same: to reach a consensus as quickly as possible. Where no consensus is possible, the question will be settled by vote. Each country has one vote, but not every country will be voting on every issue. The question may be between conflicting proposals, or between a proposal for a change and the *status quo*. Often, proposals will have to be modified in order to attract sufficient support for passage.

Even after the vote is taken, nothing is final. A delegation on the losing side may reserve the right to raise the question again in a higher committee or in plenary assembly. There, where there are more delegations present (and there has been more opportunity for lobbying), the decision of the lower committee may be overturned. No outcome is absolutely assured until the closing of the final plenary assembly. Even then, if a country would be so adversely affected by a conference decision that ratification by its government is unlikely, the delegation may reserve the right not to be bound by the decision.

Of course, the members of the IARU Team will not be able to vote. Our task is to monitor the progress of the proposals which might affect the Amateur and Amateur-Satellite Services, to identify our friends and our opponents, to give information and support to our friends, and in general, to try and move the conference toward decisions which are the most favorable for the Amateur Services. A typical day for a team member in Geneva will begin with a meeting of the team at 8 A.M., attendance at as many as four different committee meetings between 9 A.M. and 6 P.M., discussions with delegates over coffee, lunch and dinner, and report-writing in the evenings and on weekends.

Next month, we will only be able to give you a general idea of how the conference is shaping up because, when that column is written, there will still be six or seven weeks to go before its scheduled conclusion on November 30. Until that date, if someone tells you that "WARC has decided such-and-such," you can look him straight in the eye and tell him he doesn't know what he's talking about. Nothing will be final until the final rap of the chairman's gavel at the final plenary assembly. QST

Strays

HAMS TO PLAY KEY ROLE IN OLYMPIC TORCH RUN

Nicknamed "Operation Hot Foot" by the many radio amateurs involved, the historic transport of the Olympic flame that will open the 1980 Winter Olympic games will be a significant opportunity for Amateur Radio.

ARRL hq. was approached by Olympic officials who felt that Amateur Radio was the only logical choice for their needs. In the words of one official, "The torch run is an ideal opportunity for the Amateur Radio community to demonstrate the operational readiness and capability that has already made it famous."

The scenario will begin at the Temple of Hera in Olympia, Greece, site of the original games first held almost 3000 years ago. It is here that the flame will be lit by solar ignition. Following tradition, it will be hand carried to the Olympic stadium in Athens. It will then be transported by air to Langley Air Force Base in Virginia, by Naval surface craft to Yorktown, VA (opposite Jamestown to symbolize the Pilgrim landing), and lastly by some 52 runners, one from each state in the union plus Washington and Lake Placid. The hand-carried flame will then make its way through rural towns and big cities on its nine-day, 1600-km historic trek to Lake Placid, NY, for the opening ceremonies. Amateur Radio will be there at every step of its journey in America.

Though the United States has on four occasions hosted the Olympic Games, 1980 will be the first time the sacred flame will have originated in Greece. It will be a momentous occasion filled with excitement, ceremony and pomp. But for the amateur volunteers en route it means long grueling hours of communications under pressure, cold days on the road, responsibility, reliability and honor.

Two-meter mobile simplex will link the 16-vehicle split caravan. One group will accompany the torch-carrying runner, while the other rides with the advance party. Two-meter repeater operation will serve when direct transmission is impossible. It will also be the means by which the mobile crew maintains contact with the stationary operators located in their ham shacks. The role of the low-band relay team will be to support the mobile team in whatever traffic situation arises, be it emergency or routine, as well as to relay up-to-the-minute information to the Lake Placid WORAN team (Winter Olympics Radio Amateur Network) via 40, 75 and 160 meters.

It is estimated that several million people will share in the ceremonies that welcome this "distinguished foreign visitor." The many years of planning and the generous contributions of human resources and tangible goods demonstrate the kind of spirit that is most fitting for these international games.

It certainly will be no mean task to provide the sole communications for this momentous event. That is why all radio amateurs can take pride in knowing that, once again, when humanity needs quality, reliable communications, the public turns to Amateur Radio operators, the communications specialists serving their community and nation with knowledge, dignity and pride. — *Bobbie Chamalian, WB1ADL, ARRL Olympics Coordinator*

FLANDERS FIELDS AWARD AVAILABLE

For 48 hours, beginning at 1900 UTC on November 9, the Belgian Amateur Radio Society will operate their club station, ON7FF, from Passendale in Flanders Fields. To receive the four-color (42 × 26 cm) award, send log details and seven IRCs to ON7FF, P. O. Box 32, 8900, Ypres, Belgium.

David S. Porter, K2BPP, is the first person to have visited both the North and South Poles. He was at the South Pole in 1970 as an honored guest and again in 1973 as a consulting engineer for the U.S. Navy at McMurdo Naval Station. This photo shows David at the North Pole in April 1979. He is planning a return trip to the North Pole, this time for a record-breaking four days, for April 1980. A first during the trip will be the operation of Amateur Radio from the pole. Most of the expedition members are lined up but there may be room for someone experienced in OSCAR operation. Interested? Contact Dave at P. O. Box 81, Hope, NJ 07844.

Washington Mailbox

Conducted By Stan Horzepa, J.D.,* WA1LOU

Radioteletype

One of the most intriguing modes of specialized Amateur Radio communications is radioteletype. Recently, with the appearance of microprocessors in the ham shack, RTTY has seen a resurgence in popularity and growth. Newcomers to the mode may not be aware of all of the rules and regulations concerning their newfound interest, while the old-time RTTY hackers may need to refresh their buffers. So, this installation of "Washington Mailbox" will be devoted to the radioteletype mode.

Q. Which teleprinter code are hams permitted to use?

A. Amateur Radio RTTY transmissions are restricted to a single-channel, five-unit (start-stop) teleprinter code which corresponds to the International Telegraphic Alphabet Number Two with respect to all letters and numbers (Section 97.69(a)). The internationally recognized teleprinter code fitting the FCC's requirements is the Murray code, which is commonly referred to as Baudot in the ham radio fraternity.

Q. What about ASCII?

A. At this time, the American Standard Code for Information Interchange (ASCII) is *not* permitted in the Amateur Radio Service except under special authorization from the FCC. (For example, U.S. hams are authorized to use ASCII through OSCAR 8; this authorization is part of the satellite's Amateur Radio license.)

In August 1978, the FCC issued a Notice of Inquiry and Further Notice of Proposed Rulemaking in Docket 20777, which posed a number of questions concerning what kind of standards would be necessary to permit ASCII in the Amateur Radio Service. The deadline for comments has passed and the FCC will study the matter with the results coming later; results that may open the door for ASCII on the ham bands.

Q. By the way, what is ASCII?

A. ASCII is a code composed of seven binary data bits, each bit being either a "0" or a "1." ASCII is used extensively in the computer field.

*72 Stiles St., Waterbury, CT 06706

Q. On what frequencies is RTTY permitted?

A. It depends on whether you are using frequency-shift keying (F1) or audio frequency-shift keying (A2).

Q. What are frequency-shift keying and audio frequency-shift keying?

A. Frequency-shift keying (fsk) is the continual transmission of an rf carrier with its frequency being shifted to represent RTTY marks and spaces.

Audio frequency-shift keying (afsk) is also the continual transmission of an rf carrier. Instead of shifting the frequency of the carrier, however, the mark and space pulses are generated by changing the frequency of a modulated tone.

Q. Then, on what frequencies is fsk permitted?

A. On 10 through 80 meters, F1 is permitted in the "exclusive" cw portion of each band. For example, on 80 meters, fsk is permitted from 3500 to 3775 (the "exclusive" cw [A1] portion of the band is the same). On 6 meters, fsk is permitted from 50.1 to 54 MHz, while on 2 meters, from 144.1 to 148 MHz. Above 220 MHz, fsk is permitted on all Amateur Radio-allocated frequencies (Section 97.61(a)).

Q. What about afsk?

A. A2 is not permitted below 50.1 MHz. Above 50.1, A2 has the same frequency allocations as F1 (refer to the previous answer) (Section 97.61(a)).

Q. I thought I've heard some operators admit that they used afsk on the hf bands. What's the story?

A. A number of hams operating RTTY in the hf bands are using audio tones fed into the microphone input of ssb transmitters. With properly designed and constructed equipment that is correctly adjusted, satisfactory F1 emissions may be obtained. The user should make certain that audio distortion, carrier and unwanted sidebands are not present to the degree of causing interference in receiving equipment of good engineering design.

Q. Getting back to permissible RTTY frequency space, it seems that most of the RTTY activity I hear is restricted to a small segment of the allocated spectrum. Isn't this true?

A. Yes; just as other specialized ham radio operations meet around certain frequencies, RTTY operators do the same. Generally, on 10 through 40 meters, RTTY activity is found between the first 80 and 100 kHz of each band. On 80 meters, the activity is found between 3.600 and 3.630 MHz. On vhf and uhf, most of the RTTY activity takes place on 2 meters. There are a number of RTTY repeaters on that band and many of these are on the frequency pair of 146.10/70.

Q. Everybody seems to be transmitting at 60 words per minute. Are any other speeds permitted?

A. Yes. Besides 60 wpm, amateurs may transmit at 67, 75 and 100 wpm plus or minus 5 wpm (Section 97.69(b)). Sixty wpm seems to be the standard because most of the older surplus teleprinters operate at that speed; however, with the use of newer surplus printers and the influx of microprocessors, 100 wpm is increasing in popularity.

Q. Are 170 and 850 Hz the only permissible frequency shifts?

A. No. Any shift between 0 and 900 Hz is permitted (Section 97.69(c)).

Q. What about station identification? Are there any special rules for RTTY operation?

A. The only special RTTY rule is that at the end of a transmission exchange with another amateur station, a RTTY operator does not have to identify the station he is in contact with; he only has to identify himself (Section 97.84 (a)).

Q. You mean that at the end of a transmission, all I have to send is DE W1HQ?

A. Yes, however, and this is important, you must identify in either telegraphy, using the Morse code, or by phone, using the English language (Section 97.84 (g)). Identifying in the RTTY mode is not satisfactory.

[Note: Questions appearing in this column are typical of those frequently asked of the FCC and other agencies. Answers, prepared at ARRL, have been reviewed by FCC staff. Numbers in parentheses refer to specific sections of the FCC rules.]

Strays

I would like to get in touch with . . .

☐ amateurs in Minnesota, neighboring states and provinces who would be interested in performing propagation experiments on the vhf, uhf and shf amateur bands, 6 meters to 10 GHz. Shelby W. Haukos, KA0CME, 1239 N. Baird Ave., Fergus Falls, MN 56537.

☐ anyone interested in forming an International Rotary Club net on 15 meters, or possibly through the OSCAR satellites. Contact John McCoy, WA4PGJ, 117 Royal Oaks, Jackson, TN 38301. Tel. 901-427-7334.

☐ anyone who has a schematic and/or service information for a Unitrex Model 1202M electronic calculator. Also, any hams who were in AACS in the Aleutians, AK, during WW II. Contact B. G. Davenport, W4GCJ, 7810 Folly Ct., Columbia, SC 29209.

QST congratulates . . .

☐ the Sonoma County (CA) Radio Amateurs, Inc., whose first exhibit at the county fair provided fair-goers with a half-size model of OSCAR 8, an OSCAR demonstration, RTTY demonstration, keyboard cw with readout, hands-on cw, receiver for public use, operating radio stations, a message center and public relations desk. Nearly 150 people signed up for September classes.

FM/RPT

Conducted By Stan Horzepa,* WA1LOU

Things to Come

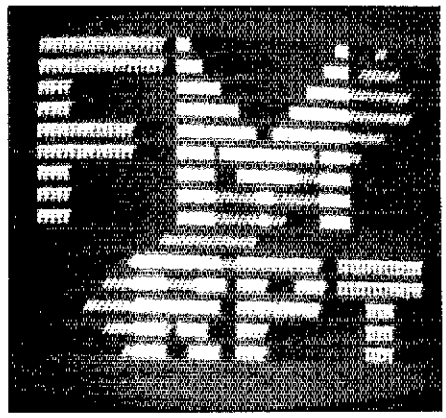
Where do you look to find the state of the art in Amateur Radio today? Find the nearest ham who owns a microcomputer. Most likely that micro is being used in some ham radio application. Whether it is being employed for simple logging or to transceive cw, the marriage of ham radio and the hobby computer is where the state of the art can be found today.

One area of Amateur Radio in which microcomputers have really made an impact is radioteletype. The same hams, who had previously eschewed RTTY because they disliked those big, noisy and oily printers, are now active RTTY operators (a la microcomputers). How did this happen, you ask? Well, when these hams brought home a microcomputer, the first ham radio application for the micro that came to mind was RTTY. Clearly, RTTY and micros are a natural combination and that is why this specialized mode of Amateur Radio communications is healthier today than at any time in the past. More and more micros are entering ham shacks everywhere and as they come on line, more and more RTTY operators are being born. These operators, involved in the ways and means of computers, QSO intelligently about the latest advances in their hobbies.

Another area in which micros are being used is in repeater operation. If you come across a repeater with an elaborate control system, there is a good possibility that the repeater is being controlled by a microprocessor. One micro can easily handle the jobs formerly performed by a proliferation of control circuits. Still more tasks could be assigned to the micro and it would not even begin to tire. Just as micros are a natural in RTTY, they are also a natural in repeater operation.

In the October installment of this column, there was a photograph of some members of the Chicago Area Radioteletype Repeater System (CARRS) servicing the first RTTY repeater in the Chicago area (on 144.71/145.31). These Windy City hams are active in the forefront of Amateur Radio; the system they are building will tie repeater technology, RTTY and microprocessing all into one package. In order to give you some idea of how their repeater works (and where the state of the art is), a short description of part of their system follows.

Signals that are transmitted on the repeater's input frequency are sensed by a DT-600 demodulator. Any received signals are timed by the demodulator. After four seconds, a cooling fan and the afsk power supply are turned on. The repeater controller card waits to receive eight alphanumeric characters from the UT-2 UAR/T regenerative receiver and then turns on the repeater. Regenerated, distortion-free data now move from the UT-2 UAR/T to the afsk generator and then to a tone mixer which allows a 738-Hz cw identification to be superimposed over the RTTY/afsk-generated tones. This cw identification is out of the passband of most terminal units. Although the identification is audible, it will not affect the reception of the RTTY signal.



FM/RPT via microcomputer. Soon, you may be copying similar microprocessed messages from your local repeater.

To conserve energy, the repeater will not come on if a continuous 2125-Hz mark tone is sent without any space tones. Also, during a RTTY transmission, when there is a lapse of 35 seconds between sent characters, the repeater will shut down and go ito a waiting mode until another character is sent.

It's quite a system . . . enough to whet the appetite of all repeater buffs. And there's more to come! Plans call for an 8080-based computer to be added to the repeater system. With a computer on board, an electronic mailbox and other computer-related activities will be conducted. (A quick explanation of "electronic mailbox": Generally, it permits a station using RTTY to access the repeater and leave a message addressed to another ham. The computer stores the message until the other ham checks in to retrieve any and all messages left for him.)

Other repeater groups are also discovering the creative ways in which computers may be used in their systems. What we may be seeing is the beginning of another transition in Amateur Radio. If the FCC permits ASCII to be used by amateurs, the transition may become a revolution that will completely change the ways in which we presently communicate.

While standing by for some action from Gettysburg, you may want to begin getting acquainted with the microprocessor field. Be prepared for the things to come.

REVERSE AUTOPATCH

'Twas early September. The weather was hot and humid. I was on vacation, traveling westbound on I-90 with the windows rolled down and the tape player cranked up. Next to me sat my handheld, which was humming with the conversation on a local repeater. I was only half listening to all of the sounds vibrating in my ears when I thought I heard a tone followed by someone saying, "Hold on, guys. I have to answer the phone."

I reached over to the tape player and turned down the music. Then I reached over to the handheld and turned up the QSO . . . was this one of those reverse autopatches that I had heard so much about?

Someone transmitted two tones over the repeater, and the telephone system and the repeater became one. The caller happened to be a ham. He was looking for a friend who was not on the repeater at that time, so he hung up.

"Is that legal?" someone asked. The ham who had answered the phone chose to answer the question concerning its legality: "Yes, it's legal . . . as long as the caller is not able to access the repeater and speak over the air without some ham turning the system on. The tone that lets us know that there is an incoming call is okay because the caller doesn't speak at that time . . . "

That answer seemed to satisfy the inquisitor. Before I was out of the range of the repeater, a few more "legal" reverse autopatches were completed.

I hate to be the bearer of bad news, but such reverse autopatch systems are illegal; they permit anyone with a telephone to transmit a signal over the Amateur Radio airwaves without a licensed amateur being in control of the transmission. By telephoning the repeater, the caller sets off the tone which is transmitted over the air to let repeater users know that a call is incoming. This tone is as illegal as one of your unlicensed kin transmitting cw over your station while you are traveling on business in East Oshkosh . . . no licensed amateur is controlling the transmission.

Reverse autopatches may exist legally if there is strict control of the system: The control operator of the repeater must intercept each incoming call before the call or a tone indicator may be transmitted over the air. Only after the incoming call is screened by the control station may the caller be put through the repeater. Such a system is legal because a licensed amateur, the repeater control operator, is controlling what goes over the air.

And that's the way it is.

MICHIGAN FREQUENCY COORDINATION

New officers were recently elected to the Michigan Area Repeater Council (MARC) and a new home base for the council was established. All correspondence to MARC regarding frequency coordination and other Michigan repeater matters should now be directed to Raleigh L. Wert, W8QOI, 309 East Gordonville, R 12, Midland, MI 48640.

INTERMOD PROGRAM

A listing of the intermod locator program mentioned in the June installment of this column may be obtained by forwarding an s.a.s.e. to this writer.

*72 Stiles St., Waterbury, CT 06706

Correspondence

Conducted By Perry F. Williams,* W1UED

RADIOLOGICAL MONITORING

☐ In September *QST*'s Correspondence column, Dave Beauvais, K1JPP, calls for "repeater-based radiological monitoring." Either the author does not understand radiation or radiation monitoring in the slightest, or the letter was deliberately intended to "keep the fire lit" on the hysteria which followed the Three Mile Island incident.

The atmospheric sampling, mostly manual, and sophisticated counting techniques required for low-level-radiation detection and analysis are not the type of thing that can be done adequately and automatically at a repeater.

Before the amateur community drains away valuable contributed time for something with as little value as this proposal would have in the often-neglected public service area, K1JJP should campaign to have dosimeters placed in every commercial airliner. I have received 10 to 20 millirems on a cross-country flight, much more than has been documented for any member of the public in the TMI incident. The population of Denver should be warned about the dangers of living too high — literally! — in the Rockies, where the yearly average radiation dose is twice the U.S. average of 100 to 150 millirems. And how about Brazil, with as much as 1600 millirems of natural radiation?

Aside from the monitoring done on the plant site, there *is* sufficient monitoring done by independent agencies to insure the health and safety of the public. K1JPP probably tried to contact the wrong people in the wrong agencies, and the system in the correct agencies is not geared to inquiries from the public.

In regard to the New Jersey milk samples referenced by K1JPP, the levels detected were 1/20th the amount deposited in similar milk samples when fallout from the last Chinese atomic bomb test passed by. As one colleague of mine with a Ph.D in Radiation Chemistry remarked, "I wish my equipment always worked as well as that in New Jersey at those contamination levels." — *C. H. Ballard, WB6CDY, Morgan Hill, CA*

[Editor's Note: Mr. Ballard is a registered nuclear engineer who has worked for 11 years in and around various nuclear plants, including the Vermont Yankee site referenced by K1JPP. For a contrasting view, see the next letter, from another nuclear engineer who works for New Jersey's Bureau of Radiation Protection.]

☐ As a radio amateur who is concerned with radiological protection as a profession, I would like to reinforce and enlarge upon the recommendations of Dave Beauvais, K1JPP. He was calling for amateurs to embody radiological monitoring in fm repeaters. If such a system could be constructed and calibrated properly, it would add significantly to the protection of the public. Hams can play a role in Three Mile Island type situations by utilizing their communications skills. Communication was a very weak link in the TMI incident.

K1JPP found confusion in at least one state as to who is responsible in the event of a radiological accident. In New Jersey, it's the Bureau of Radiation Protection, within the Department of Environmental Protection. We hold drills with each of the two reactors operating in the state. One was scheduled for September with Salem Nuclear Station; another is due this month with Oyster Creek. The drills, as would an actual accident, involve numerous local, state and federal agencies. The Bureau is a small organization, and not specifically an emergency-response group; we cannot do the job alone. We need the active participation of individuals and groups, private and governmental, to respond to a radiological incident. Radio amateurs, working through Civil Defense, can play a significant role in communications in the event of a peacetime nuclear accident, whether at a fixed facility or during transportation.

K1JPP stated that particulates from TMI were found in the milk in New Jersey. I do not know of any particulates which escaped from Three Mile Island and showed up in New Jersey. The chief problems at TMI were the radioactive gases xenon and iodine. Because it concentrates in milk and the thyroid gland, iodine in air and milk was monitored closely by the Bureau laboratory. We were chiefly concerned with Pennsylvania milk being brought into New Jersey. No radioactive iodine attributable to Three Mile Island was found in our lab. Another laboratory did report finding elevated levels of radioactive iodine in New Jersey milk, but undoubtedly conducted an extended-period test: The precision of radiation counting is dependent upon how long the sample is analyzed. A minimum detectable level of 15 picocuries per liter is possible if a sample is counted for four hours; a level of 2 picocuries per liter is possible for samples counted for 48 hours. No value measured in our lab exceeded 15 picocuries per liter, the four-hour minimum detection level.

I hope that these technical comments are of interest, but more importantly, that the need for participation in radiological emergencies has been reinforced. — *Joseph M. Vann, W2HSD, Trenton, NJ*

NO MYSTERY!

☐ Concerning the "Mystery Letter" submitted by Dave Hardacker, W7TO, and printed on page 76 of September *QST*:

Actually I do not see a mystery at all. Everyone knows of Don Wallace, W6AM. He is as much of an institution as Arthur Fiedler! — *Terry A. Posey, N4KT, Crawfordville, FL*

The question is too easy. There is only one Don Wallace, W6AM, on his way to Virginia Country Club (WA6YAO). I enjoyed trying to figure out who the author of the mystery letter was. My old *QST* file seems to indicate that K5ONE/5 was the 1967 Class C Field Day mobile winner. Except for that red herring, I would guess W6AM (NØAJH). I've had the pleasure of working W6AM's "mobile substitute for an antenna farm." W7TO is right: Don's mobile cw moves along *fast* also! (N2XJ). Some years back, with the indicator on my keyer set at 30 wpm, I was answered by W6AM chugging along at yesterday's 60 mi/h. Truly, his contribution to ham radio has inspired many through the years, myself included (W6KXJ). I was at an "Open House" and saw W6AM operating that rig (WA6YSO). One kilowatt mobile. High-speed cw while roaring down the highway. DX in the remote parts of the world. It has to be the old DXer himself, W6AM (N6JM). I remember seeing a photo of W6AM in a magazine a few years ago, working cw mobile. The caption mentioned a kilowatt in the trunk (WØJX). There's no doubt at all that this is W6AM. Have worked him many times with his kW mobile. Have never yet heard Don on phone (maybe because *I* am seldom there!) (AG4S). I have heard his mobile signal on 20-meter cw. It has quite a punch! (WD6EEQ). The world has only produced one Don C. Wallace, W6AM, and that letter only scratched the surface. Someone could write a book about W6AM. I know firsthand, because I used to try to compete with him in the DX pileups (W8NBK). Don's success at one-handed driving is a sure sign of a misspent youth. Wonder if his fenders ever got crumpled in a DX pileup while driving the freeway? (W1AM). The mystery letter personality is W6AM, who has been involved in more harebrained operating endeavors than anyone I know. I only wish I had half the spunk of that old-timer. They tell me Don is past 80 now. Looks just as fit as Clayton Moore, the Lone Ranger. Hope he goes on forever (WB2EZG). Imagine the signal he puts out when passing the other direction on a freeway! (AC6H) It appears that K5ONE won the 1967 mobile FD. However, for some reason I can't pinpoint, I select W6AM. If I'm wrong, may Sir Arthur Conan Doyle forgive me (WA5MUF).

☐ Your mystery ham of September *QST* is probably more of a mystery than you realize. How this 81 years young credit to our hobby can continue to attack life with the enthusiasm and energy of a man 50 years his junior is truly amazing.

Having had the opportunity to serve as the second op at W6AM during the past six years, I

*Manager, Membership Services Dept., ARRL

can fully attest to the continuing accomplishments of Don Wallace. Somehow he singlehandedly maintains the famous "radio ranch and rhombic farm" so that he can keep in touch with numerous friends around the world and simultaneously retains his lofty position atop the DXCC Honor Roll. He has visited and operated from enough countries to qualify for DXCC on that basis alone. Don recently returned from a safari to the upper Amazon!

I am convinced that the word "old" is not in Don's vocabulary and strongly suspect that after most of us have passed on to that "big hamfest in the sky," the radio waves will still sparkle with that often-heard and unique sound of W6 America/Mexico. — *Jim Neiger, N6TJ, Newport Beach, CA*

ANOTHER MYSTERY

☐ "Mysteries" like the Don Wallace letter are always of interest to me. Now here is one from a half century ago which is about a "bootleg" call:

The amateur transmitter was located right in the ship's radio room. A pair of "two-tens" were used in the transmitter which folded down out of sight. It was never discovered by the Radio Inspector. The call sign was **B4UP**. Perhaps quite a few amateurs have wondered who signed that "exotic" call. Some may care to guess who the operator was — I knew him well.

I would like to see other "mystery" letters in this column. Perhaps we can even solve the IAAW mystery! — *George Meek, W6IC, Fort Bragg, CA*

[Editor's Note: IAAW was the first signal heard across the Atlantic by Godley in 1921 — it was a "pirate" who has never been located.]

SHELDON'S SOLAR SOLUTION

☐ Relief is in sight, I believe, for many sensitive radio amateurs who crave an antenna tower but who refrain from such installation for fear of neighborhood reaction.

In the 1980s large rooftop arrays of solar panels will appear on many suburban homes, with blessings and possible subsidy from the local and federal governments. In addition, commercial enterprises are already afoot to promote 5-meter parabolic reflectors to homeowners and business people wishing to receive TV satellite transmissions directly, without the need for a cable TV distributor.

This new consumer hardware is bound to relax residential codes. How can a three-element Yagi at 40 feet remain threatening to neighbors with 200 square feet of roof-mounted solar panels or 16-foot backyard dishes? — *Sheldon Peck, WB1EWP, Boston, MA*

TOO MUCH OF A GOOD THING?

☐ In reply to Dick Baldwin's editorial in September *QST* concerning the proliferation of conventions, hamfests, et al, most Amateur Radio organizations run these affairs for several reasons: to raise needed funds, to furnish a common meeting ground for hams and to provide an outlet for selling or swapping used gear and parts. Retailers have found that they can make a buck there, but no one expects the manufacturers to show up at a flea market. It's nice to see them at the major conventions, but we all realize that no one manufacturer can make them all.

What other exhibitors can one attract? QSL printers, engravers of name plates, ham magazines, small manufacturers of add-on devices may never be contacted by the committees who run the big shows.

When we elect to serve on a hamfest committee we do it as a labor of love. We put something back into the hobby, at no small personal cost. The industry can do likewise.

It's possible that some smaller clubs can band together in a joint function. But let's not discourage events that strengthen our hobby and bring in new hams. — *Henry Wener, WB2ALW, East Hills, NY*

☐ I read with dismay the editorial, "Too Much of a Good Thing." The arguments may be valid for the amateur who spends every weekend journeying hundreds of miles to such events, but are largely irrelevant to the average ham.

For the typical amateur, the benefits of local hamfests far outweigh the disadvantages.

Hamfests and conventions increase the visibility of our hobby to the general public. Such conspicuous activity not only generates interest in prospective hams, it also lets people who never will become hams know exactly what we're about.

Hamfests and conventions provide the amateur with the opportunity to meet in person the people who have been contacted on the air. The call then becomes representative of a face rather than just a noise out of the ether. Hamfests increase membership and generate interest in local amateur clubs and organizations. Finally, the hamfest flea markets provide the newcomer or less prosperous member (me included!) with the opportunity to purchase used equipment at reasonable prices. How many of us bought our first station at a flea market? These events also allow those of us homebrewers still around a source of radio parts unavailable or too expensive from other sources.

Hamfests are sponsored primarily for the local community, a fact that the editorial ignored. The 12-year-old Novice or the old-timer not up to a long trip will come to an event close to home. ARRL, by asking us to cut down on the number of events, is asking us to cut down on an activity nearly as popular and beneficial as operating our stations. — *Bob Faris, K1PW, Brookfield, CT*

☐ Are hamfests put on for ARRL and for advertisers, or to give amateurs the chance for eyeball QSOs? Let's *save* energy by having lots of small hamfests close to home! — *J. C. Pinckney, WB2VNM, Smyrna, NY*

EXPANSION

☐ This short note is to express my joy and hearty approval of your expansion of "Correspondence" from one to two pages effective with September *QST*. I'm very glad to see it bigger; it is always one of the first sections I read. — *Ralph E. Covington, W7SK, Reno, NV*

[Editor's Note: We can't promise to keep it up. *QST* editorial space has to fluctuate in parallel with the amount of advertising purchased for an issue. But when space permits, a two-page format will be used because many readers like the column. By the way, W7SK is also a regular contributor to *QST*; as SCM Nevada, he has some copy in "Station Activities" each month.]

SAD DAY

☐ It is a sad day for our club. A few months back we requested ARRL's slide show on the outgoing QSL bureau. This week we received this message, "The training aid requested is no longer available. ARRL members have lost our copies."

Some of you may have been fortunate enough to see the slide show before all the copies were lost. Our club wasn't so lucky. I just hope that one of the lids who lost the slides needs a QSL from West Virginia. I'll be happy to set up a sked and work them. Of course, I'll probably lose the QSL before I have a chance to send it! — *Pete O'Dell, AE8Q, Parkersburg, WV*

CONSIDERATION, PLEASE!

☐ I would like to ask all operators to be a little more considerate on QSLs. As a newly licensed amateur, I thought when I got my ticket I'd be swamped with QSLs.

Not so. After a year I find my return rate for cards is only 33 percent. You who *have* your awards already may find QSLing a nuisance, but remember others sent their cards to you back when, so you could qualify. We newly licensed amateurs would like the same courtesy! — *Roger Vankirk, KA8FHB, Morgantown, WV*

☐ I'm writing this letter in the spirit of cooperation and friendship we all share.

In order to shuck right down to the cob, please keep your cotton-picking cw signals off the segment of 20 meters traditionally reserved for RTTY — 14,080-14,100 kHz. There is no FCC rule that says you must do this, but it's not an unreasonable request. If we cooperate and help each other out, we won't need a rule — too many of them already. RTTY stations voluntarily stay up in this segment, to find each other and to avoid clobbering cw down on 14,050. How about your help in keeping cw off these few freqs? — *Charles E. Martin, AB4Y, Bowling Green, KY*

☐ I'm in charge of QSLing for W6RO aboard the *Queen Mary* and in that post see a need for a few lessons on QSLs. I get cards with only the sender's call — no name or address. Others omit the date, time or frequency. And a great many don't understand times expressed in GMT or UTC or Z. Without all this information it is hard to return your card! — *Rosemarie Pitz, N6BCY, Long Beach, CA*

[Editor's Note: Information on converting one kind of time to another can be obtained from Special Requests, ARRL, Newington, CT 06111. Please enclose a stamped, self-addressed envelope (s.a.s.e.). Or see "UTC: The 'Right On' Time," Nov. 1978 *QST*, p. 52.]

MY MOTHER, THE HAM

☐ On page 59 of the September *QST* I was delighted to see my mother in the photo, but she wasn't identified as Mary Esthern Hauck, WA6VUE. Though she's 85, legally blind and needs two hearing aids, you'll find her frequently on 7125 kHz.

There are 11 hams in the family, including her three sons and their wives (not all are active and not all on the same modes). — *Nick Hauck, W6QPE, Sanger, CA*

The New Frontier

The World Above 1 Gig

Conducted By Bob Cooper Jr.,* W5KHT

10-GHz Summer Pastime in Italy

As most vhf and uhf enthusiasts know well, the warm weather months for those of us living where the climate changes by season are a very productive period for extended-range communications. Happily, the same weather which produces long-haul refraction or ducting potential also is by coincidence nice shirt-sleeve weather and that encourages amateur operators to "head for the hills" (or wherever DX is to be found).

On the American side of the pond there was apparently no concerted effort to extend the existing mileage records for our most popular gigahertz assignment: 10 GHz. The same can hardly be said for European amateurs who during the month of July broke the existing record for terrestrial communications in this band not once but five separate times! We'll devote much of this month's column space to the efforts and results.

Correspondent G. Tomassetti, I4BER, the ARI microwave manager for Italy provides the details. Most of the contacts that follow were managed with what has become something of a "standard 10-GHz station" in Italy and elsewhere in Europe. Such a station consists of a 1-meter dish and a Microwave Associates Gunnplexer with an i-f of 30 MHz and peak (fm) deviations of either 100 kHz or 1 MHz. Duplex is very prevalent and apparently is a very handy alignment tool itself because it represents the "ultimate" in break-in operation.

If you locate the ends of the new record 10-GHz QSOs on a map it becomes obvious that the Italians, at least, have refined the technology of selecting good paths for 10-GHz extended-range work. Virtually all of the contacts are located such that the paths begin at elevated locations (3000 meters at one end is not uncommon) and then shoot out over the Adriatic Sea to the south-southeast where the opposite end of the path is located on a point of land that juts out from the seacoast. This gives the path a "slanted profile" with one end well elevated such that this end can "see" the positive refraction area of the sea, while the opposite end is located on the water but positioned so it looks back across the water to the opposite station.

The first record-breaking contact occurred on July 12th at 1900 GMT between IØSNY/7 and I3RGH/3. The distance covered was 550 km (341.8 miles). That record lasted six days almost to the hour; on July 18th at 1852 GMT, I3CLZ/3 contacted I4CHY/7 for a 571-km (354.8-mile) QSO. Alas, that record was to last only eight minutes, for at 1900 on the 18th IØSNY/7 grabbed the honors back by contacting I3CLZ/3 and extending the record to 582 km (361.7 miles). There is obviously very spirited competition at play here!

There followed a three-day lull and then at 1712 GMT on the 21st of July, I2FZD/3 made the grade with I4CHY over a 589-km (366-mile) path and IØSNY/7 was once again out of the record business. The record-breaking period drew to a close on the 27th of July when I2FZD moved to the /2 call district and further extended his own record to 633 km (393.4 miles) by contacting I4CHY/7 who had been a part of earlier record-breaking efforts.

One can just picture the savvy Italian 10-GHz crowd pouring over road maps and topographical profiles, laying out possible paths to establish newer and newer records of achievement for 10 GHz. I4BER notes in his report that most of these contacts were repeated over 2-meter links so that nonparticipants could share in the excitement of the accomplishments. The Italians certainly have a flair for turning summertime holiday periods into productive amateur sessions!

In amongst all of these record-breaking contacts were numerous shorter-than-record QSOs. I4CHY/7 for example also made a QSO on July 26th (1800 GMT) with YU3JN/2 for a 411-km (255.4-mile) best-yet between Italy and Yugoslavia. Another I4CHY/7 contact with I3ZJL/3 was of special interest because the I3 was using a homebuilt 3-mW transceiver feeding a 25-dB gain horn. The contact path was 571 km (354.8 miles). That works out to 118 miles per mW which is certainly energy conservative. I4CHY, holidaying as a /7, managed to make 20 separate QSOs on 10 GHz with an average path of 448 km (278.4 miles).

The "Italian Summer Experience" is both instructive and challenging. Yes, a fortunate combination of topography and amateur interest in the 10-GHz assignment has been partially responsible for their accomplishments. No, they have no corner on the 10-GHz market and as amateur interest in this band expands there are bound to be other areas of the world where the combination of choice topography and amateur population meshes to produce exciting new records. The Italian lesson suggests that when there is an elevated "launching site" at one end of the path with a clear shot at a large, stable body of water, the combination of considerable height at one end plus water over the majority of the path is a surefire combination. While the 3000-meter elevations in use by I amateurs this summer are certainly choice, other experience (notably in Australia up to 2304 MHz) indicates that such extreme elevation at one path end (or both) is not essential. In fact, experience with the much longer path from Hawaii (the elevated end) and California (the water table end) suggests that having both ends elevated is undoubtedly a mistake.

More importantly perhaps is that I amateurs have taken foreign (to them) technology and made it their own; the Microwave Associates Gunnplexers have sold well as basic 10-GHz building blocks throughout the world but MA tells me that fully half of the Gunnplexers have gone "overseas!" This sales figure combined with the apparent lack of activity by W/K amateurs in this band suggests that many of our own amateur experimenters are overlooking both a challenging and exciting "sport" by not spending time working with 10-GHz. Certainly with the ready availability of hardware on this side of the pond, plus a high amateur population density to work against, many of the obstacles faced by non-U.S. amateurs simply evaporate here. So to the Italian (and other European) amateurs who have taken an intense interest in bettering the amateur's understanding of new technology in a new portion of the shf spectrum, our hat is off to you. To American (and Canadian) amateurs who apparently have to date ignored the challenge of 10 GHz, a further challenge is presented. Most of the lower shf "records" now belong to the Australian amateurs. The upper shf records are rapidly becoming European records. Both groups are accomplishing their results with technology that is largely born in the United States and then exported before it is fully explored here. There is a message here!

Preamp vs Power Amp

Reader Raymond E. Elsner of Annapolis, MD, takes us to task for our September column in which we suggested that TWT amplifiers being widely touted for amateur service in the surplus market were effective boat anchors. As Raymond points out, the HP broadband, highgain, high-power microwave amplifiers (such as the 489A, 491C, etc.) were never designed for "small signal," low-noise service. In a 1970-era HP catalog sheet provided, he notes the specified noise figure in a 2-to-4-GHz range version of this unit was indeed 30 db. There are, however, at least several "small signal" series of similar TWT amplifiers around on the surplus market which did make low-noise claims in their original data sheets. The Watkins-Johnson 269-22 family, for example, is advertised in amateur surplus markets as a "low noise amplifier." At one point the unit probably did make noise figure specifications, but typically by the time it gets to the surplus market, the performance has degraded substantially although the voltage gain may still be quite good. So we stand on our earlier warning; if you aren't sure of what you are buying, don't spend any more than you can afford to "throw away" on a boat anchor!

*Rte 5, Box 364, Guthrie, OK 73044

Happenings

Conducted by W. Dale Clift,* WA3NLO

OSCAR Aids Search and Rescue

The Canadian Department of Communications, citing research obtained from using OSCAR-series Amateur Radio satellites, has announced an international program to evaluate a satellite-aided search and rescue system (SARSAT). Canada, the United States and France have agreed to cooperate in a program that will see Canadian and French eletronics packages put aboard U.S. National Oceanographic and Atmospheric Administration (NOAA) weather satellites, beginning in 1982, for a 15-month demonstration and evaluation. If successful, this trial SARSAT project should lead to the establishment of an operational international satellite-aided search and rescue system that would save lives of crash or marine emergency victims, as well as time, fuel and other costs associated with air-sea rescues. The ability of the system to dramatically reduce rescue response times to accident sites gives it potential for saving countless lives and decreasing the dangers to searchers. In 1975 and 1976, the DOC Communications Research Centre at Shirley Bay, ON, carried out tests using OSCAR satellites and simulated emergency locator transmitter (ELT) signals "to show that such a system could successfully pinpoint the location of crashes to within an accuracy of 10 to 20 kilometers, in a matter of minutes after the satellite first 'heard' the crash alarm."

The trial SARSAT will have three basic elements: one or more NOAA satellites, with their add-on Canadian transponders and French receiver-processors; a network of ground stations; and both operational and experimental ELTs and marine emergency position-indicating radio beacons (EPIRBs) carried by aircraft and ships.

The satellites will "listen" on the 121.5-MHz, 243-MHz and 406-MHz emergency frequencies used by commercial and military ships and aircraft. Within minutes after an initial alert is received, a fix, pinpointing the emergency site within 20 kilometers, is produced by ground computers. The information is flashed to rescue coordination centers, notifying them that an emergency has occurred and pinpointing the site. SARSAT works by measuring the varying Doppler shift in the frequency of the ELT or EPIRB signal as the satellite approaches, passes over and then moves away from a crash or emergency site. The high speed of the satellite produces an apparent increase in the frequency of the ground signal the spacecraft receives while it approaches, with a similar decrease as it moves away from, the source of the emergency signal.

The USSR is planning a similar system for its own satellites with a view to establishing interoperability with the SARSAT system. Other countries, as well, have expressed interest in cooperating in the program.

COMING UP: ARRL DIRECTOR/VICE DIRECTOR ELECTIONS

Every two years, full members of ARRL have an opportunity to select directors and vice directors to represent their ideas about how the League should be run. ARRL directors and vice directors are elected to represent specific geographic areas called divisions. (See page 8 of this issue to determine your division and the names of your director and vice director.) This year, nominations were open in the Atlantic, Canadian, Dakota, Delta, Great Lakes, Midwest, Pacific and Southeastern Divisions. The Executive Committee of the ARRL Board of Directors has declared the following candidates to be lawfully nominated and eligible for director:

Atlantic Division — six candidates for director: Jesse Bieberman, W3KT; G. W. "Bud" Hippisley, W2JJ/K2KIR; Harry W. Robinson, W2AZ; Lawrence J. Solarczyk, WA3TSD; Thomas R. Sundstrom, W2XQ; George S. Van Dyke, Jr., W3HK; and Dennis D. Voorhees, AD3O. Three candidates for vice director: Alan H. Komenski, AC2K; Harold C. Smith, K2HC; and Hugh A. Turnbull, W3ABC.

Canadian Division — three candidates for director: Fred Hammond, VE3HC; William W. Loucks, VE3AR; and A. Mitchell Powell, VE3OT. Three candidates for vice director; Aaron D. Solomon, VE1OC; H. Gordon Steane, VE3BMG; and Frederick H. Towner, VE6XX.

Dakota Division — one candidate for director: Garfield A. Anderson, KØGA. One candidate for vice director: Tod Olson, KØTO. Because there was only one eligible candidate for each office, the Executive Committee declared Mr. Anderson and Mr. Olson to be elected to the respective offices of director and vice director from the Dakota Division for the 1980-1981 term without membership balloting.

Delta Division — two candidates for director: Max Arnold, W4WHN, and Malcolm P. Keown, W5XX. Two candidates for vice director: O. D. Keaton, WA4GLS, and Lionel "Al" Oubre, K5DPG.

Great Lakes Division — three candidates for director: David E. Heil, K8MN; Leonard M. Nathanson, W8RC; and Jack E. Siringer, W8AJW. Two candidates for vice director: Tony W. DePrato, WA4JQS, and George H. Goldstone, W8AP.

Midwest Division — three candidates for director: Leland L. Bahr, WØVT/W9DRC; Paul Grauer, WØFIR; and W. R. "Randy" Rowe, Jr., NØTG. One candidate for vice director: Claire Richard Dyas, WØJCP. Because there was only one eligible candidate for vice director, the Executive Committee declared Mr. Dyas to be elected to the office of vice director from the Midwest Division for the 1980-1981 term without membership balloting.

Pacific Division — two candidates for director: Michael W. Delich, WA6PYN; and William J. Stevens, W6ZM. One candidate for vice director: Robert C. Smithwick, W6JZU. Because there was only one eligible candidate for vice director, the Executive Committee declared Mr. Smithwick to be elected to the office of vice director from the Pacific Division for the 1980-1981 term without membership balloting.

Southeastern Division — one candidate for director: Larry E. Price, W4RA. Three candidates for vice director: Frank M. Butler, Jr., W4RH; David Novoa, KP4AM; and Robert H. Reid, W4TK. Because there was only one eligible candidate for director, the Executive Committee declared Mr. Price to be elected to the office of director from the Southeastern Division for the 1980-1981 term without membership balloting.

Ballots have been sent to all full members of the League in those divisions where there is more than one candidate for either office. To be valid, they must be returned to Headquarters by noon, November 20. A committee of tellers will count the ballots and results will be announced over W1AW and in *QST*. Any full member of one of these divisions who has not received a ballot by November 1 should immediately get in touch with Marge Tenney or Perry Williams at ARRL hq.

COURT ARRESTS RADAR DETECTOR LAW

Superior Court Judge Joseph Ryan recently handed down a landmark decision which found the District of Columbia's law against radar detectors to be unconstitutional. Ruling in the case of *D. C. v. McGhee*,[1] Judge Ryan found that the law "infringes a citizen's Constitutional rights . . . in that it constitutes an invasion of a citizen's privacy, a denial of the citizen's right to know what officials of the government are doing, an illegal search and seizure of the citizen's property in an electronic

*Deputy Manager, Membership Services, ARRL

[1]Superior Court D.C. Criminal No. D 1506-79, June 26, 1979.

sense, a violation of the citizen's rights as retained by the people, and an enactment in excess of the powers delegated to the United States . . . "Practically speaking," Judge Ryan reasoned, "we are dealing with whether a citizen may possess in his vehicle an electronic device which in no way affirmatively intrudes upon the property or person of any other citizen. We are not concerned here with the citizen as an operator projecting any sort of beam or projecting any sort of electronic signal which would interfere with or in any way vitiate the electronic beam projected by the government, assuming that the government was legally entitled to project such beam.

"Drawing a parallel to the instant situation," the judge continued, "suppose a citizen kept a pair of binoculars alongside his seat and would observe through the binoculars far ahead the existence of a police speedtrap. Would our constitutional law sustain an interpretation that the citizen could be prohibited from carrying binoculars in the car?"

The District of Columbia argued that its basis for the law was its police-power interest in preventing speeding. However, Judge Ryan ruled that there was no evidence that the defendant was speeding or even had any intentions of speeding. "There is no reasonable relationship between the police-power objective and the end sought by the legislation. Even if there were such a valid relationship, the chilling effect on personal rights and liberties guaranteed by the Bill of Rights far outweighs any such legislative purpose."

[Editor's Note: Hq. occasionally gets requests for information on radar detector laws. While this case does not deal with amateur communications, it deals with legal issues which may or may not be applicable to cases involving amateurs.]

U.S. Senator Barry Goldwater (R-AZ), K7UGA, proudly accepts the Ham of the Year award from his fellow amateurs at the 29th annual Fort Tuthill Hamfest in Flagstaff. The award is sponsored annually by the Amateur Radio Council of AZ. Additionally, Governor Bruce Babbitt declared the week of August 5-11 "Amateur Radio Week." (*K7VOR photo*)

FCC "CENSURE-Y" CLUB

"Voice of the Voyager" Caught, WDØAYM Revoked

Michael J. Martin, WDØAYM, of Minneapolis, MN, recently had his Amateur Radio station license revoked and his Novice class operator's license suspended by FCC Administrative Law Judge Joseph Stirmer. In December 1977, Martin purchased a radio transmitter and, with a group of friends, began operating a "pirate shortwave radio station." Using 100 watts of power from two different locations in the St. Paul area, Martin broadcast on 5850 kHz to anyone who would listen, even though this was a frequency assigned for use by other radio services, including international military communications. He also broadcasted test transmissions and a few programs on 11,700 kHz.

These broadcasts were made at various times between December 1977 and August 1978 and included mystery theaters, music and talk shows. The station identified itself as the "Voice of the Voyager." Martin took program and record requests over a telephone "loopline" system by which he would dial a special number connecting him with telephone equipment in New York City. By giving out another special number, his listeners could call and be connected to his telephone line at the New York City terminal. He used this system so he could communicate directly with his listeners without giving the station's telephone number over the air.

The "Voice of the Voyager" received between 300 and 400 reception reports from the Eastern and Southern U.S., the West Coast and Central Canada. There were unconfirmed reports of reception in England. In order to evade detection, Martin used a Houston, TX, mailing address for the station. To mail QSL cards to listeners, Martin would mail them in a bundle to another address in Minneapolis, where they would be mailed in a bundle to Ann Arbor, MI. An individual in Ann Arbor would then break the packet and mail the cards to those who had verified Martin's reception.

Judge Stirmer noted that Martin's operation was difficult to locate. On 10 occasions, all 13 Commission monitoring facilities were engaged in monitoring and taking bearings in an effort to locate the illegal transmitter. Once Martin was located, the Commission issued a warning letter and violation notice, but the Judge found that willful and repeated violations continued. "Such violations are inexcusable, cannot be condoned and clearly constitute ample grounds for revocation of Martin's amateur radio station license and suspension of his Novice Class operator license," ruled Judge Stirmer.

In the "Order to Show Cause" why Martin's amateur license should not be revoked, FCC refers alternatively to possible violations of the amateur rules, including 97.7(e), 97.87 (a), 97.113 and 97.115. However, it appeared that Martin did not operate an amateur station and had never operated one. Rather, his conduct in operating the "Voice of the Voyager" without a license represents willful and repeated violations of Section 301 of the Communications Act of 1934, as amended. The Judge concluded, however, that since the facts in the case demonstrate Martin's unfitness to remain a licensee of the Commission, there are ample grounds for revoking his amateur station license and suspending his amateur operator's license.

PETITIONS FOR RULEMAKING FILED

The following is a brief summary of petitions for rulemaking filed with the FCC:

RM-3426, filed by Robert L. Rooney, Box 5, Fulton, NY 13069, seeks to extend the waiting period after failing an amateur exam to 60 days before it may be retaken. The present waiting period is 30 days.

RM-3454, filed by Albert S. Keltz, W2TXB, 41 Durkar Ln., Rochester, NY 14616, asks that the Commission give reciprocal credit for amateur license exam elements 4(A) and 4(B), and Commercial exam element 4.

RM-3455, filed by B. C. Auchincloss, Jr., KA6ATS, 2323 Santa Barbara St., Santa Barbara, CA 93105, asks the FCC to institute a means whereby U.S. citizens living abroad may take exams for Amateur Radio licenses by mail.

RM-3456, filed by Shannon Cisco

Edward G. Razer, W2ZI, received his 60-year ARRL membership award from A. G. (Bebe) Wentzel, W2HX, assistant director, Atlantic Division, at his home after an extended hospital stay.

WB4AZT, 116 Pender St., Suffolk, VA 23434, asks that the Commission change its rules to grant exam credit to applicants for amateur licenses if those applicants are former holders of amateur licenses.

RM-3457, filed by Jerry Falletta, WA2DWN, 661 Park Pl., No. 1, Elmira, NY 14901, asks the Commission to permit the retransmission of NOAA weather stations by amateur stations.

RM-3458, filed by Shannon Cisco, WB4AZT (see RM-3456 above for address), asks that the Commission make amateur upgrading more attractive by changing the amateur rules to permit Advanced class operators phone privileges from 3775 to 4000 kHz and 21,250 to 21,450 kHz; General class operators phone privileges from 3800 to 4000 kHz, 7200 to 7300 kHz, 14,250 to 14,350 kHz, and 21,300 to 21,450 kHz; Technician class operators phone privileges from 3950 to 4000 kHz, 7250 to 7300 kHz, and 28,600 to 29,000 kHz; and Novice class phone privileges from 145 to 146 MHz. The petition also proposes ew privileges to Novice and Technician class operators from 3650 to 3775 kHz and 7050 to 7150 kHz.

RM-3461, filed by the Ohio Area Repeater Council, 7025 State Route 188, Circleville, OH 43113, asks the FCC to require a special endorsement from the Commission for the setup and operation of a repeater station.

RM-3474, filed by the Johns Hopkins University Applied Physics Laboratory Amateur Radio Club, Laurel, MD, seeks amendment of the Amateur Rules to allow unattended automatic control of beacons and to restrict beacon operation power and frequencies.

The FCC will accept comments on these petitions on an informal basis; however, you must send a copy of your comments to the petitioner. Address your comments to Secretary of the FCC, Washington, DC 20554. Be sure to include the number of the petition at the top of the first page of your comments.

AUTHOR DENIED AMATEUR RADIO TAPES

The FCC has denied author James Reston's request for tape recordings and transcriptions of Amateur Radio communications between the People's Temple in California and the People's Temple in Guyana. Mr. Reston had intended to use the materials as research for a book about the mass suicide tragedy at the South American settlement.

In denying the request, FCC said that "one of the purposes of Section 605 *[of the Communications Act]* is to protect radio transmissions of a private nature," and "with the exception of emergency communications, amateur transmissions should remain nonpublic and divulgence by anyone who might happen to intercept them should be prohibited." Mr. Reston had sought recordings made by FCC personnel and by a private amateur operator.

Though the FCC had turned over some of the other information requested, it stated that the People's Temple transmissions "fall, without question, into the personal category and cannot be said to be for the use of the general public . . ."

SCANNERS, NOT HAM OPERATION, RESTRICTED IN NJ

The latest word is that it is against NJ State Law (2A: 127-4) to have a scanner in one's car which is "operative on frequencies assigned by the federal communications commission *[sic]* for fire, police, municipal or other governmental uses" unless one has a permit from the police. The State Assembly has passed the bill reinstating this law. Although this does not outlaw Amateur Radio operation from an automobile, it is a good idea to be able to produce an amateur license in case you are stopped by a police officer who confuses amateur equipment with police, fire or similar monitoring equipment. For more information, see "Happenings" in July, August and September 1979 *QST.*

LATEST ON FCC APPLICATION PROCESSING

The latest "Summary Report" from FCC's Private Radio Bureau on its application-handling processes indicates that the present turn-around rate is 21 days. Previously, this rate had been recorded as 20 days.

STAFF NOTES

The ARRL staff welcomes David R. Bristol, II, KA2BNV, as the new *QST* editorial assistant in the Production Department. His duties will include the editing of general interest articles, Strays and book indexes, along with other editing tasks. Born and raised in Meriden, CT, Dave comes to us following 22 years of duty in the U.S. Air Force. His travels with the USAF have taken him all over the world, including an extended six-year tour in Italy, from which he has just returned. Married, with two daughters, Dave enjoys all water sports and, of course, ham radio, which seems to be a popular hobby around here for some reason. Welcome back to Connecticut, Dave! — *Rich Palm, K1CE*

Edmund B. Redington, W4ZM, received his 60-year ARRL membership award at the Old Timers QCWA Annual Banquet in Gaithersburg, MD. The presentation was made by League President Harry Dannals, W2HD.

The World Above 50 MHz

Conducted By
William A. Tynan,* W3XO

Challenges

There's no shortage of challenges left in the world above 50 MHz. Some may argue with this statement, contending that now that there are over a dozen 2-meter WASs and two on 70 cm, there just isn't much left to accomplish on the vhf bands. Others may point to the swelling 50-MHz WAS list for support of their conclusion that everything has been done that can be done. In this conductor's mind, that's like a proposal back in the 1860s that the U.S. Patent Office should be done away with because everything had already been invented. No, there's no shortage of challenges in our chosen niche in Amateur Radio. Let's enumerate some and thereby, perhaps, inspire people to set about the task of accomplishing them.

Now that WAS has been achieved on both 2 meters and 70 cm, what about that other prestigious award, DXCC? Who will be first to work 100 countries on any vhf band and which band will be the one it is made on first? Remember, don't say that it can't be done! These are very dangerous words and anyone uttering them in connection with vhf/uhf endeavors may some day be required to eat them. Who will be the first to span the Atlantic on a frequency above 144 MHz without benefit of moonbounce or man-made satellites? VE1ASJ and G4DGU had encouraging results in their attempt during last August's Perseids. How about bridging the Pacific from the West Coast to HI on the bands above 1 GHz? The Gulf of Mexico offers another place to exercise these bands as do the Atlantic and Caribbean areas. For the Westerners with their rugged terrain, how about trying mountain bounce on one or more of the microwave bands.

Those who earned WAS on 2 meters and 70 cm utilized a combination of EME and other modes to amass the 50 states. How many states can be worked without using the moon? Can the 48 continental states be worked using terrestrial propagation modes alone? I don't know, but it sure would be interesting to try.

And there are a myriad of purely technical challenges awaiting inquisitive experimenters. Last month, I discussed the great improvement possible in ultra-weak signal reception by taking advantage of computing capabilities now available to us with the advent of the microprocessor. Development of such techniques is certainly worthy of being considered a technical challenge. But there are others that I can think of immediately. How can stable high power be obtained on the bands above 1 GHz? Maybe those magnetrons used in microwave ovens offer one approach but a lot must be done to tame those beasts. We are in great need of the equivalent of an "RIW" amplifier for 1296 or 2300. What about low-noise preamplifiers for those bands? Help is on the way in the form of inexpensive high-performance devices but it will be up to the hams to put them to use in our specific applica tion. Will the noise figure sessions at vhf con ferences a few years hence be dominated by 1.5-dB units for 5600? Who knows? Of course there are innumerable challenges in the field o antennas for the higher bands. What about ac tive phased arrays as are being used in modern radars?

The field of propagation offers a continuing technical challenge to the vhf/uhf amateur Whether discovering hitherto unknown modes such as was recently done in the case of FAI, o trying to explain modes we have been using fo years, as is being attempted by several for Es or merely learning to best utilize well understood modes, hams, because of thei great numbers and wide distribution, are in a unique position to contribute to man's storehouse of knowledge of the behaviour o the electromagnetic waves which make up the radio spectrum.

These have been just a few ideas fo challenges yet to be accomplished. It is hoped that presenting them will kindle the spark in those with the drive and ability to overcome them and show the rest of us the way. There are certainly many more challenges that I have no mentioned. Pass along your thoughts fo others and I will be happy to air them.

In the meantime, let's get moving!

THE STANDINGS BOXES

Next month's column will include the 2-meter standings box. This will be the first time that this box employs the format announced last April. It is suggested that readers reread that column to refresh their memories as to the new format and guidelines. Due principally to the extremely good conditions prevailing during August and the first half of September, the volume of updates for the 2-meter box was the highest ever. Nevertheless, I am sure that many more stations improved their records than were heard from. The following is a compilation of the number of updates received in 1979 by call area: 1-nine, 2-seven, 3-ten, 4-twelve, 5-eleven, 6-one, 7-none, 8-five, 9-nine, Ø-13, KH6/KL7-two, VE-three and DX-two. Many submitting information are not listing their call-area totals; if they don't provide me with a complete list of stations worked, including VEs, XEs and DX, I have no way of knowing how many call areas they have. This goes for those who have achieved 2-meter WAS. Most of these have stopped reporting since they snagged their 50th state. But, since all of them have EME capability, it seems clear that they have worked some DX in addition to their 50 states.

Many stations, which I have never heard from since assuming the responsibility for the column in April 1975, will appear on the standing list. As stated last April, such stations will be dropped from the standings the next time it appears, probably May 1980. Those with WAS need not worry; they will not be dropped. Nevertheless, I would like to hear of their continuing activity. As emphasized in the April 1979 column, one does not need to improve his total in order to remain in the standings. If you haven't worked any new states, simply say so and indicate your desire to continue in the box. I would appreciate receiving a complete listing of each state and country worked with the station you consider the one you want as credit for the particular state or country. Please include one for each VE and XE call area. With this information, even if you don't provide your totals, I can easily calculate them. Once again, I would prefer that your report be on the forms I have developed for the purpose, or in a similar format. An s.a.s.e. to me will bring copies of the form. What I do not like to see, are reports on small bits of paper or buried in letters. Such reports are too easily lost. I will, however, continue to process all submissions no matter how presented. It's simply a matter of my batting average.

All stations active on 2 meters and above are urged to submit reports. It is expected that many calls will disappear from the box the next time it appears because of lack of response. This will make way, in the 25-per-call-area formula, for newer active stations, which is the way it should be.

*Send reports to Bill Tynan, W3XO, P. O. Box 117, Burtonsville, MD 20730 or call 301-384-6736 and record your message.

BEST TROPO SESSION EVER!

That's how many are referring to the huge tropo opening which took place just before the September VHF QSO Party and continued until a few days thereafter. Jim Stewart, WA4MVI, who has access to FAA meteorological charts and has been studying weather patterns and how they affect vhf propagation for several years, turned in the following description of the event:

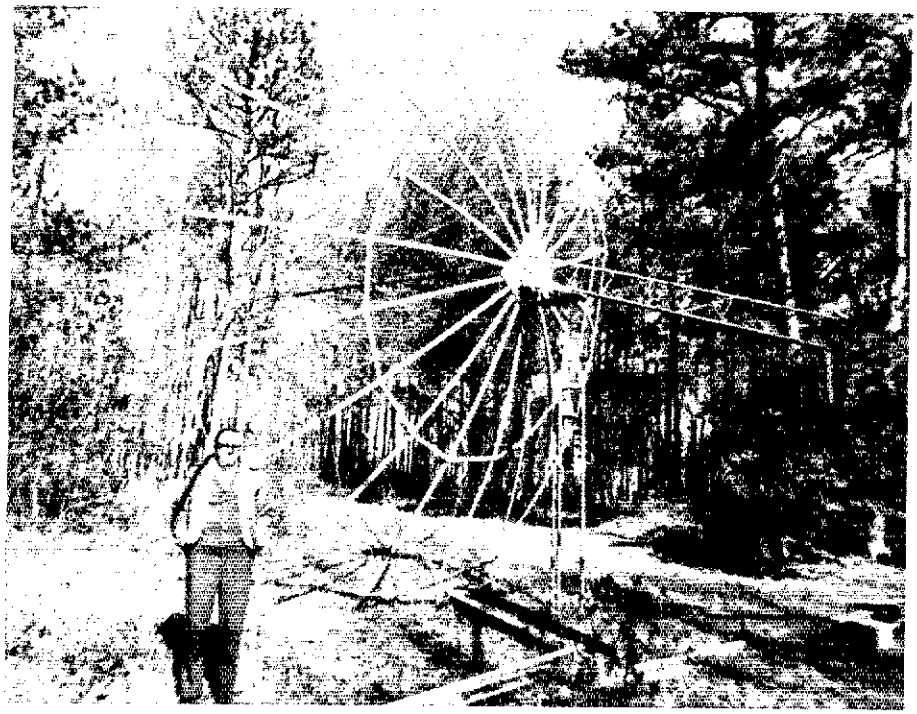
"The tremendous widespread band openings experienced during the September VHF Contest weekend and beyond will long be remembered as one of the most remarkable and best yet. For several days stations were working from Texas to Connecticut and Michigan to South Carolina on 144 and 432 MHz!

"Conditions were excellent for many stations to boost their states-worked totals to new heights in only a few short hours. Contest scores also soared to new record levels and for those who persisted after the contest ended, even better conditions appeared the next day.

"For those who wonder in amazement at the mechanisms responsible for such an occurrence perhaps to be alert for some future repetition, we can offer some evidence which places this event in the tropospheric or 'tropo' category in which the atmosphere 'traps' vhf/uhf signals and conducts them along. A blanket of warm air around 4000 ft provided a sharp boundary layer above a cooler base over almost the entire East Coast from September through 10. The entire East Coast was void of turbulent weather, and from the Mississippi to the Atlantic high barometric pressure yielded calm and pleasant weather.

"All National Weather Service upper air sounding stations sampled showed a strong temperature 'inversion.' The atmosphere usually cools with increasing altitude but inversions occur when odd layers form. In this situation, the air cools with altitude up to a point then the temperature warms abruptly forming a sort of 'waveguide' effect. In this opening the layer warmed about 12 degrees around 4000 ft and signals sounded 'like locals' for up to a thousand miles and more.

"Such occurrences are common in the autumn months but seldom is such a large area included. Many alert vhf operators have developed the knack of watching for certain clues which suggest that something may be imminent. Observing the presence



The unusual but effective 2-meter EME antenna system at WB5LBT. Bob's array consists of 16 7-element loop Yagis on a polar mount.

of slow-moving areas of high pressure and large areas of nonviolent calm weather followed by a front on the western boundary, local effects, such as pronounced layering of haze and cooler than seasonal nights, and calm wind conditions will often announce good tropo conditions."

Others were equally enthusiastic in their description of the conditions prevailing between September 8 and 12. K1HTV, near Hartford, CT, noted that the opening did not begin in his area until late Sunday evening, September 9. Rich said that they could hear N6NB/1, Mount Equinox, VT, working Midwest stations but did not get into it themselves until 0400 UTC, September 10. At that time he and his son WB1ALW, who was sharing the rig, started working 8s, 9s and Øs on 2 meters. The following morning, about 1100 UTC, they worked WD5CRK and a half dozen other OK stations on 2 and at 1230 UTC heard K5SW on 70 cm. Frantic calls produced no results, the same as attempts to work 70-cm stations the previous evening. The problem was later traced to a shorted coax. Nevertheless, K1FO was alerted, and Steve hooked up with K5SW for state number 21 on 70 cm. The night before, K9KFR, IN, and NØIS went into K1FO's log for states 19 and 20. After spending a few hours at work, Steve came home about 2115 UTC, September 10, and worked a string of NC stations on 2 meters, as well as a number of SC and GA stations later in the evening. On 70 cm, WA4CQG, AL, and W4ISS, GA, were worked that evening for states 22 and 23. K1FO laments the scarcity of 1-1/4-meter activity but he does report working K4EJQ, TN, for state number 17 on that band. The next evening, conditions were especially good toward MI and VE3 from the Washington area on 2 meters. When this conductor switched over from 2 meters to 70 cm to attempt a sked with W8IDU, I found WA1NGR/3, DE, working MI stations WA8HGX and WB8BKC on ssb. I broke in and easily worked both as well as W8IDU. During the contest, the most outstanding 2-meter signal here, especially considering the distance, was WB4LHD/5, AR. It was particularly interesting to hear and work that station via tropo on 6 meters. This is the greatest distance I have ever heard tropo signals on 6 meters.

Reports on this opening have been far too numerous and lengthy to include them all, but here are a few additional tidbits which should give an inkling of the strength and extent of this particular tropo occurrence. W9IP, IL, reports working during the contest 500 stations in 38 sections on 2 meters, including all of New England except NH and ME, 24 sections on 70 cm, running just 10 watts, and 32 sections on 6 meters. Mike's section multiplier of 101 was rounded out with seven sections on 1-1/4 meters, once again attesting to the less than desired activity level on that band. If properly populated, 1-1/4 could very well have outperformed both 2 meters and 70 cm under such conditions. VE3UH worked a number of AR, OK and TX stations. One of the latter was W5GVE, who reports working both John and K2LWR, WNY. It's a long way from Corpus Christi to the Niagara frontier! WØFY, St. Louis, terms it "the wildest vhf contest he has ever been in." Between 0200 and 0345 UTC Sunday evening, Joe worked 72 stations on 2 meters in KY, IL, IN, OH, WNY, NNJ, WPA, MD, VA, NC, MI, TN and VE3. He notes that to the west was pretty much of a void, although he did QSO one station each in KS, OK, TX and IA. NE, MN, WI and the Dakotas, which are a normal staple from his QTH, were not even heard. WØFY pleads for more cw. He knows he missed many stations in the bedlam.

Yes, it was a fantastic weekend for those fortunate enough to be located in the broad area covered by the opening. Others, such as many New Englanders and VE3FN, Ottawa, did not fare so well, however.

A few days before, another fine tropo session took place. In fact if it were not for the mighty September 8 through 12 fireworks, it would have probably been afforded the lion's share of column space this month. This one, reported by W2PGC, near Buffalo, took place the evening of September 4/5. On that occasion, Sam worked a total of 113 stations on 2 meters and 16 on 70 cm. Included in the 2-meter ranks were 45 stations in IL, 20 in IA, 13 in WI, 12 in IN, 11 in MI, two in MO and one in SD. On 70 cm, contacts included three stations in IA, MI and WI and six in IL as well as a VE2. One of the IA stations Sam worked was running only 2 watts.

ON THE BANDS

6 Meters — No F2 in this part of the world as of mid-September but it certainly is on the way. The 28.885-MHz liaison frequency has already come back to life and the 1700 UTC Sunday net on that frequency is back in business. W6XJ reports frequent reception of ZL and VK video on 45.25 and 46.25 respectively. KH6IAA has been experiencing regular nightly openings to H44. KZ5NW, who will be signing HP2XPW by the time this appears in print, has begun to hear TE signals from South America. We should be in for our first good opening to Europe or South America about the time you read this. It is hoped that ZB2BL will be back on soon. Jimmy has been moving. He picked the right time to do it. Incidentally, his QSL manager for 6-meter contacts is now W2UTH (and his daughter WB2AKA). Those lucky enough to work ZB2BL should send cards with s.a.s.e.s to the W2UTH QTH listed in the *Callbook*.

The Es season lingered on into September. The second was one of the best days of the latter part of the season, producing widespread double hop, particularly from southern CA to the southeastern part of the country. W6XJ worked a string of 4s on that occasion. In addition KH6s NS, IAA, FLD and BZF worked a number of West Coast stations as well as some Midwesterners. A few days earlier, beginning at about 0630 UTC September 29, WA8TTS reports a KL7 opening following an aurora. Tom says that, in addition to himself, WD8RZG, K8III and K8NXI took part, working KL7NA, WL7ACY and WL7AFA. Special WAS 50-MHz certificates continue to be issued. The latest to join this group are WB5DSH, WA7VIS, AB6H, WB7EAX, N2ASC (the first two to get a 50-state award), WB7TOV, WA2DPU and W3ILG. Congratulations, gang. I'll publish the complete list of 50-MHz WAS holders in a few months.

2 Meters — That tropo session the weekend of the contest dominates the 2-meter news this month, but there were several other interesting happenings. More raves came in on the Perseids. One of the biggest success stories comes from WA4LYS, FL. Paul reports picking up 14 new states plus KP4EOR. He would like to work CO and NM before taking the EME plunge and is available for skeds. Call 904-641-2358. Certainly the most fascinating m.s. tale comes from VE1ASJ and G4DGU. Operating from a portable location at approximately 50 degrees north and 5 degrees west, G4DGU, assisted by a group of avid UK vhf operators, ran skeds with Andy 2800 miles (4483 km) away in St. Johns, NB. While they did not succeed in completing a QSO, both heard identifiable bursts from the other. Typical bursts were about 0.75 seconds in length with signals just barely out of the noise. The prospect of a 2-meter terrestrial contact across the Atlantic is an exciting one indeed. Good luck in future tries.

Al, WB5LUA, joins the parade of 2-meter operators who have completed contacts with all 50 states. An EME QSO with W1XJ, RI, did the trick. But W1XJ wasn't finished satisfying the needs of hungry state-hunters. A few hours after working WB5LUA, he completed another moonbounce contact, with K5GW, who thus becomes the latest to work all states on 2 meters. Congratulations, Al and Gerald.

1-1/4 Meters — WA8EUU, MI, writes that he, along with WB8BKC, WA8VPD and W8IDU, is active on ssb regularly from the Detroit area. All are running 100 watts and up and concentrate their operation on Tuesday evenings from 2100 to 2300 local time. Stations worked from time to time include K8DW, W8UB, W8CSW, K8ATQ, WA8PKB, WB8PAT, K8ZES, VE3BQN, W3GNR, WB9SNR, W9UD and WØVB. On several occasions, K8ATQ puts in an S9 signal from the Cleveland area despite running a mere 300 mW.

DE is available on the band. WA1NGR/3 has an ssb rig and is always looking for customers. K1LPS, VT, also tells me that he has equipment going on 1-1/4. Other stations reporting recent ssb/cw activity include K1FO, CT; K2CBA, NY; K4LHB, VA; K4EJQ, TN; W9IP, IL and K5FF, NM.

70 Cm — The second 70-cm WAS goes to K2UYH as a result of an EME contact with WA7DKZ, WY. Congratulations to Al, who, like WØYZS (holder of 70-cm WAS Number One), has worked very hard at this project. K2UYH has also worked extremely diligently to promote 70 cm in general and EME in particular so his achievement of WAS is especially fitting. The next question is, who will be number three?

In addition to the extensive tropo, which took place over the weekend of the contest and a few days thereafter, reported on earlier, 70-cm EME enthusiasts hit it lucky the evening of September 7 (the 8th UTC). Both K2UYH and K1LPS reported exceptionally good conditions. K1LPS noted solid "armchair copy" from SM6CKU, ZE5JJ, K3NSS, DL7YCA, VE7BBG, W5FF, WA7BBM, WB5LUA and K2UYH. A contact was completed with W5FF in about 12 minutes but various things prevented additional QSOs.

WØOHU recounts an interesting tropo contact in early August. It was with AG9U, Chicago, 290 miles distant. AG9U was running just 3 watts to a 6-element Yagi which he was holding in his hand pointing out his window. Nevertheless, he was putting in an S8 ssb signal. Perhaps the fact that AG9U was located on the 90th floor of the Hancock Building had something to do with his success! Incidentally, WØOHU thinks that more 70-cm operators should observe uhf TV signals as an indication of band conditions. He suggests using the simplest of antennas such as the loop on the back of the set. He also recommends that people call and listen on the hour plus or minus five minutes, thus maximizing the chance of working someone during times when activity is low. QST

Coming Conventions

November 17-18
Florida State, Clearwater, FL

1980

January 4-6
North Florida Section, Orlando, FL

January 26-27
Southeastern Division, Miami, FL

ARRL NATIONAL CONVENTIONS

July 25-27, 1980
Seattle, WA

March 13-15, 1981
Orlando, FL

FLORIDA STATE CONVENTION

November 17-18, 1979, Clearwater, FL

The ARRL Florida State Convention will take place this year at the Sheraton Sand Key Motel on Clearwater Beach, November 17 and 18. This year's event will combine the best in new commercial equipment displays from Amateur Radio's friendliest dealers with a larger than ever swap area. An ICOM 710 hf station and other prizes too numerous to mention will be awarded.

The latest update on WARC proceedings is just one of the interesting forums we have scheduled. FCC exams Saturday at 9 A.M. Please mail FCC Form 610 to the Tampa office by November 9. (Note on the form that the exam will be taken at the ARRL Florida State Convention, Clearwater, FL.) Ladies events both days, luncheon and style show Sunday (gents welcome). First prize is a microwave oven, as well as many other prizes — tickets $5. QCWA Gator Chapter will host the Saturday luncheon; all hams and guests welcome — tickets $6. Saturday evening we have planned a banquet for your entertainment pleasure — tickets $9. Swap tables $10 (all sold in advance) for both days; no one-day tables. Parking should be no problem, as we have arranged for off-hotel parking at Highway 60 and Missouri Avenue (main road into town from U.S. 19 and I-4). Courtesy buses will run on demand both days for duration of hamfest. The last bus after show closes will run until all have been served.

We have arranged for special room rates at $30 double, per day; extra person $4, children under 18 free. Hamfest donation $3; each advance registration includes a special award. Please make all reservations through and checks payable to FGCARC (Florida Gulf Coast Amateur Radio Council, Inc.), P. O. Box 157, Clearwater, FL 33517. Telephone Ham Convention and Motel Reservations direct to 813-461-HAMS. Talk-in 37/97 and 223.34/224.94. QST

50 Years Ago

November 1929

☐ The Editor quotes a Federal Radio Commission document which, in denying commercial requests for certain frequencies, tosses a few bouquets to amateurs for their pioneering of short waves and their discipline in self-policing.

☐ Bev Dudley says the absorption wavemeter is no longer capable of sufficiently precise measurement, and describes a heterodyne frequency meter to fill the need, using the Standard Frequency System broadcasts.

☐ Our beloved Hiram Percy Maxim was surprised on his 60th birthday with more than 700 messages of greetings from amateurs and organizations around the world.

☐ We're getting to the season of increased ham radio interest, and Dudley shows a pair of 201As in a "detector and one step" receiver circuit which a novice can build as a starter.

☐ What really goes on inside the glass envleope when a tube breaks into oscillation? W3LW starts with the tuned-plate, tuned-grid circuit and takes us through the fundamentals.

☐ Technical Editor Lamb says the new UV-845 is not designed for r.f. use, but in audio applications outperforms other 50-watters like the UV-211.

☐ The lack of fabricated shield boxes is no problem if you follow the advice of H. D. Pendleton on bending and forming your own metal enclosures.

☐ The formulas and graphs look a bit overwhelming, but K. S. Weaver of Westinghouse provides some very useful information on distortion effects on power-tube output.

☐ W1BFT is among many submitting impressive lists of "Calls Heard."

Hamfest Calendar

Indiana: The Allen County Amateur Radio Technical Society announces their seventh annual hamfest Sunday, November 18, at the Allen County Memorial Coliseum on U.S. 30, Fort Wayne, IN. Indoor exhibition and giant flea market space, over 3000 parking spaces, prizes and forums. Admission $3 at the door, $2.50 in advance. Children under 12 free. Table (3 × 8 feet) rental $4. Reservations from ACARTS, P. O. Box 342, Fort Wayne, IN 46801. For confirmation include s.a.s.e. Talk-in on 28/88, 25/85 and 52.

***Louisiana:** The North Louisiana annual hamfest, sponsored by the Twin City Ham Club of Monroe and West Monroe, will be held Sunday, November 11, 8 to 3, at the West Monroe Civic Center, North 7th St. and Ridge Ave., West Monroe. Swap tables, displays, information, prizes and recreational vehicle hookups available. Tickets $1. Call-in on 25/85, 52 and 3910.

Massachusetts: The Framingham Amateur Radio Association will hold its annual fall flea market on Sunday, November 11, 10 to 3, at the Framingham Police Station drill shed. Admission $1, sellers tables $5. Sellers are advised to preregister as tables are limited. Talk-in on 75/15 and 52. Contact Ron Egalka, K1YHM, P. O. Box 3005, Saxonville, MA 01701. Tel. 617-877-4520.

Maryland: The Columbia Amateur Radio Association will hold its third annual hamfest at the Ellicott City National Guard Armory (east of Rte. 29 on Rte. 103) on Sunday, November 25. Doors open at 6 for exhibitors and 8 for the public. Admission $2, tables $5. Food and prizes available. Talk-in on 73/13, 16/76 and 52. For table reservations and info write: Sue Crawford, N3SC, 6880 Mink Hollow Rd., Highland, MD 20777.

Michigan: The Oak Park High School Electronics Club presents a Swap 'n Shop on Sunday, November 25, at Oak Park High School, 13701 Oak Park Blvd. Donation $1.50, table $2.50. Refreshments and prizes.

***Ohio:** The Defiance County ARC is sponsoring their second annual hamfest on Sunday, November 4 at the Defiance County Fair Grounds in Hicksville from 8 to 4. Tickets are $1.50 in advance and $2 at the door. Talk-in on 69/09 and 52.

Ohio: The 22nd annual Auctionfest '79, sponsored by the Massillon ARC, will be held November 18, from 8 to 5, at the Massillon Knights of Columbus Hall. Flea market opens at 8, auction at 11. There will be prizes, displays and talk-in on 52. Tickets $2, advance table reservations $1 per table from: Joe Turkal, K8EKG, 1234 Concord N.W., Massillon, OH 44646.

Pennsylvania: The R. F. Hill ARC third annual indoor winter hamfest will be held at the National Guard Armory, Sellersville, PA, on November 11, from 9 to 5. Admission $2 (women and children free). Exhibitors $3, dealers $6. Exhibitors and dealers bring your own tables. Prizes, refreshments and heat. Talk-in on 28/88 and 52. For info contact Andrew Williams, WB3FIY, 716 W. 3rd St., Lansdale, PA 19446.

Pennsylvania: The Foothills ARC of Greensburg will hold its annual swap and shop Saturday, November 3, at St. Bruno's Church in South Greensburg. All facilities indoors, prizes. Talk-in on 07/67. QST

*ARRL Hamfest

Strays

W2TB IS FINE

☐ Charles E. Gardner, W2TB, of Bayside, NY, assures us that he is fine and on 3780 ssb daily. He was mistakenly reported as deceased in the QCWA June 1979 roster.

I would like to get in touch with . . .

☐ hams in the Cleveland, OH, area who are interested in forming a net for sharing microwave technology. Contact Paul V. Maynard, WB8QXV, 11841 Coves Rd., Chesterland, OH 44026. Please enclose s.a.s.e.

☐ hams or anyone else in the Eastern PA area who is interested in experimenting in the 1750-meter band. Contact Terry Frederick, WB3EZH, 229 Noble St., Sonderton, PA 18964.

25 Years Ago

November 1954

☐ Some of our sideband amplifiers produce distortion sufficient to cause unwanted spurious signals and resultant interference. Warren Bruene of Collins shows us some of the cures.

☐ The Baltimore club took advantage of Maryland Amateur Radio Week with an A-one job of public relations projects.

☐ Some folks won't like the potential radiation from W2ZKE's superregen receiver for 10 meters, but perhaps the miniscule power will keep it under control.

☐ Build your own panoramic receiver with a regular scope and a modification of the BC-453 surplus unit, says W4CUU.

☐ The Editor extends best wishes to George Sterling, W3DF/W1AE, retiring as a Commissioner after a long and illustrious career in communications engineering and regulation.

☐ W9NVC digs down deep in the principles of generating single sideband signals using crystal-lattice and half-lattice filters.

☐ Novices (and others) who own the popular S-76 receiver can improve its performance using suggested modifications provided by W1ICP.

☐ Sooner or later a c.w. fan wants to try voice, and W1JEQ has designed a 25-watt modulator you can use when the bug bites.

☐ The 813 finds widespread acceptance as an efficient amplifier, especially with its low drive requirements, and W6KEV shows his neat construction job of a multiband final.

☐ W2JXM's "break-in with one antenna" gadget has been simplified in a design by WØLLQ, saving a couple of tubes. — *W1RW* QST

YL News and Views

Conducted By Jean Peacor,* K1IJV

The Only One on Your Block

Upgrading is in! You can be the only one on your block to hold the coveted Extra Class. All you need is motivation.

How many Novices have fallen by the wayside never to upgrade? If only they'd hit the books a little harder. How many have just plain given up on the code? If only they'd stayed with it until the clanking of radiator pipes and other earthly sounds automatically translated into letters of code in their minds. How many are just content with the status quo? Who needs those Extra privileges? Truth is, we would all like them. The privileges are available for all. Earning them is something else; a challenge and an experience.

True to the amateur's code, you can find radio amateurs everywhere more than willing to share their knowledge. Just ask. Radio clubs are outdoing themselves in providing all kinds of theory classes. So many are giving so generously of both talent and time it is almost as though they would even supply you with the motivation if it were within their power. Would that they could, but it has to be done by you.

Many YLs have accepted the challenge. "It was the thrill of the challenge plus stubbornness that finally got me the Extra." That's how Monita McLemore, AK5H, from Jackson, MS, summed it up.

Flashing back, it wasn't all easy. Monita's OM, Harry, is WB5FLP. They both thoroughly enjoy new challenges and have undertaken many. One summer's project produced a family-built sailboat. Another time, they built a harpsichord (Monita has a master's degree in piano). The whole family took a course in scuba diving, becoming certified in that field. All new challenges. Then seven years ago Harry built a radio receiver. He did it alone.

As Harry progressed toward becoming licensed, the rhythmical sound of Morse code suddenly fascinated Monita. She helped in the taping of code lessons and while driving on trips, they both learned. Radio became an unexpected challenge.

With Harry's encouragement, Monita became a Novice. Listening to cw QSOs became her hobby. Through listening, she discovered that some operators even made mistakes and survived. That's when she took to the airwaves.

Harry and Monita lived in Little Rock, AR, up to this point. Following a move to their present QTH, they both obtained General and then Advanced licenses.

The Extra Class? Too much! It looked impossible to retain all that theory and keep your code speed up at the same time. But, late last summer Monita learned of the rule change allowing one to keep code credit for a year. Here was the irresistible challenge. With some extra time during the summer (she teaches general music during the school year plus private piano lessons), study became her number 1 project for the next three weeks. Her immediate aim was to pass the code test but she intended to give the theory a good try, too. She passed the code test 100 percent; missed the theory by two questions. Disappointed? She was elated! If you can come that close, all that was necessary was to redouble her efforts. She did it!

Monita is already considering her next challenge: Homebrewing. What better way to retain all her hard-earned knowledge and learn more in the process.

My intent when I began this article was to hopefully provide the motivation for one more YL to head for her Extra Class. It's already succeeded. I've just motivated me!

RESULTS — DX YL TO NORTH AMERICAN YL CONTEST

"The DX YL to North American YL Contest is my favorite. The increase in YL activity makes it a better contest each year." These are comments from Patricia Williams, WB4PRM, whose QTH is Rockmart, GA. Her score of 79 gave her first-place honors for North American YLs in the cw portion. First-place cw DX YL award goes to IIMQ, Ada Richetti Garibaldi of Italy.

"My Favorite Contest" Patricia Williams, WB4PRM.

First-place ssh in North America winner is Donna Menart, WB9ZBE, from Wisconsin with her score of 1485. Donna comments: "This was my first try at a YL contest and I know it won't be my last. It combined my two favorites — DX and working YLs. I'd like to see many more YLs taking part." First-place ssh DX YL award was won by PS8YL, Teresinha V. Nobre from Brazil; score 4180.

Certificate winners: N. A. ssb — WB4PRM, 1373, second place; WD5FQX, 1317, third place. DX ssb — LX1SM, 2501, second place; DJ1TE, 2485, third place. N. A. cw — K1NEI, 72, second place; WA2DMK, 15, third place. DX cw — F9IQ, 165, second place; YK3KS, 100, third place.

Mark your calendar now for next April's contest. It is a great opportunity to meet worldwide YLs.

"Contests Foster Goodwill" Donna Menart, WB9ZBE.

SMILE AND THE WORLD SMILES WITH YOU

Sunny Sherri Bicknell, WA1HFJ, received her Novice license in 1966. Blind since birth, it was while attending Perkins Institute in Boston that she met several radio amateurs. Their encouragement and help inspired her to become licensed. What a wonderful way to keep in touch with present friends and to make new ones.

Many hams helped her along the way. It was not always a bed of roses, such as the time that her transmitter went up in smoke. But, undaunted, Sherri received her General in 1967.

College followed at Lighthouse in New York. She has pursued an interest in writing and more recently, attended classes in the use of an Opticon. This miraculous machine enables her to now read most books. Through scanning the pages and producing a series of vibrations which she translates, an entire new world has come alive for her since not all books are Brailled. Sherri provided an exciting demonstration of this at WRONE's spring meeting and again at the Grafton Lions' Club.

The recent acquisition of a Triton II finds her on the airwaves often as of late. Cw on 40 meters is a favorite. To quote her: "A blind person must feel good about themselves and have a sense of humor." This attitude will shine right through your antenna when you QSO Sherri. QST

"Keep a Sense of Humor" Sherri Bicknell, WA1HFJ.

*Country Club Dr., Monson, MA 01057

In Training

FUNDING AMATEUR RADIO IN PUBLIC SCHOOL SYSTEMS

Imagine this: Before you stands a public-school building with two 40-foot towers supporting a tri-band Yagi each and several vhf arrays. Strung between the towers are dipoles for 80 and 40 meters. A long wire stretches high above the playing field to a tree on the far side of the grounds. Inside is a shack boasting two complete operating positions as well as three auxiliary listening stations and several cassette tape recorders for code practice. Along the walls are library shelves laden with Amateur Radio publications, world maps, operating awards and a sizable collection of QSL cards.

Sound too good to be true? It might if you are a public-school teacher who has attempted to convince your local school administration to purchase such "extravagances" from the school's yearly budget — especially now with many schools experiencing massive cutbacks in spending for extracurricular activities. But not if you are one of the growing number of teachers who have written successful grant proposals, talked local manufacturers into donating materials or used any of a number of other available fund-raising techniques.

Want to Know More?

There are four commonly used ways of funding Amateur Radio in your school system: an Elementary and Secondary Education Act Title IV grant, other state-funded educational grants, your school's local budget and donations from the private sector. You may wish to try one or all of these methods to raise the necessary money to get your program going. The key to success lies in tailoring your request to the donor's interest or needs.

Grants

When approaching the subject of grant funding, perhaps the best place to begin is to determine what is available within your state. Even federally funded grants such as E.S.E.A. Title IV are administered by each state's Department of Education. There will be some variance from state to state as to what programs are successful in acquiring a grant.

Forty-meter operating position at Ridley South Junior High Amateur Radio station, WB3ESG. The station is a part of a Learning Enrichment Program under the direction of Dr. Arthur Smith, N3DR. Students are (top to bottom) Leo Ryan, WB3KEK; Walt Green, WB3LRS and Edmond LeDonne, WB3KQS. *(WB1ADL photos)*

Ridley South Junior High Amateur Radio station, WB3ESG. Notice some of the older, donated equipment. Operators are (left to right) WB3EXI, WB3DWB, WB3EWZ, WB3EQP, WB3EQJ, WB3EXE and WB3WQI.

In doing the research for this column, it was found that the Connecticut Department of Education's grants office was very helpful not only in detailing what was available but also in giving advice as to how to write a proposal and which types of programs were likely to be favored this year. For instance Title IV, Part B is allocated to library materials and equipment; Title IV, Part C is given to "Innovative Programs" that serve as models for the state's educational programs. Since Amateur Radio is already funded in one program in Connecticut, any new proposal would have to be very different from the current one in order to receive funds under Title IV, Part C. I suspect that each state's Department of Education office gives equally fine service (hopefully) and a little time on the telephone will save a lot of time and effort in writing your proposal. Ask what types of programs involving Amateur Radio have already been funded.

You might also want to ask what they like to see in a written proposal. Sometimes, simply how well a proposal is written is the determining factor for funding acceptance. The people who process the applications can tell you what *they* think a well-written proposal contains. The advice we were given is that each grant proposal should contain (in concise and well-written form): (1) justification of the *need* for the program, (2) clear objectives of the program, (3) a description of what the program hopes to accomplish, and (4) a plan for evaluation of how well the program's objectives were accomplished.

Creative Approaches to Amateur Radio

Devising a program for funding is a great chance to be creative. Amateur Radio lends itself well to an amazing number of approaches. Here are excerpts from a successfully funded program developed by Charles Burke, Jr., WA2SLK.

"The field of electricity/electronics is rich with career opportunities especially here in the state of New Jersey. According to current statistics, the third largest industry in the state is electronics . . . Unfortunately, most persons employed in the field are male — and almost exclusively so at the higher income levels . . . While career opportunities are plentiful, there is a perplexing situation existing within the public educational institutions. Due to a lack of interest, only one of the county vocational school centers now offers a course in electronics. Only one of the centers offers a course in electrical trades.

". . . [Another] problem deals with the absence of females involved with this type of program. The number of females has historically been extremely small. This year there is only one girl in all of the electricity/electronics programs.

". . . In an effort to correct this situation, a new approach to teaching electronics was instituted in September. Units in power and communication were added, and the emphasis on mathematics was redirected toward understanding overall concepts and practical application. However, the most exciting thing was the creation of a radio club . . . The radio club was initiated in the middle of September, and by the end of October the club had grown to 24 members and had acquired both a citizen band radio and an Amateur Radio station. The fascination with the power and scope of the Amateur Radio stimulated a number of students to work for their FCC licenses.

"The excitement of this venture was carried into the classroom and the club was made an integral part of the program. The overall effect of this innovation was startling. Enrollment figures for next year show an increase of over 700 percent in those electing to take the advanced course and over 200 percent for those taking the first-year course.

"One final statistic involves the number of females who are potential students in this program. Many of those who were included in the informal survey indicated an active interest in the radio club. We now have several actively working to develop an educational program through the club. The radio club and its image appears to generate a positive reaction in the eyes of many female students while the older image did not."

Charles C. Burke, WA2SLK, says of his proposal for an Amateur Radio-oriented curriculum, "The state liked the idea for it was unique and this led them to approve it under curriculum development. They really were hot over the sex-biased aspect since this is an area which has not been explored enough by vocational electronics programs in the state. Since they offered almost 100 percent funding under the sex-biased approach this was the area in which the grant was finally accepted." The grant amounted to $13,000.

Instructors in other states have received funding for mini-grants for equipment and larger grants for stations to be set up for Learning Enrichment Programs, special education programs, and more. Approaches to the funding issue are as limitless as your imagination.

Donations

Whatever you do, don't overlook the important (and often very fruitful) method of funding known as donations. Donations are usually of two basic varieties: private individual contributions and corporate gifts. Dr. Arthur Smith, N3DR, acquired a great deal of equipment and parts supplies for his Learning Enrichment Program through donations. He told us that in order to find sources of corporate gifts, he simply sat down with the Yellow Pages and started calling all the electronics-industry-related firms that were listed. One company donated over $5000 worth of double-sided pc board "scrap." Another firm donates "free samples" of etching chemicals whenever the school's supply runs low. Don't forget that this is a tax deduction for the company and most are happy to donate "scrap" materials. Some will even donate new and marketable materials.

Another piece of advice from Art Smith, N3DR, is not to overlook the amateur community as a source of donations. He says that many amateurs were very generous in donating older, used equipment that was still in good working order. The school district sends the donor a tax-credit letter stating the fair market value of the donated equipment. The value is arrived at through used-gear catalogues and, when no price can be found, a value is determined based on the prices for components in the equipment. For example, if an old transmitter has a large (and expensive) transformer, then the value of the gear is arrived at by the market value of the transformer. Usually the donor receives far more value in tax credit from the donation than could be acquired through cash sale at a hamfest. It's a happy situation for both giver and receiver.

School Club and Activity Funds

Another potential area of funds that should not be overlooked is your local school's budget. There may not be enough money earmarked for classes to set up the necessary station to accompany a course in Amateur Radio/electronics. However, there might be money available in the budget for clubs or school activities and a radio club could be formed and the station later incorporated into a course. Another source of funds that shouldn't be overlooked is your school library. Libraries are eligible for Title IV, Part B funds, and in addition to new gear, you might be able to work with your librarian to get a good selection of Amateur Radio publications that can be used as course texts or to supplement course materials.

Where There's a Will . . .

The feedback that we have from teachers who have successfully funded Amateur Radio programs is that a lot of enthusiasm, a well-thought-out program, and a little luck are all you need to put together a top-notch program. Have you thought seriously about bringing Amateur Radio into your classroom?

If you are currently involved in such a program, we would like to hear from you. Please write to us at C&TD and tell us about your ideas, successes and failures, and if we can be of any assistance to you.

Jeanette M. Stumbo Zaimes, AB1P

Conducted By Clarke Greene,* K1JX

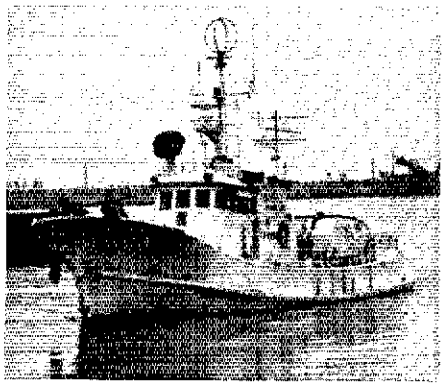
Okino Torishima Revisited

One of the most-sought-after countries in recent years is the tiny island of Okino Torishima. The first expedition there, several years ago, left many DXers in North America and Europe still unsatiated, mostly due to propagation characteristics of the sunspot minimum.

Earlier this summer, JF1IST and JH1ZAW set up operations on this reef off the Japanese coast. These pictures tell the story.

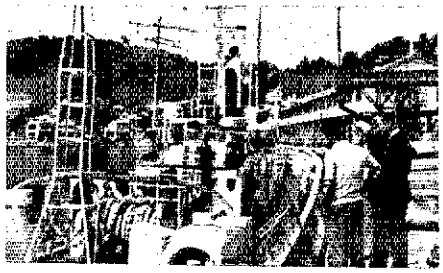
If you worked JF1IST/7J1, you can send your QSL to his manager: Yoshio Arisaka, JA1HQG, 4-3-9 Yuigahama, Kamakura, Kanagawa, 248 JAPAN.

*7815 Mandan Rd., Apt. 102, Greenbelt, MD 20770

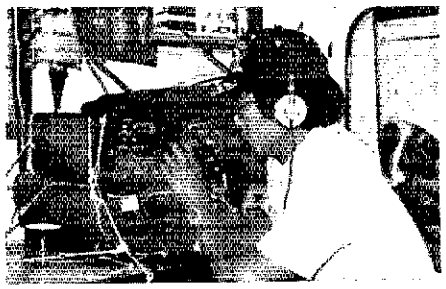


No. 16 Hakuryu Maru. The vessel was a 40-ton fishing boat *No. 16 Hakuryu Maru.* A total of six were on board, four crewmen, one assistant engineer and JF1IST himself.

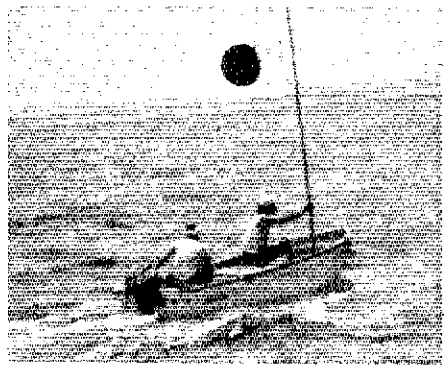
Before departure. JF1IST is checking all the equipment and supporting gear at the port.



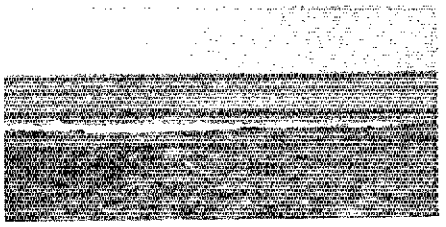
Departure. Now ready for the trip, all gear and antennas were packed and on board. Mr. Uchiyama, general secretary of JARL (in dark blue suit), came to see them off. They departed Nakanosaku port in Fukushima Prefecture at 0100 UTC on June 4, 1979.



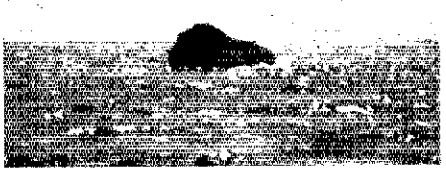
JF1IST/mm. He was on the air during the trip as JF1IST/mm, and maintained scheduled QSOs on 14.140 MHz with JA1HQG, Mr. Arisaka, who had been the chief of 7J1RL . . . . JARL DXpedition in 1976.



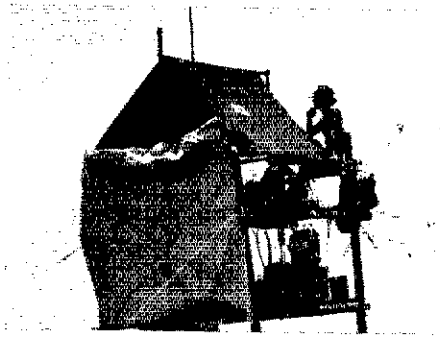
Okino Torishima. The group had difficulty in finding the island on June 10 and the morning of June 11. At last they could manage to find the island at 10:30 local time (0130 UTC) on June 11, 1979. Here they are approaching the reef by a small shuttle boat.



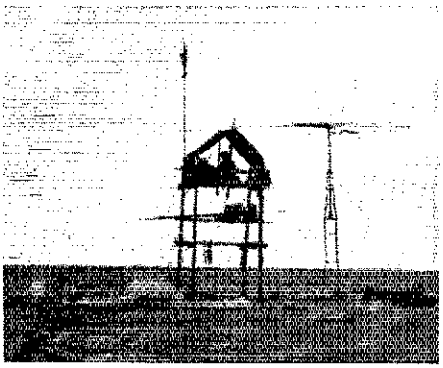
The reef around Okino Torishima.



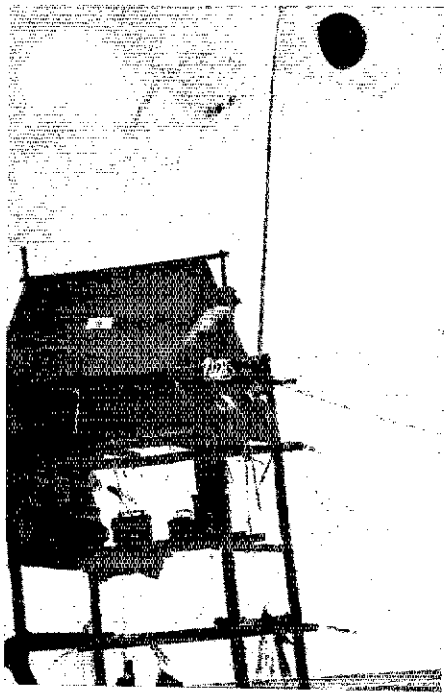
Kitano Rodai. Highest point of the reef, 1.5 m (5 ft) from sea level at high tide.



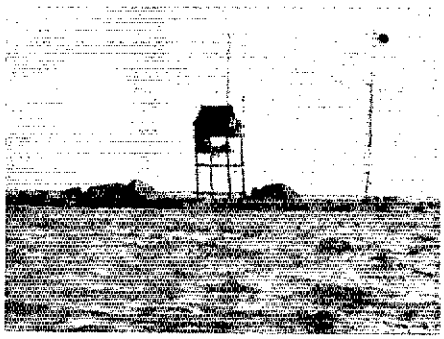
Completed operating stand. Wooden operating stand supported by a couple of guy wires. The upper platform for operation and lower portion was used for generators and gas. JF1IST had one 1.2-kW, one 800-W and two 300-W generators.



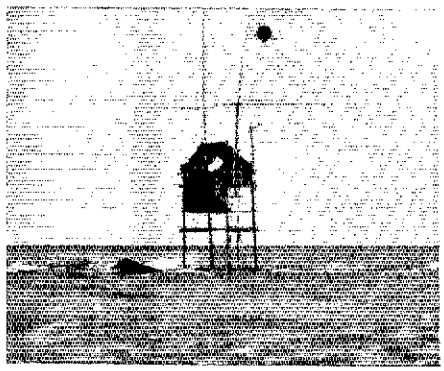
The operation began at 17:21 local time (0821 UTC) on June 11.



JF1IST waiting for his food. The meals were brought in once a day from the mother vessel at low tide. Fighting with the pileups, he stayed in the tent for five straight days.



Okino Torishima (low tide).



Okino Torishima.

(All photos and information courtesy JA1HQG and the JARL)

Table 1

JF1IST/7J1 Okino Torishima DXpedition Recap

Date:
Start June 11, 1979 08:21 UTC
End June 15, 1979 06:53 UTC
The first station worked:
JA5CAX June 11, 1979 08:21 UTC 14 MHz ssb
The last station worked:
WB8LDH June 15, 1979 06:53 UTC 14 MHz ssb

Total stations worked, 5488: JA, 2445; USA, 2225; Other, 818; including 476 contacts on 50 MHz. 73 stations were worked by JH1ZAW/7J1.

Continent and country breakdown: Continents worked, 6; DXCC countries worked, 72; NA, 12; SA, 6; AS, 9; EU, 26; AF, 8; OC, 11; including two countries (JA and HL9) on 50 MHz.

Table 2

Band Breakdown

Frequency	*Stations*	*JA*	*Others*	*DXCC*
7 MHz	172	103	69	10
14 MHz	2924	1100	1824	70
21 MHz	1818	670	1148	36
28 MHz	98	97	1*	2
50 MHz	476	475	1**	2
Total	5488	2445	3043	72

Note: * VK, ** HL9

Table 3

Continent and DXCC Country Breakdown

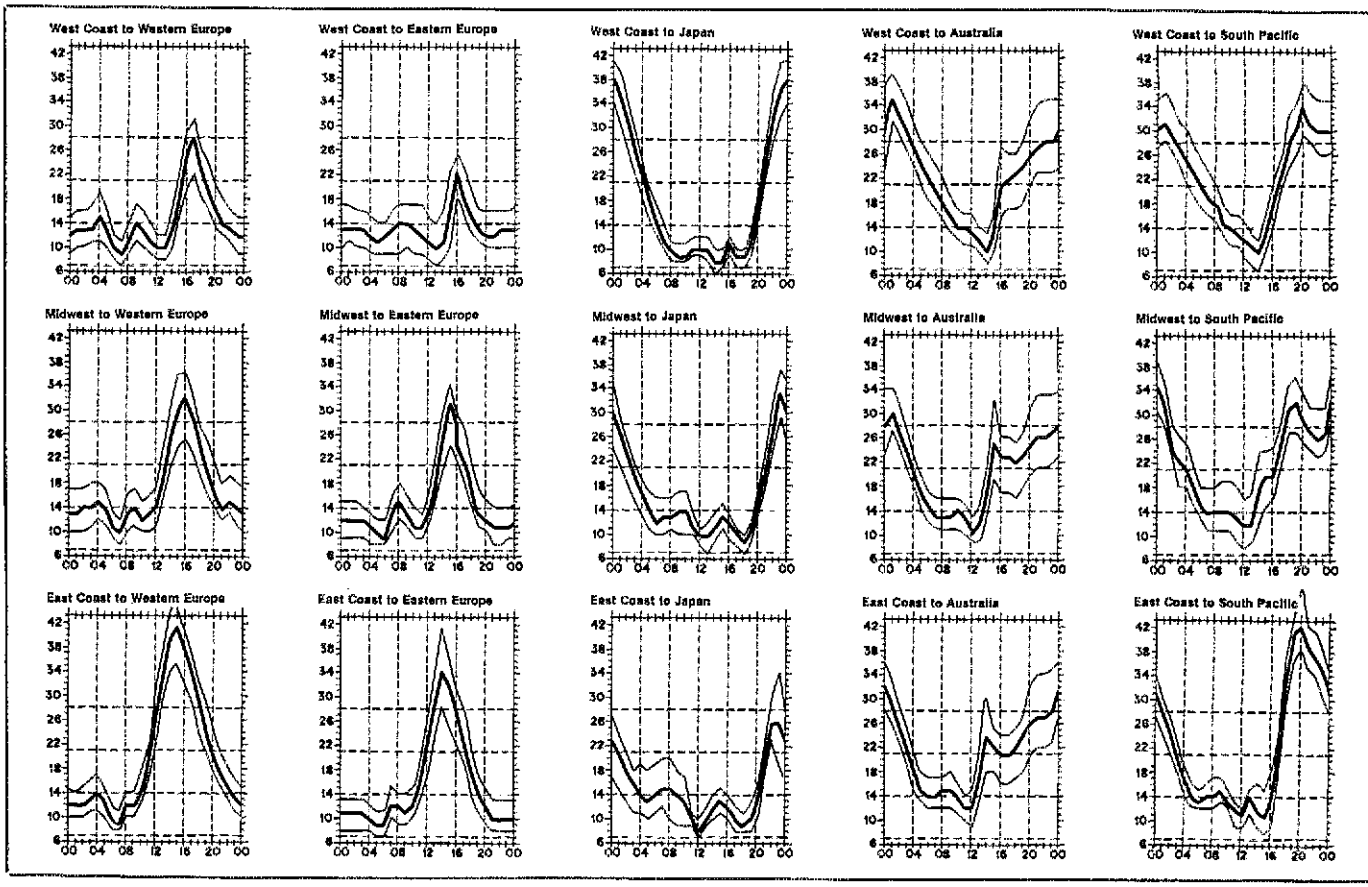
AF	*AS*	*EU*	*NA*	*OC*	*SA*
CN8	HL9	CT OH	HH	DU	CX
EA8	HS	DL OK	HI	FK8	HC
S79	JA	DM OZ	HKØ	KA1	LU
VQ9	JAØ	EA ON	KL7	KH2	PY
ZE	JD6	F PAØ	KP4	KH4	YV
ZS	VS6	G SM	KV4	KH6	ZP
5H3	4X4	GW SP	TI	P29	
6W8	9M2	HA UA1	VE	VK	
	9V1	HB9 UB5	VP2	YB	
		I UP2	W	YJ8	
		ISØ UQ2	XE	ZL	
		LA YO	YS		
		OE YU			
8	9	26	12	11	6

DX PORTFOLIO

Normally, for best results any directional antenna, from a dipole to a multi-element quad, should be aimed toward the station you intend to work. The question is, which way is that? Armando Villamore, WA4QVH, has come up with a quick solution to the problem.

Here is the program he uses on a programmable calculator for finding the distance and the true bearing of any QTH by simply entering: (1) latitude of your QTH, (2) latitude of the DX station, and (3) difference in degrees between your longitude and that of the DX.

Touching the run/stop key instantly gives the distance. Touching the run/stop key a second time gives the azimuth. However, the azimuth has to be modified slightly as follows to get the true bearing: 1st quadrant (N&E) — no change - true bearing; 2nd quadrant (S&E) — add 180; 3rd quadrant (S&W) —



When are the bands open? These charts predict this month's average propagation conditions for high-frequency circuits between the U.S. and various overseas points. One chart for East Coast to West Coast is also included. On 10 percent of the days of the month, the highest frequency propagated will be at least as high as the uppermost curve (highest possible frequency, or hpf). On 50 percent of the days of the month, it will be at least as high as the middle curve (maximum usable frequency, or muf). On 90 percent of the days of the month, it will be at least as high as the

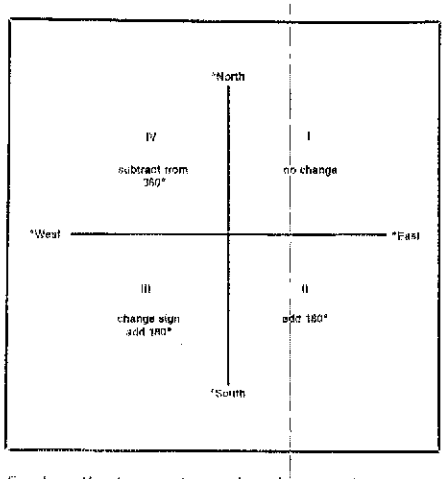
Table 4
Program
Distance in Nautical Miles and Great Circle Bearing
Program Lines:

01 — RCL1	13 — X	25 — RCL1
02 — SIN	14 — +	26 — SIN
03 — RCL2	15 — 1/COS	27 — RCL3
04 — SIN	16 — 6	28 — COS
05 — X	17 — 0	29 — X
06 — RCL1	18 — X	30 — −
06 — COS	19 — R/S	31 — RCL3
08 — RCL2	20 — RCL1	32 — SIN
09 — COS	21 — COS	33 — X≤Y
10 — X	22 — RCL2	34 — +
11 — RCL3	23 — TAN	35 — 1/TAN
12 — COS	24 — X	36 — GTO 00

Storage Registers:
R1 - L1 (latitude of own QTH)*
R2 - L2 (latitude of other QTH)*
R3 - DLO (difference of longitude)**
*Convert from deg-min-sec to degrees and decimal degrees before entering. If L1 and L2 contrary name make L2 negative.
**If in E and W longitudes you have to add to get this entry.
If distance in other than nautical miles desired, modify program after step 18 as follows and continue with R/S (19): miles — 1.150779 X;
kilometers — 1.852 X.
If only bearing needed, start from line 20.

change sign and add 180; 4th quadrant (N&W) — subtract from 360.

Armando runs this program on an HP-33E calculator but it can be used on any similar one using reverse polish notation, or on any non-programmable calculator having trig functions, by simply following the program steps. Calculators with trig functions are now available for less than $20!



Finding the true antenna bearing requires having a rough idea of where the DX station is. Table 4 shows the corrections needed to give the true antenna bearing from the calculator output. As an example, if you live in New Jersey and want to find the heading to New Zealand, you enter the information into the calculator and run the program. The output might come out to be −52°. An educated guess puts New Zealand somewhere southwest of you, thereby in quadrant III. The instructions for quadrant III are to change sign (−52 becomes 52) and add 180. The antenna heading for New Zealand is therefore 232.

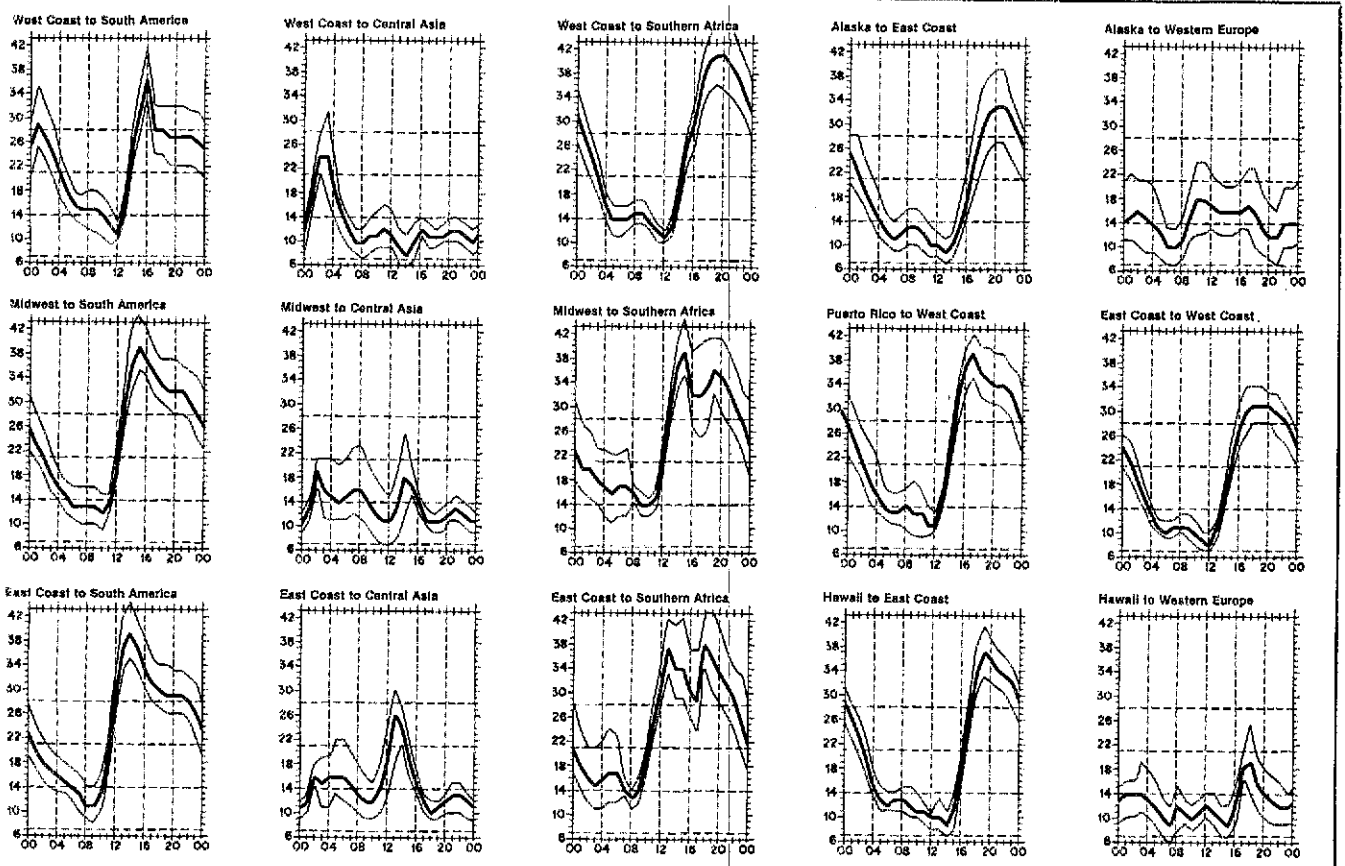
QSL CORNER

Administered By Joan Becker

WORLDWIDE QSL BUREAUS

Here is an updated list of worldwide QSL Bureaus. Check the QSL Corner regularly for more recent listings of QSL Managers and other helpful information.

A3 — Amateur Radio Club of Tonga, c/o 'Atenisi Box 220, Nuku 'Alofa, Tonga
A4 — Roars, Box 981, Muscat, Sultanate of Oman
A9 — Arab Box 472, Awali, Bahrain
AP — Lahore Amateur Radio Society, P. O. Box 65, Lahore, West Pakistan — Asia
BV — China Radio Assn., Box 101, Taipei, Taiwan, 100 Republic of China
C2 — Nauru ARC QSL Bureau, Box 29, of Nauru, Pacific Ocean
C6 — Bahamas Amateur Radio Society, Box 6004, Nassau, Bahama Islands
CE — Radio Club of Chile, P. O. Box, 13630 Correo 15, Santiago, Chile
CM-CO — FRC Apartado 1, Havana, Cuba
CN — Arram c/o M'Rabety Driss, 3 Rue Al-Farabi Rabat, Morocco
CP — Radio Club Boliviano, P. O. Box 2111, La Paz, Bolivia
CR9 — Cards for members only via Hong Kong Amateur Radio Transmitting Society, P. O. Box 541, Hong Kong
CT — Rede Dos Emissores Portugueses QSL Bureau, Rua D Pedro V No. 7-40, Lisbon, Portugal
CX — RCU Box 37, Montevideo, Uruguay
CR6-D2 — L.A.R.A. Box 484, Luanda, Angola
D4 — LARCV QSL Bureau, Box 145, Mindelo, Cape Verde
DA-DL — DARC Amateurfunk-Zentrum Box 1155, D3507 Baunatal 1, Federal Republic of Germany
DM — DM QSL Bureau, Box 30, Berlin 55, German Democratic Republic
DU — PARA QSL Bureau Box 4083, Manila, Philippines
EA — URE Box 220, Madrid, 4 Spain



lowest curve (optimum traffic frequency, or fot). See January 1977 *QST*, page 58, September 1977 *QST*, page 35 and January 1979 *QST*, page 11, for a complete explanation. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. Data are provided by the Institute for Telecommunication Sciences, Boulder, CO. These predictions for November 15 to December 15, 1979, assume a sunspot number of 156, which corresponds to a 2800-MHz solar flux of 198.

EI — IRTS QSL Bureau Box 462, Dublin, Ireland
EL — Liberian Radio Amateur Assoc. Box 1477, Monrovia, Liberia
ET3 — Telcoms ARC Box 1047, Addis Ababa, Ethiopia
FB8,FC,FM7 — REF, 2 Square Trudaine 75009, Paris, France
FG7 — Radio_Club Guadeloupe, Box 387, 97110 Point-Apitre Guadeloupe, French West Indies
FK — QSL Bureau, Box 3956, Noumea, New Caledonia
FO8 — Radio Club Oceania, Box 374, Papeete, Tahiti, French Oceania
FP0 — Richard S. Wujciak (K2RW), 7 Woodside Dr. Rockaway, NJ 07866
FP8 — Henry Lafitte (FP8HL), Box 89, Saint Pierre et Miquelon, Via Sydney, NS Canada
FY — Radio Club De Guyane, Box 508, 97300 Cayrne, French Guiana
H1-H0 — REF, 2 Square Trudeine 75009, Paris France
G — RSGB QSL Bureau, E. G. Allen (G3DRN), 30 Bodnant Gardens, London SW20 OUD England
GI — RSGB, R. Parsons (GI3HXV), 45 Erinvale, Belfast, Northern Ireland
GM — RSGB, D. Macadie (GM6MD), 11 Marchmont Rd. AYR KA7 2 SB Scotland
GW — RSGB, J. L. Reid (GW3ANU), 28 W. Erson Rd., Gabfla, Cardiff, Wales
HA — HSRL, Box 214, 1050 Budapest, Hungary
HB, HB0 — USKA QSL Bureau, Post Fach 9, CH-4900 BE Langenthal, Switzerland
HC — Guayaquil Radio Club, Box 5757, Guayaquil, Ecuador
HH — Radio Club D'Haiti, Box 70-B, Port-au-Prince, Haiti
HI — RCD Box 1157, Santo Domingo, Dominican Republic
HK — LCRA Box 584, Bogota, Colombia
HM — Korean Amateur Radio League, Central Box 162, Seoul, Korea
HP — HPRA, Box 9A-175, Panama 9A, Republic of Panama
HR — Radio Club de Honduras, APTO 0 273, San Pedro, Sula, Honduras
HS — RAST, Box 2008, GPO, Bangkok, Thailand
HV — (HVICN) Domenico Petti, Radio Station, Vatican City, Europe
I, IV — IZ-Associazione Radiotegnica Italiana, Via Scarlatti 31 I-20124, Milan, Italy
JA-JR — JARL, Sugamo 1-14-2 Toshima-Ku, Tokyo 170, Japan
JT — Radio Club JT1KAA, Box 639, Ulan-Bator, Mongolia — Asia
JY — RJAS, Box 11020, Amman, Jordan
KA2, KA6, KA8 (two letter suffixes only) — FEARL -M- c/o Sam Fleming GARH-ID-GS-T, APO San Francisco, CA 96343
KC4US — KC4US QSL Bureau, c/o Com Nav Supp for Antarctica, Code So/Communications, FPO San Francisco 96601
KG4 — Guantanamo ARC KG4, Box 73, FPO New York 09593
KG6 — MARC, Box 445, Agana, Guam USPO 96910
KH6 — John H. Oka (KH6DQ), QSL Bureau Manager, Box 101, Aiea, Oahu, HI 96701
KJ6 — c/o MARS Station Det 1 1957 Comm GP, APO San Francisco, CA 96305
KL7 — Alaska QSL Bureau, 4304 Garfield, Anchorage, AK 99503
KM6 — KM6BI, Box 43, FPO San Francisco 96614
KP4 — KP4 QSL Bureau, Box 1061, San Juan PR 0092
KS6 — KS6 QSL Bureau, Box 1618, Pago Pago, AS 96799
KV4 — Graciano Berlardo (KV4CF), Box 572, Christiansted, St. Croix, Virgin Islands 00820
KX6 — QSL Bureau Via KX6BU, Box 444, APO San Francisco 96555
KZ5 — QSL Bureau, Box 407, Balboa, CZ
LA-LJ — NRRL, Box 21, Refstad, QSLO 5, Norway
LU — Radio Club Argentino, CC 97 1000 Buenos Aires BA, Argentina
LX — R. Schott (LX1DC), 35 Rue Batty Weber Esch-Alzette G. D., Luxembourg
LZ — Central QSL Bureau, Box 830, Sofia, Bulgaria
OA — RCP, Box 538, Lima, Peru
OE — VSV Box 999, A-1014 Vienna, Austria
OH — SRAL, Box 10306, oo101 Helsinki 10, Finland
OK-OL — CRC, Box 69, 113 27 Praha 1, Czechoslovakia
ON — UBA, Box 634, 1000 Brussels, Belgium
OX3-OZ — QSL Bureau, B.W. Nielsen (OZ7BW), Solbjerg, Denmark
OX4 — MARS Director XP1AB, APO New York 09121
OY — QSL Bureau, Box 184, DK-3800 Torshavn, Faroe Islands
PA-PI — VERON, Box 400, Rotterdam, The Netherlands
PJ — Verona, Box 383, Curacao, Netherlands Antilles
PT-PY — LABRE, Box 07-0004, 7000 Brasilia DF, Brasil
PZ — QSL Manager, Surinam Amateur Radio League, Box 566, Paramaribo, Surinam, South America
P2 — QSL Bureau, Box 204, Port Moresby, Papua, New Guinea
SJ-SM — SSA Ostmarksg 43, S-12342 Farsta, Sweden
SP — PZK QSL Bureau, Box 320, 000950 Warszawa, Poland
SU — Ibrahim IBR Mohamed, SU1IM, 7 Roda Str., Cairo, Egypt
SV — RAAG, Box 564, Athens, Greece
SV0 — Radio Amateur Assn. of Greece, Box 54, Athens, Greece
S2 — Bangladesh Amateur Radio League, c/o Engr. Saifud Dahar Shahid, 27 Dhanmandia R. A. Rd. No. 7, Dacca 5, Bangladesh
S7 — QSL Bureau, Box 191, Victoria, Mahe, Seychelles
S8 — Transkei Amateur Radio League, Box 821, Umtata, Republic of Transkei
TA-TC — Turk Radio Amatorleri Cemiyeti, Box 699, Istanbul, Turkey
TF — Islemzkir Radio Amatorer, Box 1058, Reykjavik, Iceland
TG — CRAG, Box 115, Guatemala City, Guatemala
TI — Radio Club of Costa Rica, Box 2412, San Jose, Costa Rica
TU2 — ARAI, B P 20036, Abijnan, Ivory Coast — Africa
U — Central Radio Club, Box 88, Moscow, USSR
VE — CRRL Central QSL Bureau of Canada, Box 663, Halifax, Nova Scotia, B3J 2T3 Canada
VE1 — L. J. Fader, VE1FQ, Box 663, Halifax, Nova Scotia, B3J 2T3 Canada
VE2 — A. G. Daemen, VE2IJ, 2960 Douglas Ave., Montreal 301, PQ Canada
VE3 — The Ontario Trilliums, Box 157, Downsview, ON Canada M3M 3A3
VE4 — W. A. Studen, VE4BJ, 578 Oxford St., Winnipeg, MB Canada R3M 3J9
VE5 — A. Lloyd Jones, VE5JI, 2328 Grant Rd., Regina, SK, Canada
VE6 — G. D. Holeton, VE6AGV, 4003 — 1st N.E., Calgary, AB, Canada T2K 0X2
VE7 — Harold Martin VE7AFY, 9960 Wilson Rd., Apt. 45, Ruskin, BC Canada V0M 1R0
VE8 — Al Sturko, VE8NS; Box 340, Fort Smith, NT Canada X0E 0P0
VE0 — Canadian Central QSL Bureau, Box 663, Halifax, NS Canada B3J 2T3
VO1-2 — CRRL VO QSL Bureau, Box 6, St. John's NF, Canada A1C 5H5
VK1 — QSL Officer, VK1ACA, Canberra Radio Society, Box 1173, Canberra City Act., 2601 Australia
VK2-W1A — VK2DIV - QSL Bureau, c/o Hunter Branch, Post Office, Teralba, NSW Australia 2284
VK3 — QSL Bureau, E. Trebilcock, 340 Gillies St., Thornbury, Victoria, Australia 3071
VK4 — QSL Bureau, Box 638, GPO Brisbane, QLD Australia 4001
VK5 — Geo. W. Luxon, VK5RX, 203 Belair Rd., Torrens Pk., SA 5062 Australia.
VK6 — QSL Bureau, J. Rumble, VK6RU, Box F319, GPO Perth, WA Australia 6001
VK7 — QSL Bureau, GPO Box 371 D, Hobart, TAS, Australia 7001
VK8 — QSL Bureau, Box 1418, Darwin NT, Australia 5794
VK9-0 — Federal QSL Bureau, 23 Landale St., Box Hill, Victoria, Australia 3128
VP2A — QSL Bureau, Gerald R. Price, VP2AC, Box 641, St. Johns, Antigua, Leeward Islands
VP2D — QSL Bureau, ARC of Dominica, c/o Postal Deliveries, GPO Roseau, Dominica, Windward Islands
VP2G — QSL Bureau, Box 421, St. Georges, Grenada
VP2L — QSL Bureau, Timothy A. James, VP2LT, Box 322, Castries, St. Lucia, Windward Islands
VP2S — QSL Bureau, Box 142, St. Vincent, West Indies
VP8 — Amateur Radio QSL Bureau, Falkland Island Dependencies, c/o British Antarctic Survey Hq, Port Stanley, Falkland Islands
VP9 — Radio Society of Bermuda, Box 275, Hamilton, Bermuda
VQ9 — QSL Bureau, Box 191, Victoria, Mahe, Seychelles
VS6 — Hong Kong Amateur Radio Trans Society, Box 541, Hong Kong
VU — ARSI QSL Bureau, Box 534, New Delhi 1, India
XE — LMRE, Box 907, Mexico DF, Mexico
YB — RARI, Box 2761, Djarkarta, Indonesia
YK — TIR, Box 35, Damascus, Syria
YN — CREN QSL Bureau, APTO 925, Managua, Nicaragua
YO — Central R C, Box 1395, Bucharest 5, Romania
YS — Club de Radio Aficionados de El Salvador, Box 517, San Salvador, El Salvador
YU — QSL Bureau SRJ, Box 48, 11001 Belgrad, Yugoslavia
YV — RCV, Box 2285, Caracas, Venezuela
ZB — Gibraltar ARS, Box 292, Gibraltar
ZD8 — Ascension AR Relay League, Box 4308, Patrick AFB, FL 32925
ZC4 — Joint Signal Board Hq., British Forces, Cyprus, BFPO 53, London, GPO England
ZD7 — W. R. Stevens, Box 16, Jamestown, St. Helena Island
ZE — RSR, Box 2377, Salisbury, Zimbabwe
ZF — QSL Bureau, Box 1029, Grand Cayman, Cayman Islands
ZK1 — QSL Bureau c/o Radio Station, Rarotonga, Rarotonga, Cook Islands - Oceania
ZL — Joe Reed, ZL2AH, Box 40212, Upper Hut, New Zealand
ZP — Radio Club Paraguayo, Box 512, Asuncion, Paraguay
ZS — SARL, Box 3037, Cape Town, South Africa
3A — ARM QSL Bureau, Pierre Anderhalt, 3A2CN, 41 Bd du Jardin Exotique, Monaco, Europe
3B — Paul Caboche, 3B8AD, Box 467, Port Louis, Mauritius, Africa
3D2 — Raj Singh, 3D2R, 19 Le Hunte St., Suva, Fiji Islands
3D6 — Radio Society of Swaziland, Box 21, Ezulwini, Swaziland
4S7 — QSL Manager, Radio Society of Sri Lanka, Box 907, Colombo, Sri Lanka
4U1 — International Amateur Radio Club, Box 6, 1121 Geneva 20, Switzerland
4X4-4Z4 — IARC, Box 4099, Tel Aviv, Israel
5B4 — CARS QSL Bureau, Box 1267, Limassol, Cyprus
5N2 — NARS QSL Bureau, Box 2873, Lagos, Nigeria, W. Africa
5R8 — Box 587, Tananarive, Malagasy Republic, Africa
5V — Box 33, Atakpame Togo, West Africa
5W — Western Samoa RC, QSL Bureau Secretary, Box 1069, Apia, Western Samoa
5Z4 — QSL Manager, c/o Radio Society of Kenya, Box 45681, Marirobi, Kenya, Africa
6W8 — CH Teriot, 6W8BF, Box 971, Dakar, Senegal — Africa
6Y5 — Jamaica Amateur Radio Assn., Red Cross Bldg, 76 Arn Ld Rd., Kingston 5, Jamaica
7P — K. A. J. Younger, Agricultural College, Box 829, Masero, Lesotho, Africa
7Q — H. Y. Bvumbwe, 7Q7AE, Box 24, Blantyre, Malawi, Africa
7X — ARA QSL Service, Box 2, Alger-Gare, Algiers, Algeria
8P6 — Amateur Radio Society of Barbados, Box 814E, Ridegtown, Barbados
8R1 — Ivan Gouveia, 8R1AG, 89B Duke St., Kingston, Georgetown, Guyana
9A — Antonio Ceccoli M1C, Dogana 67/71, 47.031 Republic of San Marino
9G1 — GARS QSL Bureau, Box 3773, Accra, Ghana
9H — QSL Bureau, Box 575, Valletta, Malta — Europe
9J2 — Radio Society of Zambia, Box 332, Kitwe, Zambia
9K — Nasir H. Khan, 9K2AN, Box 736, Kuwait, State of Kuwait
9L — SLARS, Box 10, Freetown, Sierra Leone
9M — MARTS, QSL Manager, Box 777, Kuala Lumpur, Malaysia
9Q5 — UZRA QSL Bureau, Box 1459, Kinshasa 1, Republic of Zaire
9V — SARTS, Box 2728, Singapore 1
9X5 — RAR QSL Bureau, Box 663, Kigali, Rwanda
9Y4 — T & TARS, Box 1167, Port of Spain, Trinidad
A,K,N,W1 — Foreign stations only via Hampden County A R Assn., Box 216, Forest Park Station, Springfield, MA 01108
A,K,N,W2 — Foreign stations only via North Jersey DX Assn., Box 8160, Haledon, NJ 07508
A,K,N,W3 — Foreign stations only via Jesse Bieberman, W3KT, RFD 1-Box 66, Malvern, PA 19355
A,K,N,W4 — Foreign stations only via National Capitol DX Assn., Box DX, Boyce, Virginia 22620
WA-WB4 — Foreign stations only via Sterling Park ARC, Box 599, Sterling VA 22170
A,K,N,W5 — Foreign stations only via ARRL W5, QSL Bureau, Box 1690, Sherman, TX 75090
A,K,N,W6 — Foreign stations only via ARRL 6th Area QSL Bureau, Box 1460, Sun Valley, CA 91352
A,K,N,W7 — Foreign stations only via Willamette Valley DX Club Inc., Box 555, Portland, OR 97207
A,K,N,W8 — Foreign stations only via Columbus Amateur Radio Assn., Radio Room, 280 E. Broad St., Columbus OH 43215
A,K,N,W9 — Foreign stations only via Northern Illinois DX Assn., Box 519, Elmhurst, IL 60126
A,K,N,W0 — Foreign stations only via AK-SAR-BEN Radio Club, Box 291, Omaha, NE 68101

DX Century Club Awards

Administered By Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmation for contacts with 100 or more countries on the official ARRL DXCC List. You may also submit cards to endorse your award in 20-country increments through 240, 10-country increments through 300, and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from July 1 through July 31, 1979. An s.a.s.e. will bring you the full rules for participation in the DXCC, the DXCC list and application forms.

New Members

Mixed

DK5PR/301
DLØBY/159
FC2CI/100
FR7AK/139
HB9BGL/103
HK3YH/130
HS5AKW/100
JF1DMY/215
JR1SQU/101
JA4SP/109
JA7ZP/227
KP4V/182
OE3ZDB/113
OZ1CTK/167
TI2BEV/111
VE2BAX/106
VE2FGS/101
VE3KIK/100
VE7AYJ/127
VE7CIX/104
5L2BS/101
AB1P/109
AF1U/139
AC2U/110
AD2R/108
K2CP/104
N2ARE/104
N2OA/100
W2EEL/101
WA2CIO/113
WA2OSE/101
WA2PYI/103
WA2YEX/100
WB2GEX/104
WB2IZN/208
WB2LJK/100
WB2OHD/136
WB2QEU/122
K3CQY/100
K3CT/102
N3JD/103
N3VA/102
WB3EWB/100
WB3FYL/112
WB3JTT/102
AA4KY/101
AD4J/102
K4ENL/104
K4KJZ/106
KB4FQ/170
KB4LX/102
W4YH/289
WB4CCT/101
WB4ZPM/104
WD4LRD/101
K5ARH/115
K5IMC/106
K5UT/101
K5XE/107
W5QEE/174
WB5UDA/100
WB5YKD/100
KB6FT/101
KC6X/100
N6NF/119
W6GO/181
W6MND/109
WA6OEC/202
WB6FKR/150
WB6ITM/119
WB6QBZ/112
WB6QPG/100
WB6RSU/100
N7ALX/104
N7RU/220
W7OC/100
WB7UXK/100
K8MO/195
K8ZPB/164
KBBBS/100
W8UPH/110
WA8UYM/102
WB8APN/105
WB8ZSB/100
WD8BKM/109
WD8DXG/133
WD8QOY/100
WA9BFV/101
WB9ZKK/164
WD9JLD/100
KØTB/1/110
NØALL/114
NØGP/100
WØHSC/107
WØJRP/101
WØOGJ/100
WØOGM/105

Phone

AH2AB/100
CE4EM/110
DA1QR/102
DJ7XB/153
DK6LI/120
EA5ET/123
G3KOZ/100
I4QCD/101
I3NEN/109
I8HZT/106
I8XIU/115
JA7ZP/217
JY5AR/101
KL7IYX/100
LA1ND/131
LA6JU/122
OE3ZDB/106
OF5GML/YK/122
PY3DX/166
ZL3AAX/108
ZP5CVE/141
9M2EE/109
AA1U/106
AF1U/136
WA1PBE/102
WB1GOO/107
N2HG/102
N2LA/121
WA2EIJ/103
WA2VUY/102
WB2DYO/113
WB2IZN/208
WB2PQK/108
WB2QEU/117
K3FN/131
K3IE/128
N3VA/101
W3GXK/101
WB3FYS/107
WB3HDP/114
WB3FIY/149
WB3FSN/101
WB3KEQ/174
WB3KGY/102
K4JJW/101
K4KJZ/104
KB4BW/106
KB4CL/102
KB4FQ/163
N4ARU/100
W4KOQ/104
W4TBF/111
W4YH/269
W4ZBA/123
WB4MTE/112
WB4SWI/109
WB4VQO/101
AJ5N/130
KA5BWU/100
KB5DQ/132
N5QEE/174
W5SGI/108
WA5CGF/110
WD5GFP/108
K6WB/100
N6MU/227
W6GO/165
WA6OEG/162
WA6OEY/125
WA6RLE/139
WB6FKR/140
WB6ITM/119
WB6QBZ/112
WB6QPG/100
WB6RSU/100
WD6BKM/109
K8AQA/112
K8MO/181
K8UQ/100
W8MFU/100
W8WVM/101
WD8BKM/102
WD8DXG/130
WA9LCU/108
WAØABT/101
WBØTLL/108
WBØVLL/103

CW

DK5PR/105
G4FAM/142
GM3YOR/110
HA8UB/100
HK3YH/121
KL7AF/122
LU1BAR/W3/100
OE3EVA/100
OZ1CTK/113
AB1V/103
K1MEM/100
W1WKP/102
AC2U/109
N2XJ/133
W2SSC/120
K3VDU/130
WB3FIZ/110
AB4Z/143
K4HRG/125
N4QS/117
W4OO/100
WB4TUY/105
K5OGX/103
K5XE/103
AF6D/105
N6HI/101
N6MU/107
W6SZN/101
WA6OEG/110
K7CU/105
W8TWA/110
K9WA/160
ABØX/102
NØJC/101

5BDXCC

I1SBU
I2ZLG
W2JB
W4YH
K5MK
DJ8WD
DL7SY
W1JR
DJ6OZ
DJ2UU
W6QL

Endorsements

Mixed

DJ6OZ/233
DJ6RX/323
DK5WS/281
DK9FB/312
F6DYG/203
G4FAM/186
GU4EON/122
HB9AHA/329
HB9PL/341
HB9RX/302
I2PNB/290
I8RFD/260
IT9PUG/302
IT9WGI/290
IØZG/290
JA1DM/348
JA1IBX/332
JA1QER/304
JA5CAX/251
JA5PUL/271
JH7BRG/231
KH6CF/280
KL7AF/203
KL7JDR/141
KP4CKY/159
KP4EQF/200
LA1KI/334
LA1ND/152
OE3EVA/260
OH2BH/340
OH2QQ/348
OH6RA/265
OZ6MI/330
PAØFRA/122
PY2BKO/338
PY2ELV/324
SM6BXV/196
SM6CWK/333
SM6EOC/326
SM7BIP/281
SM7DMN/303
SP7HT/320
VE3CE/240
VE3XK/261
VE7BBD/272
VP9GD/177
YU3SO/240
YV4BK/270
YV5AK/312
ZL1AH/331
ZS6IW/336
4Z4GH/223
AA1K/240
AE1T/162
K1DP/200
K1KNQ/312
K1LDK/125
K1MEM/280
K1THP/144
K1UO/291
K1WJ/249
W1BFK/120
W1BL/263
W1EOA/300
W1HSP/203
WB1FSW/154
WB1GOO/132
AJ2E/304
K2AGZ/324
K2GBH/152
K2QF/124
K2SB/314
K2TV/230
K2UPR/160
K2WS/202
N2DT/252
W2CKR/219
W2GC/351
W2IQZ/140
W2IYX/306
W2MP/308
W2PK/243
W2QL/260
W2ROH/185
W2ULO/124
WA2CBB/313
WA2MTI/204
WA2OHD/170
WB2GTB/141
WB2QAX/259
WB2VFT/300
K3EH/309
K3IE/213
K3KO/141
K3VDU/172
W3AP/304
W3BBL/144
W3EV/211
W3RJ/292
W3TEF/150
WA3ATP/328
WB3DJF/142
WB3HAZ/246
WB3HDP/149
WB3JUK/132
AA4T/250
AG4L/221
K4DJ/332
K4HJE/325
K4HRG/285
K4IBP/251
K4ID/338
K4JAF/160
K4NV/200
K4TXJ/220
K4UEE/300
K4ZYU/300
KA4P/120
KC4G/181
N4QS/175
N4WF/327
W4AFS/311
W4BV/307
W4JD/318
W4OHZ/269
W4UKA/325
W4YV/310
WA4JJW/221
WA4OAX/120
WA4OUF/261
WA4SKE/186
WA4ZMM/124
WB4NDX/264
WB4OSS/322
WD4HPZ/161
WD4KRK/139
WD4LWC/126
AF5H/256
K5EOA/203
K5FC/220
K5FJ/347
K5FNQ/160
K5GK/203
K5JA/312
K5MK/220
K5QEA/250
K5UR/327
K5WE/274
N5FW/264
N5KC/362
W5KGX/347
W5OOT/123
W5TO/333
WD5BCY/125
WD5HRX/123
AF6D/220
K6AG/280
K6CH/354
K6OJO/317
K6YCM/262
K6ZMB/200
K6ZOR/160
N6AR/342
N6FT/220
N6HI/136
N6MA/165
N6PV/125
W6BIL/318
W6BYH/306
W6CQ/251
W6DN/304
W6EUF/338
W6GMF/320
W6IR/260
W6JZU/300
W6PMT/252
W6TFO/253
W6YA/336
W6YB/334
AA9M/250
W5KGX/342
W5OOT/122
W5TJY/224
WA5HLO/121
WB5KYF/146
K6OJO/316
K6RLY/145
K6SX/250
K6TXR/328
K6YCM/260
N6AFD/143
N6AR/323
W6EUF/336
W6ILH/224
W6ORD/250
W6PMT/250
W6TFO/198
W6YB/317
WA6IJZ/191
WA6DUG/321
WA6DZM/140
WA6GFE/330
AA7C/171
K7CU/4/204
K7GVL/282
K7KG/311
W7ADS/353
W7GB/240
W7NP/260
W7XN/225
WA7CWM/140
WA7NEQ/140
WB7OUL/227
WB7QXK/160
AC8L/250
AE8B/206
AI8S/262
K8BCK/263
K8CSG/300
K8JH/143
K8NN/302
K8VFV/163
N8BM/270
W8CZN/161
W8NK/140
W8PR/334
W8QBG/290
AA9M/250
WA6DUG/321
WA6DZM/140
WA6GFE/330
AA7C/171
K7CU/4/204
K7GVL/282
K7KG/311
W7ADS/353
W7GB/240
W7NP/260
W7XN/225
WA7CWM/140
WA7NEQ/140
WB7OUL/227
WB7QXK/160
AC8L/250
AE8B/206
AI8S/262
K8BCK/263
K8CSG/300
K8JH/143
K8NN/302
K8VFV/163
N8BM/270
W8CZN/161
W8NK/140
W8PR/334
W8QBG/290
AA9M/250
K9BB/252
K9FD/241
K9IL/274
K9JS/245
KB9DE/154
W9AZP/332
W9HI/121
W9LW/309
W9PN/337
W9QLD/336
W9RKP/349
WA9USE/220
WA9WWT/160
WB9POH/229
WB9SEJ/261
WB9TIZ/140
WB9ZBE/226
WD9CUP/162
WD9DEE/150
ABØX/260
AFØO/124
KØGJD/123
WØPT/298
WØQGI/355
WØRJW/119
WØRYW/140
WAØJYJ/200
WBØNAA/181
WDØBNC/200

Phone

CP1AT/144
CT1BH/327
CT1RM/303
CT1UE/324
CX9CO/282
DF4FX/249
DJ3AR/201
DK5WS/281
DL6QT/252
EA4JL/331
EA4LH/328
EA8JJ/326
EA8OZ/250
G3NML/123
HB9AHA/321
HI8LC/165
I4GSP/211
I4FAF/120
I5TDJ/339
I8ACB/270
I8YRK/332
I8ZTE/201
IØZG/286
IT9JT/329
JA1DM/311
JA1IBX/328
JA5CAX/177
JA5PUL/266
JY4MB/164
KH6JEB/224
KL7JDR/141
LU1BAR/W3/301
OE3WWB/306
OZ4RP/182
PY2DSC/320
PY2PC/332
VE3LD/123
VP2VBK/201
VP9CPI/220
VU2AIK/150
XE1NI/181
XE1YO/215
YU3SO/226
YV1TO/187
YV4BK/258
YV5CIL/279
ZL1AH/297
ZP5CBL/200
ZP5WU/142
ZS1QE/143
4Z4ZZ/121
9Y4NP/250
K1KNQ/304
K1MEM/232
K1PKT/160
K1UO/290
W1HSP/170
W1TPK/250
WA1GBA/199
WA1KYW/291
WA1LOU/120
K2TV/211
W2ITG/145
W2IYX/306
W2MP/280
W2MPI/239
W2QL/238
W2QWS/305
W2ULO/121
WA2NHE/261
WB2GTB/131
WB2SZH/199
K3EH/297
K3MA/185
W3AP/263
WA3ATP/327
WB3DJS/150
WB3EJP/171
AG4L/220
K4HJE/324
K4HRG/231
K4MEZ/301
K4PDV/330
N4WF/327
W4SKO/351
WA4CXZ/300
WA4QMQ/240
WA4ZMM/120
WB4NDX/263
WB4OSS/302
WD4LWC/126
AF5H/245
K5FJ/335
K5GK/199
K5JA/312
K5UR/324
W5ACE/348
W5KGX/342
W5OOT/122
W5TJY/224
WA5HLO/121
WB5KYF/146
K6OJO/316
K6RLY/145
K6SX/250
K6TXR/328
K6YCM/260
N6AFD/143
N6AR/323
W6EUF/336
W6ILH/224
W6ORD/250
W6PMT/250
W6TFO/198
W6YB/317
WA6IJZ/191
WB6DFX/200
WB6WCW/233
K7BCX/301
K7CU/4/165
K7DS/202
WA7OIJ/190
WB7NCD/173
WB7OUL/224
AI8S/171
K8CSG/300
K8GWM/260
K8LZ/291
K8NN/275
K8VFV/163
KB8KW/213
N8AKF/119
N8ANC/199
W8CY/261
W8MFJ/248
WB6WCW/233
K7BCX/301
K7CU/4/165
K7DS/202
WA7OIJ/190
WB7NCD/173
WB7OUL/224
AI8S/171
K8CSG/300
K8GWM/260
K8LZ/291
K8NN/275
K8VFV/163
KB8KW/213
N8AKF/119
N8ANC/199
W8CY/261
W8MFJ/248
W8PR/309
W8QBG/285
W8TWA/266
WD8NQE/138
K9FYZ/239
K9HDZ/250
K9UAA/219
KB9DE/152
W9ABA/280
W9OKL/178
W9QLD/330
W9WNB/201
W9XM/280
W9ZTP/134
WD9CUP/160
WØIE/175
WØKU/270
WØQGI/338
WØRWC/258

CW

DK6IS/122
DL1ES/180
DL1HH/230
DL8AN/241
IT9GLJ/155
JA1IBX/255
JA5CAX/167
JH7BRG/234
PY2ELV/217
YV4BK/154
N1RW/124
W1JR/240
K2BZT/190
K2FL/267
K2TV/134
W2NC/240
W2POZ/140
W2QL/143
WA2ORX/145
K3IE/154
W3AP/185
W3ODJ/181
WB3JUK/128
AB4H/150
K4IYS/120
K4NV/200
K4UEE/184
W4BQY/164
W4BV/220
W4LOO/120
W4WJ/201
N5DX/122
WB5UWF/160
N6PV/125
W6TFO/206
KB8KW/142
WB8JEY/224
NØHY/141
NØRR/231

DXCC NOTES

Honor Roll

Contrary to earlier published DXCC Notes, The *DXCC Honor Roll will continue to be published twice a year.* Honor Roll endorsements must arrive at ARRL hq. on or before December 31, 1979 to qualify for the next Honor Roll listing.

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1AIJ, John A. Knapp, Concord, NH
K1AYA, Walter G. "Pee Wee" Hunt, Kingston, MA
W1CZI, Percy C. Stewart, Hinsdale, NH
W1HMM, Richard H. Ackerman, Brockton, MA
W1IF, William M. Maguire, Peabody, MA
W1JUV, Joseph C. LaGambina, Winchester, CT
W1LLZ, Parker W. Frost, Revere, MA
ex-W1LXD, Wilma A. Michaelis, Torrington, CT
K1NZK, Mary R. Goulart, Plymouth, NH
W1PO, Stearns Poor, Marshfield Hills, MA
W1QT, Walter C. Newman, Braintree, MA
W1RFI, John R. DeVito, Waterbury, CT
W1UV, Hugh E. Ralston, Conway, MA
*K1YGS, William P. Baldyga, Torrington, CT
WA1ZVT, Glenn S. Thompson, East Dorset, VT
W2JOJ, Jonas E. Dayger, Binghamton, NY
W2LCG, Abe M. Federing, Tappan, NY
WA2MES, Ralph V. Neal, Teaneck, NJ
W2NFU, Sidney Tritsch, Tucson, AZ
W2PET, Pasquale F. Cimato, Buffalo, NY
W2QLQ, Edward J. Goodison, Binghamton, NY
WA2SWW, Wray H. Hilts, Jr., Niagara Falls, NY
WA2WQJ, Rupert R. Louzader, Bronx, NY
KA3AIV, Allen G. Butler, Winburne, PA
*W3DPU, William C. Ferguson Jr., Laurel, MD
W3HDX, Arthur E. Claus Jr., Yardley, PA
W3ILS, Byron H. Carpenter, Frederick, MD
W3NED, Orville H. Mills, Pittsburgh, PA
*W3NQV, Russel E. Gough, Bethel Park, PA
W3PUT, Carl Volz, State College, PA
WB4AXL, E. Allen Gold, Alexandria, VA
WA4DOP, Theodore A. Stevens, Vero Beach, FL
K4EPK, Henry A. Siemen, Vero Beach, FL
WB4HVL, James T. Adams, Columbia, SC
K4JBO, Paul R. McGuigan, Lighthouse Point, FL
W4KMP, Morris S. Krathen, Hallandale, FL
K4LT, William F. Grogan, Ft. Meyers, FL
W4OVJ, James G. Niles, Clearwater, FL
W4POC, Rex C. Wiggs, Fayetteville, NC
WA4WND, William E. Wall, Columbus, SC
W5CPN, Howard C. Lowen, Enid, OK
W5CZJ, Gilbert J. Boudreaux, New Orleans, LA
W5FSL, William R. Clardy, Temple, TX
ex-W5EUT, Albert S. Riley, Dallas, TX
W5GAQ, Capt. Claude R. Sauvain, Jr., McGuire, NJ
WA5LFI, Russell C. Fields, Oklahoma City, OK
WA5LPP, William F. Waguespack, Victoria, TX
W5LWA, Sheldon V. "Pete" Jennings, El Paso, TX
WB5MNC, John D. Currie, Jackson, MS
WB5NFI, Peter A. Bridevaux, Pearl River, LA
WB5NVD, Dr. Fred M. Shell, Laurel, MS
WA5PWE, Charles A. Lutz, Odessa, TX
WA5TXH, Edgar L. Von Trotha, Plano, TX
W5TZX, Gilbert G. Brubaker, Hot Springs, AR
K5ZML, Joseph D. Roux, Denham Springs, LA
WA6ASF, Paul H. Maurer, West Bloomfield, MI
KH6AW, Henry S. Lau, Honolulu, HI
W6ESX, Albert F. Hamilton, Hollywood, CA
W6GAY, Alphonse A. Adamson, Millbrae, CA
W6GOL, Dr. Arch Warnock, San Pedro, CA
K6LE, Cyril H. Pemberton, Vista, CA
WA6PBC, Elmer V. Bauman, San Gabriel, CA
N6VZ, Henry A. Deeter, Ripon, CA
W6WJC, Kenneth W. Grinde, Inglewood, CA
W7ABZ, Raymond W. Cummins, Portland, OR
WB7AGD, Earl R. Headley, Sun City, AZ
W7CDC, Harold F. Wallis, Camano Island, WA
W7ENP, Charles S. Breeding, Tucson, AZ
W7HXC, William A. Wachsmuth, Kalispell, MT
W7IOR, Leo J. Ohman, Green Valley, AZ
WA7KUQ, Leonard H. Combs, Phoenix, AZ
W7LQ, Thomas R. Runnells, Kent, WA
W7PMC, Frederick W. Vietor, Philipsburg, MT
W7USO, Dantorth Barney, Vancouver, WA
W7WMV, John H. Clapson, Raymond, WA
W8AXP, William F. MacLaine, S. Haven, MI
W8CFM, John H. Bothyl, Muskegon, MI
WB8EBG, Ralph E. Smith, Spring Lake, MI
K8GMR, Clayton C. Bitzer, Muskegon, MI
WB8IVQ, James H. Kurtz, Hartville, OH
WB8LTD, Floyd O. Bigley, Cincinnati, OH
WA8MDI, Leo J. Griffin, Belleville, MI
W8NJP, Rudolph Z. Majeske, Taylor, MI
WB8WZL, Earl J. Rives, Walled Lake, MI
W9LNK, Charles W. Reiley, Chicago, IL
K9MML, Hazel G. Hazelwood, Oshkosh, WI
K9MZO, Stephan A. Crosby, Silver Lake, WI
WA9ORU, William E. Johnson, Greenfield, IN
WB9QDC, William C. Cruze, Beech Grove, IN
WB9YQQ, Raymond F. Monroe, Richmond, IL
KAØALK, David L. Byard, Rush City, MN
**KAØBMB, Billy G. Ashbaugh, Kansas City, MO
KØECH, Frederick B. Jacobsen, Lawrence, KS
WDØEIY, Peter H. Rempel, San Bruno, CA
WØELF, Dave J. Cook, Jr., Manly, IA
WØFDS, Forrest Bryant, Princeton, MN
WAØGUE, James M. Edwards, Popiar Bluff, MO
WBØKWL, Junior R. Renne, Bloomington, MN
WØVIS, Eleanor Middleton, Pueblo, CO
VE1GL, Ian R. MacLeod, Halifax, NS
VE2EPW, Wilfrid Carpentier, Quebec, PQ
VE3WV, James Arthur Beynon, Wasaga Beach, ON
VE7BOF, George B. Blackwell, Vancouver, BC
HC2TN, Fernando Landin, M, Guayaquil, Ecuador
HP1ZZ, Antonio Zubieta, Panama City, RP

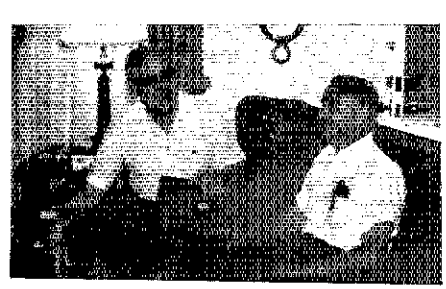
*Life Member
**Charter Life Member

Strays

THESE HAMS ARE LASTING FRIENDS

Marvin Ollendorf, W4HAH, of Atlanta, GA, and Doug Snellgrove, k4DR (ex-W4GUP), of Dothan, AL, first met on 40 meters in 1940. Two brand-new amateurs making their first contacts with their brand-new licenses, Marvin and Doug became good friends and managed to get together at Doug's place in the summer of 1941 and again at Fort McPherson, outside Atlanta, in 1942. Their only contact during the next 17 years was on the air, with many QSOs on 40 meters. In June of 1979, after more than 37 years of friendship, Marvin and Doug finally made their third eyeball contact at Marvin's home in Atlanta. — *Charlie Vaughn, B B4ZSK*

Doug, K4DR (ex-W4GUP) and Marvin, W4HAH, met on 40 meters and had their first "eyeball" shortly afterward, in the summer of 1941. *(photos by Rita Vaughn)*



Marvin (left) and Doug are still friends 37 years later, as shown in this recent photo. Marvin is holding the original transmitter that he used for their initial QSO in 1941.

Club Notes

Big Brother/Sister programs spring up more and more as formal club activities. Radio Amateur Society of Norwich (CT) sponsored Big Brother/Sister Night recently. Novice students of a local class paired off with club members to spend the evening operating members' stations at their homes. Competition developed to see which pair could work the most and the farthest stations. The students overcame apprehension, gained valuable experience and learned good on-the-air operating procedure by making actual contacts. At a set time, each station checked in to the local repeater to summarize and correlate each one's activities. Excellent!

For those clubs with a cw training class, a Morse code transceiver is available from Xitex Corp. At a substantially reduced price. The unit connects to any TTY or video terminal and can be a useful tool for improving both sending and copying skills. For further details on how to apply for the club discount prices, contact Steve Kibs, Xitex Corp., 9861 Chartwell Drive, Dallas, TX 75243, tel. 214-349-2490.

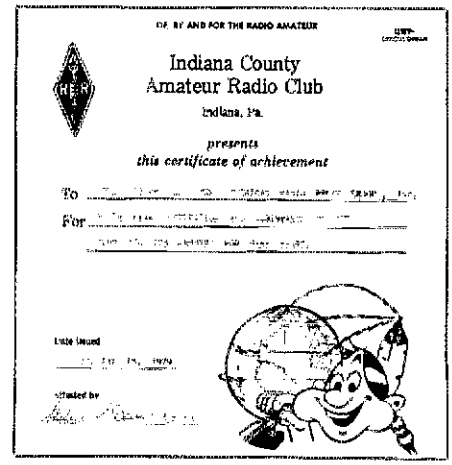
YLs get their share of offices in the Cabarrus (NC) ARS. From the left: Activity Chairperson WD4KEN; Secretary/Treasurer WD4KCN; Vice President N4ASE and President N4ASD. *(photo via WA4UPO)*

Ft. Wayne (IN) RC members asked their local radio store owner to give a talk on the Amateur Radio marketplace. Discussion covered the 10 most frequently asked questions encountered at the store, developing trends in gear from both the technology and marketing viewpoints, etc.

"Match the call sign to the pet phrase used on the club net" — a humorous program put on by Kankakee (IL) ARS. Typical phrases: "M-m-m (call sign), go ahead!" and "(call sign), standing clear." This is a program that could get victous without control on the part of the person in charge.

Greater Cincinnati (OH) ARA planned several attention-getting, attendance-drawing activities for their hamfest. The most popular was a model radio-control airplane hobbyists show.

Club officers write us often for ideas for certificates of merit. Indiana County (PA) ARC sketched their certificate with a club theme, then integrated one of our ARRL plain certificates' background. Below are the results! — *Rosalie White, WA1STO*



Rules, ARRL 160-Meter Contest

Top Band contesting is not like contesting anywhere else. Don't believe it?? Give it a try in the 10th Annual ARRL 160-Meter Contest that begins November 30 and ends December 2.

Most activity will be concentrated in the 1800-to-1825-kHz slot, though 1830-1850 should be used to spread things out. Listen for DX stations in the 1825-1830 segment. They'll tell you what frequency they're listening on (not 1825-1830 in most cases).

Rules

1) This contest will start at 2200 UTC Friday, November 30, and end at 1600 UTC Sunday, December 2, 1979. This is a 42-hour period with no limitation on operating time. Cw only.

2) The contest is open to all amateurs. A QSO with an amateur in an ARRL section (see page 8, *QST*) is worth two points. QSOs with amateurs not in an ARRL section are worth five points. DX-to-DX QSOs will not count. A station may be worked only *once* during the contest.

3) Multipliers are the 73 ARRL sections, VE8/VY1 and each foreign country worked.

4) The exchange will be the report, plus ARRL section, for those in an ARRL section. Those participants outside of an ARRL section will send a report and the name of their country.

5) Competition is within the section and non-W/VE country for certificate awards. Division high scorers will have their section award endorsed with an appropriate seal. Multioperator work is permitted with scores to be shown after single-operator listings (no certificates).

6) Contest work may be reported either on the forms available from Hq. or on a reasonable facsimile. The log must show date/time, call, RST, section/country for all QSOs. An entry consists of the log and summary sheet. Check sheets are not mandatory.

7) Entries become the property of ARRL; none can be returned. Awards Committee decisions are final. Send an addressed stamped no. 10 envelope for appropriate entry forms. All entries must be postmarked no later than December 28, 1979, to be eligible.

8) Standard disqualification criteria apply; see January 1979 *QST*, page 85.

Rules, ARRL 10-Meter Contest

Ten meters. When it's hot...it's hot. And the old 10-meter band has provided some pretty interesting contesting for the past two runnings of the annual ARRL 10-Meter Contest. Can't promise that conditions for the '79 contest will be great, but it would sure be a shame if one were to miss that BIG band opening during the contest. Make it a point to tune in to 10 on December 8-9. Note: OSCAR contacts *do not* count.

Remember to send an s.a.s.e. to Hq. for a summary sheet, log sheet and dupe sheet. Please ask for only one of each unless you can't make copies locally.

Suggested frequencies are cw: 28,000-28,050; Novice/Technician, 28,100-28,150. Ssb: 28,500-28,600; a-m, 28,800-28,900. Novice and Technician operators should sign /N or /T.

Rules

1) *Eligibility:* This contest is open to all amateurs worldwide.

2) *Object:* To exchange QSO information with as many amateur stations in any and all parts of the world as possible on 10 meters.

3) *Contest Period:* The contest shall run from 0000 UTC December 8, to 2359 UTC December 9, 1979. This is a 48-hour period with only 36 hours of operating time permitted for *all* stations. Listening time counts as operating time.

4) *Conditions of Entry:* Each entrant agrees to be bound by the provisions of this announcement, the regulations of his licensing authority and the decisions of the ARRL Awards Committee.

5) *Entry Classification:* Entries will be classified as single- or multiple-operator stations. Single-operator stations are those in which one person performs all transmitting, receiving, spotting and logging functions. Multiple-operator stations are those obtaining any assistance, such as from spotting or relief operators, or keeping the station log or records. Multiple-transmitter stations are prohibited. The use of electronic or mechanical devices and/or any other method of simultaneous operation of two or more transmitters is prohibited.

6) *Exchange:* Amateurs in the 50 United States and Canada will transmit signal report and state or province. Others (including KP4, KH2, etc.) will transmit signal report and consecutive serial number starting with 001. Stations not land-based transmit signal report and ITU region.

7) *Valid Contacts:* A station may be worked once on cw and once on phone. All contacts must be either cw to cw or phone to phone. Crossmode contacts do not count for contest credit. All cw QSOs must take place between 28.0-28.5 MHz.

8) *Scoring:* Two points are earned for each completed two-way exchange. Four points are earned for a completed two-way exchange with a W or K Novice or Technician. Incomplete QSOs will not count. Multipliers: The multiplier will consist of the number of different states Canadian call areas (VE1-VE8, VY1, VO1-2), ITU regions (as sent by nonland-based stations) and countries as determined by the ARRL Countries List. A state or province cannot be counted again as a country. Final score = QSO points × the multiplier.

9) *Reporting:* Contest work may be reported on the forms available from Hq. or on a reasonable facsimile. The log must show date/time, call, RST, section/country and serial numbers if applicable for all QSOs. This means the *complete* exchange both sent and received for *each* contact claimed in the entry for score. All entries must be postmarked no later than January 4, 1980, in order to be eligible for *QST* listing and awards. Check sheets must be submitted if you make more than 200 QSOs (total). If you are a Novice or Technician, make sure you indicate it on your entry. Note: Check sheets are the same as dupe sheets.

10) *Awards:* Awards will be issued on a section or country basis. A certificate will be awarded to the highest-scoring single-operator station in each section, Canadian call area and foreign country. Multiple-operator, Novice and Technician stations will receive an award if three or more such entries in a section are received or if the entry displays exceptional effort. Regional awards for nonland-based stations will be issued if participation warrants.

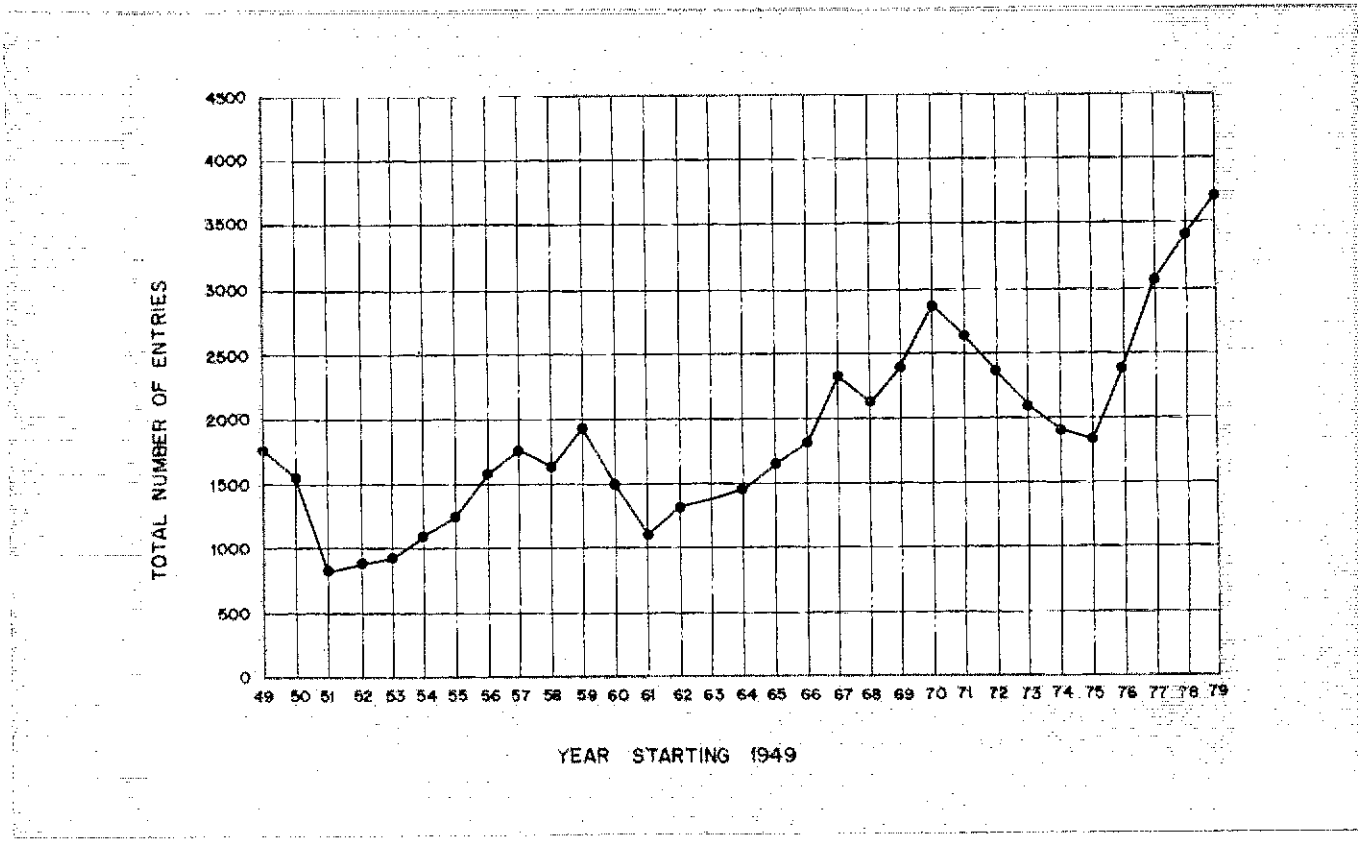
11) *Judges:* All entries become the property of ARRL and none can be returned. All entries will be passed upon by the ARRL Awards Committee whose decisions will be final.

12) Standard disqualification criteria apply; see January 1979 *QST*, page 85.

Results, 1979 ARRL International DX Competition

The only thing that's shorter is the time period. The DX 'test is still long on fun and surprises.

By Tom Frenaye,* K1KI and Bill Jennings,** K1WJ



The ARRL DX Competition, in one form or another, has been around a lot of years; gone through a few sunspot peaks *and* valleys; undergone more than a few changes; weathered sparse participation, especially during the Korean War years and remains today one of the favorite operating events in the world. Not too surprising. You mix high QSO rates with DXing and throw in a little friendly competition and who could resist trying their hand "just to see what it's all about."

Also not too surprising that the 1979 DX Competition, although reduced to one weekend per mode from the two weekend per mode format, drew more participants than ever before. After all, the serious participant is more apt to spend one full weekend in a concerted effort than trying to rearrange a schedule to accommodate 96 hours for a given mode of contesting. Given the place in the period of the sunspot cycle, it's not too difficult to understand why the top ten single-operator scores in '79 are not all that far, on the average, below those of '78 even with only one-half of the operating time available. With all of the excitement on 20-15-10 meters, few people were serious enough to stick to 160-80-40, despite good, though not great, conditions.

The club competition generated a great deal of interest again this year with more than half of the W/VE participants contributing to their club's score. The strategy for club competition varied quite a bit. Several concentrated their efforts on big multi-multi efforts, others on a large number of small multi-multi efforts with the best operators in the club paired up with the newcomers. Still others relied almost entirely on individual entries. The top club entries averaged around 600,000 points each, which equates to about 1000 QSOs per entry. Congratulations are in order for the three winners in the club competition: Central Virginia Contest Club, Murphy's Marauders, and Frankford Radio Club.

Outstanding scores showed up everywhere from VR3AH's 787 QSOs on low-band cw to K9DX's one million plus points on high-band phone to the K1CO/PJ7 13,182 multi-multi QSOs to K1GQ's 319 multipliers in the single-operator cw category. The one-weekend format seems to have pleased nearly everybody with more DX and W/VE stations putting in a full effort.

One of the biggest problems for single-operator stations was deciding which band to use since most of the time at least two were wide open. This is the point where the ability of the operator begins to show, rather than the number of antenna elements or height of the

*Assistant Communications Manager, ARRL.
**Communications Assistant, ARRL.

tower. Even if the QSO rate on 20 meters is very good, the winning scorer must have spent time enough on all bands to build up the multiplier total. Those on the East Coast aim for a large number of European multipliers, while those in the West make up ground by working large numbers of JAs and digging out the Europeans on 40 and 80.

We spent a considerable amount of time cross checking logs this year and came up with some very interesting discoveries. A look at the big multi-multi logs on cw showed that no one had a clear advantage in working multipliers, though those with spotting nets generally did work more than those without. The total numbers of DXCC countries in those big logs on 15 meters were 31 on 160 meters, 87 on 80 meters, 100 on 40, 130 on 20, 117 on 15 and 123 on 10. Kinda makes you feel you'll never get them all. A look at 15-meter phone also provided new insights. A computer listing of all call signs in the top ten 15-meter logs showed 5800 different call signs. Since the best entries showed only around 1500 QSOs, you can see that there are always a few that get away. Almost 2200 JAs were represented, along with 600 Gs, 660 DJs and 175 Us. Surprisingly, less than 100 of the 5800 were worked by the same 10 biggest 15-meter scores. A total of 154 DXCC countries were found in those logs though.

We were able to do a little more careful log checking this year compared to past years, thanks to some computer help among other things. One of the problems that was spotted was the number of incorrectly copied call signs in many logs. A number of stations received warning letters this year because of high error rates and a few lost a fairly large number of QSOs. The solution? Make sure the call sign is right before you go on to the next one, you will only hurt your own score in the end.

After listening to all of the QRM and loud signals during the contest, it was difficult to believe that QRP could do very well. TG9GI worked more than 2200 W/VE stations in his high-band phone entry with 5 watts PEP and IØXXR found the patience for 350 QSOs on 20 and 15 meters with 10 watts input on cw. Giancarlo, IØXXR, tells a story that may be very familiar to many others:

"A component failed in my regular rig and I couldn't find the needed part in Rome, so I concluded the only solution was to operate using the only transceiver available to me — an FT-7. I reduced the final amplifier drive to 10 watts input in order to get real QRP. I didn't have a crystal for 28-MHz cw, nor a receiver cw filter, so the battle had to be fought on 20 and 15 only, with my ears operating as a cw filter.

"Thirty minutes before the contest I was ready. My 40-meter Zepp was connected through the matchbox. At 2350Z the bands were silent except for a few DX signals showing that propagation was excellent. That is the magic moment when one imagines thousands of fellow amateurs looking at the clock, ready for the big run. A few minutes before 0000Z I contacted N2AA, who reported a fair 589/599 signal. 'You will be my first contact,' he said.

"The countdown started — four, three, two, one, GO! IØXXR 599 NY — N2AA 599010. Then hell broke into the passband of the FT-7; thousands of kilowatts were suddenly pumped across the Atlantic. Dozens of tremendous signals from W, K, U, OK, SP stations hit my ears — the S-meter was pinned.

"I felt like I was in a small boat swinging up and down on the waves of a stormy sea.

DX Continental Champs

Phone	*Single Operator*	*High Band*	*Low Band*	*Multioperator*
Africa	EA8OZ	EL2AV	ZS6DW	
Asia	JR1MTQ	JA3USA	JA2BAY	UK9UAO (M-S)
				JA7YAA (M-M)
Europe	GU5CIA	F2SI	EA4LH	CT2ARA (M-S)
				G4ANT (M-M)
North America	XE1OW	HI8MOG	HI8JAG	VP2DXC (M-S)
				K1CO/PJ7 (M-M)
Oceania	KH6IJ	KH6GMP		ZL3BK (M-S)
South America	HC1BU	OA4ASX	HK6DWI	FY7AK (M-S)
CW				
Africa	ZS6WW	C5AAN	EL2AV	C5ABX (M-S)
Asia	JA6IBX	JJ1BBQ	JH1RFM	JA1YFL (M-S)
				JA7YAA (M-M)
Europe	GU5CIA	YU1KV	OK1ALW	DLØAA (M-S)
				DLØKF (M-M)
North America	VP2MOC	KL7JER	HI8LC	FG7AR/FS7 (M-S)
Oceania	KH6ND	KH6CKJ	VR3AH	KH6TM (M-S)
				VK5WC (M-M)
South America	W1BIH/PJ2	CE3XV	WA4UAZ/HC1	

Division Leaders — Phone

All Band	*Multi-Single*	*Division*	*High Band*	*Low Band*
W3BGN	K3NZ	Atlantic	K3VW	WB2VFT
W9ZRX	K9KU	Central	K9DX	W9RN
KØZZ	KØKX	Dakota	WØUO	—
K5KLA	WB5TBK	Delta	AB4H	K5UR
N8JW	AG8W	Great Lakes	WB8JBM	K8SMC
N2LT	W2XL	Hudson	N9RR/2	K2IGW
WØIUB	KØCS	Midwest	WØWP	WAØTKJ
K1PR	K1ZZ	New England	W1UR	W1FC
K7RI	N7RO	Northwestern	W7EJ	N7SW
W6BH	K6OQ	Pacific	N6CT	AE6U
N4RV	K4VX	Roanoke	N4UH	W4HBK
K7LR/Ø	WØMYN	Rocky Mtn	WØYK	—
K4CL	N4RR	Southeastern	N4KG	K4VT
K6RR	W6RDF	Southwestern	K6LL/7	—
AF5K	K5JA	West Gulf	W5FO	K5NA
VE7BTV	VE1DXA	Canadian	VE3BVD	VE3BBN

Division Leaders — CW

All Band	*Multi-Single*	*Division*	*High Band*	*Low Band*
W3LPL	W3AU	Atlantic	K3VW	WB3AVN
K9DX	N9NS	Central	W9OA	N9DX
KØZZ	WØHP	Dakota	WØUO	KØKX
K4XU	—	Delta	AB4H	K5UR
N4AR	AD8P	Great Lakes	W8WPC	W8UVZ
W2IB	K2BK	Hudson	AE2A	W2ER
NØGA	KØMM	Midwest	WØSF	WAØTKJ
K1GQ	K1RU	New England	W1YN	K1VTM
K7RI	K7WQD	Northwestern	N7DX	K7UR
N6RO	N6IG	Pacific	WB7OQW	N6DM
K4PQL	K4VX	Roanoke	WB4TDH	WB4BVY
W5JW	KØUK	Rocky Mtn	WØYK	WA5YTX
N4KG	N4RR	Southeastern	WN4KKN	N4OL
K6NA	N7CW	Southwestern	K6LL/7	AA7A
W5UN	K5JA	West Gulf	W5MYA	W5WQN
VE6LU	—	Canadian	VE6KW	VE5RA

"The technique of calling CQ did not pay much. Trying for a different approach I found that answering stateside CQs was far better. Slowly I started to write down the first pages of my log, trying to convince myself that I was running QRP and that I should have patience and perseverance. During the first hours I was so discouraged that several times I was ready to go to bed. Early in the morning I began to appreciate my efforts. Several pages of the log were complete, some W6 and W7s were worked with relative ease and the multiplier total showed many states worked.

"I learned to use different operating techniques, like tailending, different sending speeds in order to distinguish my signal from the average ones, signing /QRP and working at the band edges.

"My enthusiasm grew when I worked Nevada, a hard one from Europe. Many stateside fellows could not believe the 010 power number and asked me to repeat it. 'QRP!' they said, 'Good luck!' It was like when a big ship happens to cross paths in the Atlantic with the tiny boat of a lonely sailor!

"I spent the last hours searching for needed multipliers, tired of trying five or 10 times before getting an answer. Finally at 2359Z the great storm ceased.

"Those with kilowatts and beams may not be interested in the results of a tiny station with a wire antenna, but a QRPer certainly can. I wish to thank the W/VE hams for their patience and kindness when contacting the IØXXR/QRP signal, often loosing much of their time asking me to repeat my call or

The Other End of the Pileup . . . Beaming East . . .

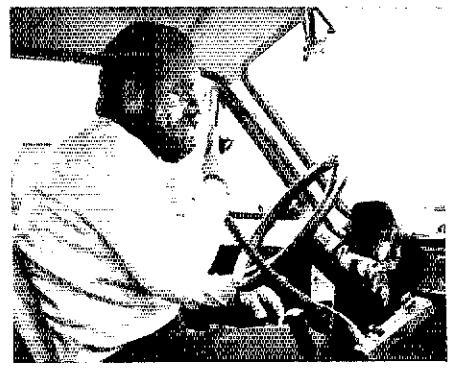
EA6CE

EA3SA

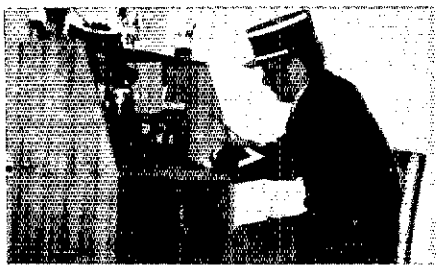
PA2TMS

EA8RL

HB9AUS



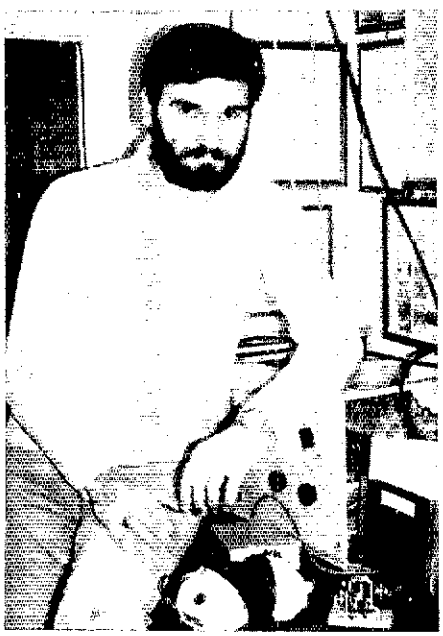
CT1DW



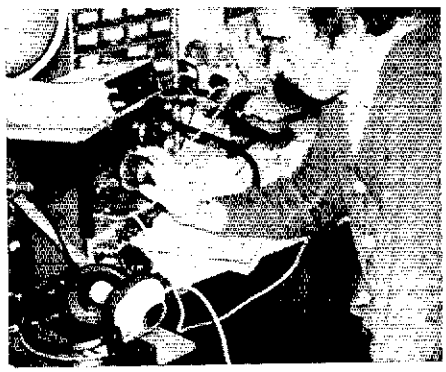
F6FGN

I6NOA

EA7AAW

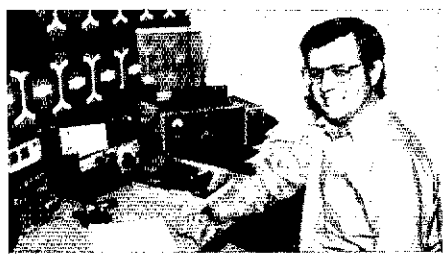


YU1OCV



ON6BC

I1HAG



GU5CIA

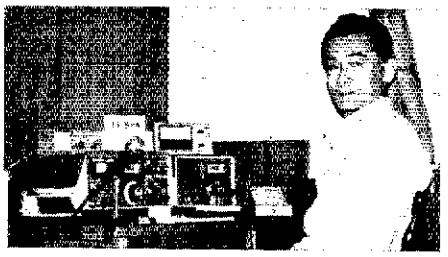
YU2RTC

. . . Beaming West . . .

JA1BWA

JH3WKZ

JJ1JPL



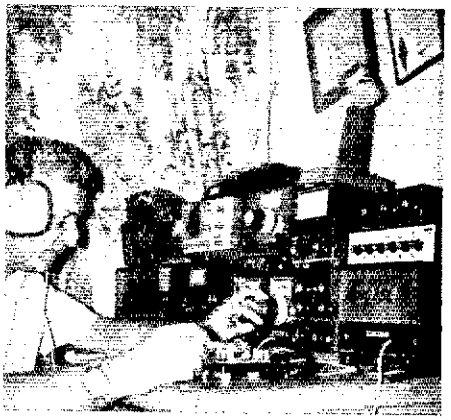
JA1KPA

And South . . .

HI8MOG

PT7WA

HI8LC



HC2SL

. . . And From Here.

WB4FIH

K4MLR

KA1CH

Top Ten DX

Phone		*CW*	
XE1OW	4,815,930	VP2MOC	3,120,048
K1XX/VP9	3,690,411	GU5CIA	2,463,300
HC1BU	3,159,195	J3ABN	2,462,784
KH6IJ	3,099,888	4U1UN	2,378,040
KH6WF	2,933,952	XE2NQ	2,374,890
GU5CIA	2,910,664	VP2VI	2,321,520
ZL1ADI	2,611,125	W1BIH/PJ2	2,241,450
W7NI/KH6	2,458,278	OZ1LO	2,091,432
W1BIH/PJ2	2,268,450	G3FXB	2,021,052
G3ZQW	2,088,891	KH6ND	1,982,508

W/VE Top Ten

Phone		*CW*	
K1PR	1,602,018	K1GQ	1,975,248
W6BH	1,501,302	W1ZA	1,858,206
W9ZRX	1,442,955	K9DX	1,619,568
W3BGN	1,406,899	W1ZM	1,610,043
W3GRF	1,326,975	W3LPL	1,595,367
K1BW	1,273,920	N4AR	1,579,989
K6RR	1,253,799	N9MM	1,564,140
N3BB	1,242,738	K1ZZ	1,527,414
N4RV	1,236,384	W2IB	1,526,868
K7RI	1,214,400	K1PR	1,519,086

Low Power Champs

Phone		*CW*	
KB9ET	497,338	N5AW	765,864
KG4W	494,982	N2GC	613,818
WØWP	353,430	WØWP	480,240
N2GC	332,856	WØUC	472,152
WA4DAN	321,264	K2MFY	439,533
K1YXG	215,670	WA4DAN	347,256
WØUC	199,926	WB5NBC	319,290
WB2VFK	166,842	K1JA	314,157
K2MFY	166,740	W3ARK	298,890
K6WJ	160,371	W5VGX	294,840

Multi-Single Leaders

Phone		*CW*	
K5JA	2,061,105	W3AU	2,072,448
K1ZZ	1,742,715	N4RR	1,961,175
K4VX	1,663,116	N6IG	1,678,950
VE1DXA	1,567,512	K4VX	1,635,333
W1CF	1,560,867	N3AD	1,619,545

Logs Received

	W/VE	*DX*	*Check*	*Total*
1977	1631	1123	280	3034
1978	1842	1340	260	3445
1979	1992	1473	285	3749

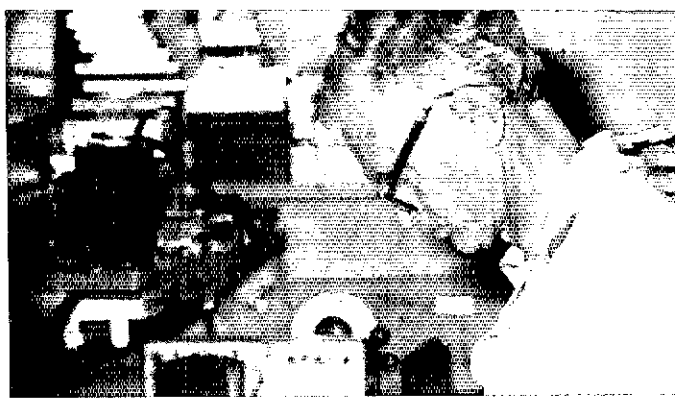
power. Thanks also to ARRL for sponsoring a great DX Competition."

The patience and perseverance spent in any contest certainly will pay off, especially when your signal is weak. Everybody hears the loud signals, good operators or not, but the weak signals depend on operator ability to get through. And operating ability and station versatility are some of the goals of any contest, aren't they?

Don't forget to mark the dates for the 1980 ARRL DX Competition on your calendars: February 16-17 for cw and March 1-2 for phone.

SOAPBOX

Enjoyed my first DX contest. 180 watts to a vertical antenna will break the pileups ... sometimes (KA0CLS). Please put me down as being in favor of the two-weekend contest. The single weekender is just good for a warm-up for the second part...I feel a little cheated that the traditional schedule was altered. Perhaps a vote to see how many prefer the two-weekend per mode format is in order? (K2OB). What if you gave a multi-multi and nobody came? Winter's last blizzard chased away my only other op and then blocked the roads so the reinforcements couldn't make it. Oh well! (K0UP). I must be crazy, working these contests with 250 watts and a vertical! Too many U.S. stations calling CQ on top of DX (AA9F). I tried to work some of the Midwestern and Eastern states that I need, but was pleased to be able to catch North Dakota as a bonus (JE3DLO). When I was on a band where the Europeans were loud into the USA, my rate went down substantially. Therefore the best time for me on 20, paradoxically, was when East Coast and Midwest signals were quite weak here, but where I was apparently one of the few DX signals coming through there. One band or another was open to the USA here around the clock and this is the first time that I have seen that happen. Few East Coast stations took advantage of it, but there was a good long-path opening over ZL from about 0800 UTC onward for a couple of hours on 15. At the same time, short-path signals from all U.S. areas were booming in on 20, a very unusual occurrence. Not too many of the gang were awake to take advantage of it though (HS1ABD/K3ZO). Murphy needs his butt kicked!! (WB7BFK). I think that this one weekend 'test is great, so does my neighborhood (WB6DFX). Who is the heathen who scheduled the now one weekend DX bash on St. Patrick's Day?? (W5RUH). There is no way a single operator can effectively cover five bands in just one weekend. I always had the feeling that I was on the wrong band, regardless of where I was. The choice between multiplier hunting and rate is always painful (N4KG). Not having an antenna farm of multi-element monobanders and a room full of SB-220s, my main interest in the contest is trying to find some new countries on new bands and bettering my own previous scores (WA5IYX). The contest was fun, even the paperwork became catchy (WB7RBV). Didn't switch over to the V antenna until the second day. Learned too late that it would have done some "smoking" into the States (W7LPF/DU2). Although I had previously participated from my home in Japan, this



Above left, the N2AA multi-multi station. Number one on cw and number two (USA) on phone. K2GL, above right, built the station and keeps it running with some mid-contest repairs.

was my first experience in the DX Competition on this side . . . *Hopefully*, I've picked up some tips on what I should do if I want to win in JA when I return after another couple of years' stay in the U.S. (AF1O/JH1ACQ/K1AD). Conditions were very good on 10 in this contest. The 15-meter band opened at an unusual time (about 12-13 UTC). I think that it would be a good idea to add monoband entry categories to those already in use (JH1WIX). On cw, everything was fine for the first day except lost the 40-meter beam and the 80 sloper . . . so up went two Vs for 40 and 80 . . . little sleep and lots of tuner-uppers . . . but a hell of an effort . . . at least nothing blew up! (K6OYE). I have returned to California and hope to be signing W6NV in the San Francisco Bay area by next year's ARRL Contest. I spent three years in South Africa and made approximately 45,000 hf QSOs (ZS6WW/W6NV). No opening from here to North America on Saturday, 17th of March. Could hear the U.S.S.R. stations working the USA (GM3LYV). Please tell some Idaho stations to come on for cw. Only ever worked one in over 15,000 QSOs (GU4CHY). The one-weekend format makes the affair a little more anxious. Could prove to be damned frustrating when the sunspots hit the down slope (K7QA). It was interesting operating with my call WH4AAA for a combination of reasons. Since this is a new call since December and the only one of its kind, I had trouble convincing people to work me. I got more calls from DX stations than from U.S. stations. I guess the statesiders and VEs thought I was somewhere in W4-land. Got the brush-off from a lot of people, who after hearing my prefix, would immediately call another CQ (WH4AAA). AGØU was like a ham without a country. Most U.S. knew where I was and would not call me, DX didn't know where I was, so wouldn't work me. Had one chap who (a DX station) kept telling me "no DX pls." Hi! (AGØU). Hadn't entered a contest since 1958! Couldn't resist when I heard all the activity on Friday night (K6IGZ). Virtually everything except the roof over our heads was packed into my Toyota and trucked over the mountains to the other side of Italy. In any case, I'm happy to have provided a country which otherwise would have not been on (M1I/W3US). This is my first serious entry and this is due to the new 48-hour, one-weekend format. Please retain it (EI3CP). WB8LSN totalled his car by hitting a telephone pole on Saturday morning on his way here to operate. What a *pileup!* The only one he ended up working that morning (WB8DQP/WB8JBM). EI1DD is a club station of a scout troop in Dublin. This is their first entry in the contest. All the antennas were homebrew wire beams. A wide-spaced lazy H was used on 10 m, three elements on 15 m, and a two-over-two driven array on 20 m. The antennas were all hung on two trees beside the scout den. There was more wire than branches! (EI2CA/EI1DD). I used my TRS-80 computer to weed out my duplicate QSOs. Sure saved a lot of time and it also helped me to get a lot of additional statistics (XE1ZZA). As a matter of interest, my *1939* ARRL DX Competition entry showed 95 QSOs in 10 districts. TX at that time had a type 46 tube in the final with 10 watts input. RX was an HRO. I see several stations in my log now that I worked on that occasion in '39, who are, like myself, still at it. W3KT is one that I notice (GW3JJ). It was the 35th ARRL CW Contest that I've entered (F8VJ). This contest is a real pleasure to operate because of the good operating practices of the U.S. stations. When you have a 30-dB pileup on stands by so that you can copy an S-4 W7, that is very good operating indeed! (F2SI). I am still completely good operating indeed! (F2SI). I am still completely floored by the actions of the multi-multi stations, who wreck the entire band by their tactics. Their continuous CQs block other stations from working the DX that the multi-multi has just worked. They do not hesitate to tell one to "get off *their frequency*." Can't you run a separate 'test for the multi-multis or give them a specified part of each band where they can fight among themselves instead of hogging the entire band? (W2AYJ). This was my first entry into the DX 'test in 24 years and lots of fun. The highlight of the contest for me was running across DL3AO, who was my first DL QSO back in 1956. He was also a letter-writing friend with whom I'd lost contact over the years. Rolf was working stations like crazy, but when I broke the pileup, he was kind enough to QSY for a chat. Yes, it would be nice to make a million points or QSOs in the 'test, but the pleasure of renewing an old acquaintance cannot be measured (W9GXR). . . . for me, the contest was a fine way to learn about the states of the U.S. (SM6JHO). After staying up all of Friday night, I got to bed about 9:30 A.M. local time. About 12 noon, the local policeman dropped by about a TVI complaint that he had received. He was much more understanding when I told him that I could hear the police radio on my audio filter! Thoroughly enjoyed operating the test from this side of the pond! Forty is a bit rough though. A clear frequency is where the S meter gets *down* to S9 (G5CMX/N8ET). I did very well as I only use dipoles and a barefoot rig. Enjoyed

Affiliated Club Competition

Unlimited Class	*Points*	*Entries*	*Phone Winner*	*CW Winner*
Frankford RC	83,419,185	126	W3BGN	W3BGN
Northern CA CC	65,734,102	107	W6BH	N6RO
Potomac Valley RC	63,381,981	93	W3GRF	W3LPL
Yankee Clipper CC	54,029,376	75	K1GQ	K1GQ
Medium Class				
Murphy's Marauders	12,873,624	24	K1PR	K1ZZ
Western Washington DXC	12,121,804	40	K7RI	K7RI
Ill-Wind Contesters	8,164,176	12	W9RW	W9RW
Wireless Inst of NE	4,909,017	24	W2RQ	W2AZO
Gloucester County ARC	4,466,025	12	AA2Z	W2SUA
Flyweight DX Group	4,018,506	21	AB4H	AB4H
Eastern Iowa DXA	3,774,482	21	WØWP	WØWP
Northern CA DXC	3,725,940	26	N6OJ	N6AN
Willamette Valley DXC	3,607,899	10	W7EJ	W7NI
Kansas City DXC	3,585,395	22	WØGNX	NØTT
Point Radio Opr. Soc.	2,814,765	11	W3IW	K3MD
Southeastern DXC	2,683,278	21	WA4QMQ	N4HI
South Jersey RA	2,322,477	13	WA2VYA	WA2VYA
Ohio Valley ARA	1,355,259	12	N8FU	K8BA
Northern Ohio DXA	1,265,886	12	K8HV	W8QWI
Lake Success RC	456,141	12	W2SGK	W2SGK
Local Class				
Central Virginia CC	5,486,820	9		N4HB
Sevier County ARC	2,371,575	6	K4XU	K4XU
Brown University ARC	1,400;121	5		K1AD
Redstick DXA	1,323,378	8	WA5IGD	WA5IGD
Meriden ARC	1,252,794	7	K1VDF	W1KKF
Buffalo Area DXC	976,098	8	W2RR	WA2ECA
North Florida ARS	816,585	3		
Motorola ARC	806,886	3		
Grumman ARC	781,020	9	W2INJ	K2OB
Lynchburg ARC	658,161	6		N4UA
Old Barney ARC	617,019	6	N2CW	
Alamo DX Amigos	538,977	8	N5HB	N5HB
Four Lakes ARC	497,862	6	K9QXY	
Waukegan VHF Soc. & ARC	432,897	6	W9TA	K9IW
Sheboygan County DXA	370,556	8	K9XJ	
Poughkeepsie ARC	309,765	6		
Carbon ARC	296,991	7	N3IK	N3IK
ARINC ARC	277,728	5	W3PWO	
Motor City ARC	239,261	6	K8SIA	K8SIA
Larkfield ARC	162,846	5	N2OZ	
Chicago Radio Tfc Assn	100,839	4		W9HPG
Big Rapids ARC	31,218	3		WA8TFA
*Unconfirmed Club Totals**				
North Texas CC	13,176,222	40		
Southern CA DXC	7,480,608	17		
Mad River RC	7,349,191	12		
Indy DXers	6,531,270	10		
Texas DX Society	5,921,676	13		
San Diego DXC	5,555,427	7		
Northern Illinois DXA	4,815,561	12		
Twin City DXA	4,151,175	7		
Central Arizona DXA	3,388,848	10		
Michigan DXA	3,163,526	14		
Brightleaf ARC	2,301,213	10		
Halifax ARC	2,250,120	4		
MSCRC-Texas A&M	2,237,888	3		
Virginia Century Club	1,953,789	10		
Boiled Owls of NY	1,475,764	6		
AR Transmitting Soc.	1,341,996	3		
Neenah-Menasha ARC	952,554	3		
Greater Milwaukee DXA	678,274	6		
Northern Ohio ARS	662,052	4		
Memphis DXS	645,450	8		
Winnipeg DXC	611,178	5		
Kettle Moraine RA	469,516	6		
Northern Repeater Assn.	261,726	3		
Ventura County ARC	248,347	7		
Albany ARC	212,712	5		
Columbus ARA	201,036	3		
Southern Calif. C. Group	200,238	3		
Lubbock ARC	74,673	4		
Mississippi Valley DX&CC	44,697	3		
Great South Bay ARC	29,844	3		

*No club roster received, not eligible for awards.

Multiplier Leaders — CW

Single Op - All Band

Station	1.8	3.5	7	14	21	28	Total
K1GQ	9	50	60	71	63	66	319
W2IB	6	42	45	63	73	63	292
W3LPL	10	42	55	65	68	69	309
N4AR	-	20	50	77	67	69	283
W5UN	-	19	50	84	66	67	286
N6RO	3	21	56	57	69	68	274
K7RI	-	16	43	58	59	52	228
K8NZ	-	24	54	68	63	60	269
K9DX	1	30	55	70	56	64	276
KØZZ	7	26	49	64	65	64	275
VE2AYU	-	21	31	55	54	52	213

High Band

W1YN	-	-	-	62	61	57	180
AE2A	-	-	-	74	70	61	205
K3VW	-	-	-	71	79	70	220
WN4KKN	-	-	-	65	56	55	176
W5MYA	-	-	-	57	67	63	187
N6ZZ	-	-	-	52	63	58	173
K6LL/7	-	-	-	46	65	59	170
W8WPC	-	-	-	61	65	63	189
W9OA	-	-	-	54	66	59	179
WØUO	-	-	-	64	59	56	179
VE6KW	-	-	-	59	58	55	172

Low Band

K1VTM	-	-	81	-	-	-	81
W2ER	-	41	65	-	-	-	106
WB3AVN	-	40	61	-	-	-	101
WB4BVY	5	35	58	-	-	-	98
K5UR	4	32	63	-	-	-	99
N6DM	-	13	33	-	-	-	46
K7UR	-	19	63	-	-	-	82
W8UVZ	1	24	62	-	-	-	87
N9DX	1	24	61	-	-	-	86
KØKX	-	-	52	-	-	-	52
VE5RA	-	14	46	-	-	-	60

Multi-Single

K1RU	2	32	41	65	60	57	257
N2MM	2	37	54	75	64	65	297
W3AU	-	38	64	78	76	80	336
N4RR	8	42	71	72	68	70	331
K5JA	-	16	39	67	65	67	254
N6IG	5	18	55	70	74	65	287
K7WQD	-	2	23	42	46	49	162
AD8P	-	22	47	50	57	61	237
N9NS	-	4	18	50	56	49	167
WØHP	6	23	59	72	68	63	291

Multi-Multi

N2AA	19	68	78	95	81	82	423
W4BVV	26	65	86	94	96	84	451

Multiplier Leaders — Phone

Single Op — All Band

Station	1.8	3.5	7	14	21	28	Tota
K1PR	1	32	46	82	67	91	319
N2LT	-	33	41	73	81	78	306
W3BGN	-	36	35	79	73	74	297
N4RV	-	29	40	77	80	98	324
K5KLA	-	8	18	68	62	78	234
W6BH	-	11	30	80	62	70	253
K7RI	-	9	17	51	49	50	176
N8JW	-	22	48	67	78	67	282
W9ZRX	-	22	45	74	76	88	305
KØZZ	-	11	20	74	78	73	256
VE7BTV	-	4	8	51	47	60	170

High Band

W1UR	-	-	-	70	73	67	210
N2CW	-	-	-	74	69	73	216
K3VW	-	-	-	70	73	89	232
N4KG	-	-	-	75	70	89	234
W5FO	-	-	-	75	75	75	225
WA6DBC	-	-	-	51	51	51	153
K6LL/7	-	-	-	38	57	74	169
WB8JBM	-	-	-	73	66	67	206
K9DX	-	-	-	80	85	85	250
WØYK	-	-	-	62	57	71	190
VE3BVD	-	-	-	87	77	74	238

Low Band

W1FC	6	62	43	-	-	-	111
K2IGW	-	22	54	-	-	-	76
W3PC	-	7	27	-	-	-	34
K4VT	-	30	57	-	-	-	87
K5UR	1	23	33	-	-	-	57
AE6U	-	5	11	-	-	-	16
N7SW	-	16	10	-	-	-	26
K8SMC	1	18	56	-	-	-	75
W9RN	-	24	47	-	-	-	71
WAØTKJ	-	10	31	-	-	-	41
VE3BBN	1	25	-	-	-	-	26

Multi-Single

K1ZZ	1	51	50	86	76	87	351
N2MM	-	31	43	83	71	80	308
K3NZ	-	18	35	87	80	70	290
N4RR	-	32	42	77	73	78	302
K5JA	-	22	47	78	80	86	313
W6RDF	-	12	21	75	65	69	242
K7SP	1	17	20	71	65	63	237
AG8W	-	3	21	77	56	72	229
K9KU	-	12	29	78	77	78	274
KØKX	-	10	47	87	75	83	302
VE1DXA	5	33	41	79	73	97	328

Multi-Multi

W2PV	9	70	70	133	121	126	529
N2AA	13	63	68	125	110	111	490

the contest thoroughly. However, I made more mistakes in typing up the log than I did points! (WD4ELG/6). I'm going to be very disappointed if the fellows with their machines sending "QRZ Contest" come up with big scores. I seldom heard them working anybody. Also very annoying were some of those same guys getting on a DX station's frequency and as soon as they had made contact, proceeded to set their machines going with "QRZ Contest," thereby blocking any possibility for others to make a contact. Seems to me that is deliberate interference (WØLP). Conditions were considerably improved this year over past years. . . . Guernsey is a "fair-to-middlin" location to contest from too! Ten meters scared the hell out of me on Saturday during the phone contest. I kept checking to see *when* it was going to open . . . never even considered that it might not open at all . . . and it *didn't* open. Many fellows asked me throughout Saturday night and Sunday morning how I had done on 10 on Saturday afternoon. A grand total of *8* QSOs and I had to call *every* one of them — no one would answer my CQs. Made up for it somewhat on Sunday though with *781* more QSOs and 49 more multipliers. Another *almost* ionospheric disaster cheated and beaten (GU5CIA/K5MM). I enclose the G3OUR entry in the 1979 DX Phone Contest. Although you have cut it to one weekend per mode, we made nearly as many QSOs as last year and got quite a few more multipliers . . . As last year, there was an EME 'test on the weekend of the contest and when club members G3WDG and G3YGF weren't busy on 432-MHz EME, they were conducting propagation tests on 10 GHz. Surely, no other clubs entering the contest had such a wide range of other activities going on at the same time! (G4BUO/G3OUR). Well, I knew it would look stupid to claim 4Q2OM, but cuss it: (1) There was an opening then; (2) He had the correct strength; (3) He had the right azimuth; (4) I need Ceylon. So what the hell. (Lotsa others figured the same I guess, cuz he had a helluva a good pileup.) (W1ERW). Just before the CW 'Test, I connected a loading coil to the end of my 10-meter ground plane (along with some more radials) and, although I did not get it adjusted properly, it worked better than anything that I have tried before. Beginning to believe that there is more to these vertical antennas than I had realized and intend to do more with them as time permits (W9HE). Enjoyed the phone DX Competition immensely, but was slightly hoarse afterward (Hi!). Hope to operate in the 'test again next year. 73 and may your logs be dupeless (WB1EKH).

FEEDBACK

Please note the following corrections to the results o the 1978 ARRL DX Competition — found starting o page 75 of the October 1978 issue of *QST*.

Add K2FL with the line score — 1,010,286 — 105 — 318 — C — 64 to the single-operator (all band phone list (second place) in Southern New Jersey.

W2UI (+ N3KR) 552,120 — 760 — 229 — C — 6 should be inserted in the multi-single phone listings i Southern New Jersey.

In the low band — phone listings for VE, VE3BB should be listed under Ontario *not* Quebec, and th line score for VE4SL should read 8319 — 59 — 47 - C — 16.

The score listed for ZL1AFW under single-operato (all band) phone headings should have been under c *not* phone.

The call sign listed as PJ7CL under North Americ single-operator cw should be changed to PJ7VL.

Single-operator cw, Oceania KH6JHT is reall KH6JHJ.

Last, but certainly not least, KL7IDT with a lin score of 10,260 — 95 — 36 — A — 8 was omitted the high-band winner for Alaska in North America.

JJ1SOE

EL2AV

(L to r) N3AM, K3RT and W3GG — W3GG, M-S, cw, Maryland - DC.

SCORES

DX scores are listed by mode, category, (single-operator high band, low band; multioperator — single transmitter, multioperator — multitransmitter) and alphabetically by prefix within each continent. The scores are listed in descending numerical order.

U.S. and Canadian scores are listed under same category headings, but ARRL sections and numerical call areas are the subdivisions.

Line scores. Example: WA1SSH 1,101,600 points — 1224 QSOs — 300 multipliers — A power. The letter in the line score denotes the highest level of power input used where A is up to 10 watts, B is between 11 and 200 watts, C is more than 200 watts and less than 500 watts and D is power input over 500 watts.

DX

Single Operator

Africa

EA8OZ 1,360,800-2100-216-D

ZS6WW 708,615-1629-145-B

Asia

HS1ABD 450,120-1240-121-D

JR1MTQ 855,600-1550-184-D
JL1KZF 686,952-1363-168-B
JR1GSE 239,648- 625-127-B
JA9CWJ 148,500- 450-110-B
JA1IZ 117,000- 375-104-D
JK1GDD 82,431- 387- 71-B
JA8SW 69,498- 286- 81-B
JH1MTR 60,237- 291- 69-B
JR3WXA 58,404- 314- 62-B
JR2QUZ 35,931- 203- 59-B
JR2PVI 35,520- 185- 64-B
JA7FFN/1 27,000- 150- 60-B
JA1CQT 23,961- 163- 49-B
JK1AIX 7533- 93- 27-B
JA7AEM 2184- 56- 13-D

Europe

CT1DW 564,705-1335-141-D

DK8AX 74,790- 277- 90-B

DM2CUO 346,104-1012-114-B
DM3YQO 294,723- 687-143-C

EA3ADW 1,650,060-2670-206-D
EA2IA 455,718-1006-151-C

G3ZQW 2,088,891-3269-213-C
G4BWP 664,548-1402-158-C

GU5CIA(K5MM,opr)
2,910,064-4182-232-B

GW3SLA 47,637- 201- 79-B

OE5CWL 926,100-1764-175-C

OH1AD 622,875-1376-151-D

OK1AGN 35,754- 201- 59-C
OK3RMW 420- 14- 10-C

ON6JG 142,290- 465-102-B

PA2TMS 1,509,390-2705-186-C

SM5CAK 215,943- 637-113-D

UA3PAZ 100,170- 315-106-B

UP2NV 136,710- 434-105-B

ZB2G(K2FJ,opr)
137,286- 526- 87-D

North America

W2GV/C6A
237,330- 879- 90-B

KL/HR 1,350,018-2514-179-D
KL7AF 490,560-1120-146-D

J6LFZ 94,860- 372- 88-B

K1XX/VP9
3,690,411-4573-269-D

XE1OW(N5AU,opr)
4,815,930-6035-266-B

Oceania

KG6JHW 161,802- 534-101-B

KH6IJ 3,099,888-4532-228-D
KH6WF 2,933,952-4144-236-D
W7NI/KH6
2,458,278-3331-246-D

VK4VU 1,560,000-2500-208-B
VK5BW 8463- 91- 31-C

ZL1ADI 2,611,125-4125-211-B
ZL1AGO 8832- 92- 32-A

South America

CE3XV 186,576- 676- 92-D

HC1BU 3,159,195-4765-221-C
WA4UAZ/HC1
1,561,662-2677-202-C

W1BIH/PJ2
2,268,450-3550-213-D

PT7WA 419,175-1035-135-B

High Band

Africa

EA8LS 395,436-1063-124-B
EA8SR 43,344- 258- 56-A

EL2AV 1,709,316-3724-153-D

S79MC 4002- 46- 29-B

ZS6ABO 431,121-1097-131-C

5H3BP 338,484- 842-134-C

9L1KB 3060- 51- 21-B

Asia

A9XBS 3480- 58- 20-C

HL9UW 13[illegible] 152- 29-C

JA3USA 775,[illegible]-1758-147-D
JA2VUP 629,280-1448-148-B
JA2YKA(JH2QXG,opr)
459,810-1179-130-B

JA1PCV 411,[illegible]-1046-131-B
JA7GAX 379,[illegible]-1028-123-D
JJ1CEI 370,170- 914-135-B
JA7BSK 280,[illegible]- 964-100-C
JH1VRQ 286,[illegible]- 797-120-B
JA9SQO 237,[illegible]- 740-107-B
JJ1NUB 234,625- 775-101-B
JA6YAI(JA6QXW,opr)
233,400- 778-100-B

JA1CG 214,920- 597-120-B
JA1WAE 204,129- 613-111-B
JF1SEK 186,945- 605-103-B
JG1IVI 148,596- 812- 61-B
JH1OBS 140,544- 488- 96-B
JA1OHD 132,252- 428-103-D
JA2FSM 111,072- 416- 89-B
JR3KEX 82,698- 358- 77-B
JJ1JPL 77,916- 302- 86-B
JA9SV 76,014- 309- 82-B
JF1EEK 74,016- 514- 48-B
JA1EF 68,172- 299- 76-B
JA1ALX 66,360- 280- 79-C
JA1PUK 60,168- 436- 46-B
JA2AYH 54,834- 247- 74-B
JI1PCN 52,992- 256- 69-B
JJ1JPL 51,273- 211- 81-B
JF3KNQ 49,434- 214- 77-B
JI1KUV 43,776- 256- 57-B
JA9VBJ 39,648- 224- 59-D
JH1UUT 33,957- 231- 49-B
JA1WL 29,241- 171- 57-D
JE2PKD 28,905- 235- 41-B
JI1QLB 23,421- 211- 37-B
JA5IU 21,000- 140- 50-B
JA7BIJ 20,412- 162- 42-B
JA5EGI 17,952- 136- 44-B
JA6PL 17,850- 175- 34-B
JK1GGG 16,830- 170- 33-B
JA1BDI 16,638- 118- 47-B
JA1EHA 16,188- 142- 38-B
JJ1SOE 15,600- 130- 40-B
JA1VZM 14,580- 135- 36-B
JA6CM 13,500- 125- 36-B
JA7UFZ 11,322- 102- 37-B
JA7BAL 10,200- 85- 40-B
JA1GTF 9975- 95- 35-C
JF2DQJ 9504- 138- 24-A
JA3KIS 9282- 91- 34-B

JA7CUK 8775- 117- 25-B
JA5AKV 8730- 97- 30-B
JF3CEC 8064- 112- 24-B
JA5SPQ 7680- 80- 32-B
JE2GHO 7640- 115- 22-B
JA6AZQ 6713- 83- 27-B
JA1BGW 6600- 100- 22-B
JA3BBG 6486- 94- 23-B
JA1BZM 6225- 83- 25-B
JA2TKO 5589- 89- 27-B
JA1LXD 5382- 69- 26-B
JA8GTO 5346- 66- 27-B
JA1KPA 5106- 46- 37-B
JR2MKV 4425- 59- 25-B
JH6LQL 4140- 69- 20-B
JH4MLJ 4080- 80- 17-B
JA6JXV 3726- 69- 18-B
JA1FO 3660- 61- 20-B
JF2BIP 3249- 57- 19-B
JA7ARW 2583- 41- 21-B
JA8VDN 2379- 61- 13-B
JR4ABB 2193- 43- 17-B
JA3EZI 2124- 59- 12-D
JA1ABV 1470- 35- 14-B
JE2UXA 1419- 43- 11-B
JF2FHQ 1230- 41- 10-B
JA3QZW/1 1140- 20- 19-B
KA6NN 984- 41- 8-B
JK1ICX 972- 27- 12-B
JF1KCE 735- 35- 7-B
JF2FLN 648- 27- 8-B
JH0HBC 648- 24- 9-B
JF1VDG 480- 20- 8-B
JF3DLO 399- 19- 7-B
JE3XWJ 360- 20- 6-B
JA7HYS/1 357- 17- 7-B
JA1AAT 351- 13- 9-B
JH0HBC 231- 11- 7-B
JI1UHU 210- 10- 7-B
JF1ORR 150- 12- 5-B
JG1WRM 105- 7- 5-B
JA5PEE 72- 6- 4-B
JH0JLL 72- 6- 4-B
JH7WEE 30- 5- 2-B
JG1FJG 27- 3- 3-B
JK1MWW 3- 1- 1-B

JT1AN 8448- 128- 22-B
JT1BG 1665- 37- 15-B

UW0IX 285,936-1036- 92-B
UY9PP 284,889- 981-103-B
UA9MR 131,100- 497-100-B
UA9FU 105,266- 398- 89-B
UA0SAU 58,753- 381- 51-B
UA0CCW 28,896- 172- 56-B
UA0FDS 16,767- 207- 27-B
UA0LBY 6666- 101- 22-A
UA0CBD 5772- 74- 26-B
UA9QAQ 5376- 64- 28-B
UA0UBG 396- 66- 6-B

UD6DER 1449- 23- 21-B

UF6FCZ 1782- 33- 18-B
UF6CX 405- 15- 9-B

UL7QF 54,168- 244- 74-B
UL7GBD 1716- 44- 13-B
UL7PBY 546- 26- 7-B
UL7GBW 120- 8- 5-B

UI8LAF 1518- 46- 11-B

UJ8JGJ 6300- 84- 25-B

9K2FX 224,976- 688-109-D

Europe

CT4NH 285,714- 962- 99-B
CT1TM 124,146- 418- 99-D

OJ3HJ 1,102,152-2417-152-C
DK7ZT 652,239-1421-153-D
DK6WA 600,039-1653-121-C
DF6FK 309,000- 824-125-D
DL4RH 126,882- 399-106-D
DF4NP 79,704- 328- 81-D
DF2RG 40,560- 208- 65-B
DL9HP 22,806- 181- 42-B
DK5WY 20,295, 123- 55-B
DA1DA 8400- 80- 35-B
DL1YA 2394- 42- 19-B
DL3RE 2112- 44- 16-C
DA2JA 936- 24- 13-B

DM2BDG 129,402- 553- 78-B
DM3RMO 97,980- 355- 92-C
DM3XM/DM3WWJ
21,780- 132- 55-B
DM4WFF 15,222- 118- 43-B
DM2CXE 9324- 74- 42-B
DM2BRK 4941- 61- 27-B
DM5WGL 4260- 71- 20-B
DM2AHI/A 2580- 43- 20-B
DM3NME 1620- 36- 15-B
DM3ZJL 1209- 31- 13-B
DM2AJH 105- 7- 5-B
DM2ATL 60- 5- 4-B

EA3SA 646,650-1437-150-D
EA1DX 523,908-1386-126-D
EA4KC 186,966- 611-102-B
EA2OJ 173,229- 511-113-B
EA1UZ 110,271- 623- 59-B
EA2QU 86,130- 330- 87-B
EA1YL 14,250- 265- 50-B
EA4ZO 11,904- 124- 32-B
EA2HW 6966- 86- 27-B
EA7ALG 4758- 91- 26-B
EA4WC 1683- 33- 17-B
EA5ND 273- 13- 7-B

EA6DE 62,160- 280- 74-B

EI2BB 718,620-1711-140-B

F2SI 1,751,358-3626-161-B
F2RO 88,088- 325- 91-B
F6BVB 69,720- 280- 83-B
F9OJ 43,680- 224- 65-B
F6EXQ 29,322- 181- 54-B
F6CLM 14,430- 130- 37-B
F6APJ 9156- 109- 28-B
F6BHX 8728- 96- 31-B
F6DMV 4686- 71- 22-B
F6DRP 928- 24- 16-B

G3ZAY 617,449-1259-137-C
G3TTJ 506,709-1149-147-C
G4BWP 449,580-1180-127-C
G3UFY 394,212- 988-133-C
G2QT 315,186- 802-131-B
G3CAZ 242,136- 684-118-C
G4CVZ 87,780- 308- 95-B
G4AMO 87,174- 334- 87-B
G3ZHL 74,700- 300- 83-B
G3MI 54,000- 240- 75-B
G3NT 29,682- 194- 31-C
G3XFW 15,660- 145- 76-C
G4HLN 13,500- 150- 30-B
G3RAM 7452- 108- 23-B

GM4EJW 81,144- 392- 69-C
GM3RAO 40,425- 245- 55-B
GM4CHX 11,187- 113- 33-B

GU3YIZ 89,784- 348- 86-B

GW3SJX/M 7296- 76- 32-B

HA4KYN 165,462- 506-109-C
HA5KBM 113,148- 449- 84-B
HA1ZD 66,339- 243- 91-B
HA2KRZ 24,174- 158- 51-B
HA4XX 9078- 89- 34-B
HA9IC 8058- 79- 34-B
HA9HW 5037- 73- 23-B
HA0MM 3900- 50- 26-B
HA0KLL 759- 23- 11-B
HA6NP 486- 18- 9-B

HB7AUS 276,381- 861-107-D
HB9DX 218,436- 668-109-C
HB7BEI 146,916- 583- 84-C

I8MPO 1,702,506-3358-169-C
I6NOA 1,545,294-3103-166-C
I4AVG 1,020,657-2167-157-C
I3GNX 613,620-1461-140-C
I1UHS 510,540-1270-134-C
I1BGJ 479,637-1067-137-B
I6ZJC 357,048- 783-152-B
I2MQP 243,810- 774-105-D
I4DVT 163,020- 494-110-C
I0WKS 145,512-1032- 47-B
I5NSR 111,510- 354-105-A

LA1NG 622,362-1313-158-C
LA0CA 488,061-1281-127-C
LA6UL 68,517- 331- 69-D
LA2AD 45,828- 228- 67-B

LA4HH 33,864- 166- 68-B
LA2GV 29,328- 188- 52-C
LA9MI 6750- 75- 30-D
LA2IJ 3612- 43- 28-B
LA7KW 3120- 40- 26-B
LA3UG 3000- 40- 25-B
LA1KQ 450- 15- 10-D
LA8OW 264- 11- 8-B

LZ1RF 18,093- 163- 37-B
LZ2TQ 6750- 65- 30-C

OE1NPW/3 472,176-1093-144-C
OE6EUG 5832- 72- 27-B

OH1AA(OH3ZE,opr)
511,704-1236-138-D
OH4UI 386,751- 941-137-D
OH1LW 335,152- 944-136-D
OH2BSS 123,564- 494- 84-D
OH6PA 22,059- 129- 57-D
OH3JR 19,488- 116- 56-B
OH2BSL 15,552- 144- 36-B
OH2BFS 75- 5- 5-B

OH9XZ 210,516- 662-106-D
OH3TV/OH9
87,120- 363- 80-D

OK1TA 577,818-1366-141-C
OK3KAG(OK3CIR,opr)
184,758- 581-106-C
OK1ATE 88,011- 381- 77-B
OK1KZ 29,382- 166- 59-B
OK1MSN 26,640- 148- 60-B
OK1DKS 23,562- 194- 51-B
OK2JK 21,060- 180- 39-C
OK3CFP 18,603- 117- 53-C
OK1KUR 14,880- 124- 40-B
OK2YAX 13,104- 159- 28-B
OK2ABU 12,513- 97- 43-B
OK1ASQ 10,600- 100- 35-B
OK1MPP 7128- 92- 28-C
OK2BSA 7176- 92- 26-B
OK3KAP(OK3CGI,opr)
4025- 47- 25-C
OK2PGR 3498- 53- 22-B
OK1KIR/P 1968- 41- 16-B
OK1RFJ 1940- 29- 20-B
OK2SPS 1209- 31- 13-B
OK2BBJ 297- 11- 9-C
OK1AOJ 264- 11- 8-B

ON6NL 241,782- 683-118-B
ON4XG 36,750- 175- 70-B
ON5NR 11,232- 78- 48-B

OZ5EV 270,270- 693-130-C
OZ6XR 43,260- 208- 70-B
OZ8T 39,585- 203- 65-B
OZ7MP 6405- 61- 35-B
OZ9OL 5376- 64- 28-B

OZ2BM 3468- 34- 34-B
OZ7SG 3450- 50- 23-B
OZ1AP 2709- 43- 21-B
OZ5JR 1620- 30- 18-B
OZ7DX 1056- 22- 16-B

PA0MUN 164,400- 548-100-B
PA0ATY 130,500- 500- 87-B
PA0EP 43,680- 224- 65-B
PA0FRS 42,336- 224- 63-B
PA0INE 28,959- 197- 49-B
PA0IJM 15,375- 125- 41-B
PA0CF 2625- 35- 25-A
PA0VP 1380- 23- 20-B
PI1GOE 1248- 96- 16-B
PA0VST 320- 16- 10-B

SM3EVR 854,670-1838-155-C
SM6EDC 640,332-1452-147-C
SM0AQU 579,360-1420-136-D
SM0GMZ 432,552-1077-134-C
SM2GYP 297,432- 972-102-C
SM7HCW 250,278- 707-118-D
SM7ISG 67,850- 275- 62-B
SM7FHJ 28,779- 181- 53-C
SM0BDS 18,564- 119- 52-C
SM6BXV 17,334- 107- 54-D
SM3ONI 6831- 103- 23-B
SM7ABL 6192- 86- 24-D
SM7AIO 2109- 37- 19-C
SM5EMR 1200- 25- 16-D
SM5RE 858- 22- 13-B
SM7GGK 756- 36- 21-B
SM7TV 660- 22- 10-B

SP9KBY(SP5GRM,opr) 206,388- 637-108-B
SP9CTW 39,060- 210- 62-C
SP5BR 22,464- 144- 52-B
SP9HXK 4743- 93- 17-B
SP6JZL 312- 13- 8-B

UW1AE 282,801- 881-107-B
UA1MU 46,116- 244- 63-B
UA4CAK 14,787- 159- 31-B
UA4ZA 13,050- 87- 50-B
UA3TN 8118- 82- 33-B
UA1AWO 7224- 86- 28-B
UA3TK 4212- 54- 26-B
UA3DDF 4125- 55- 25-B
UV3GZ 4071- 61- 23-B
UA3AGG 2295- 51- 15-B
UA4ACP 2139- 31- 23-B
RA1ARX 684- 19- 12-B
UV3CS 570- 19- 10-B

UB5MCS 469,104-1348-116-B
UB5WCW 87,360- 416- 70-B
UB5ABJ 48,555- 249- 65-B
UB5VAZ 41,022- 318- 43-B
UT5OV 21,060- 130- 54-B

UP2PAQ 198,240- 590-112-B
UP2BAS 2520- 40- 21-B

YO6KNL(YO6AWR,opr) 182,166- 632- 97-B
YO3AC 14,157- 143- 33-C
YO3JU 2550- 50- 17-B
YO6KBM(YO6OD,opr) 1785- 35- 17-C

YU2RHI 340,821- 971-117-B
YU3TEL 340,470- 913-117-C
YU1AJD(YU1ORS,opr) 10,692- 132- 27-B
YU1OON 1197- 21- 19-B

ZB2DX(G3UAZ,opr) 33,852- 217- 52-D

North America

CO8RA 4416- 46- 32-B

HH2MC(HH2TD,opr) 1,421,808-3118-152-C

HI8MOG 1,582,020-3196-165-D

KL7IXZ 990,756-2117-156-D
KL7GN 68,856- 302- 76-B

W2BBK/PJ7 13,986- 126- 37-B

TG9GI 924,489-2217-139-A

VE3PE/VP9 30,324- 266- 38-C

4C5J(XE1J) 1,166,100-2300-169-D
XE1ZZA 708,495-1585-149-B

ZF2AA(W8LUJ,opr) 103,785- 407- 85-B

Oceania

KH2AD 121,500- 450- 90-C

KH6GMP 925,350-1990-155-D
KØEU/KH6 70,200- 300- 78-B

VK8TD 344,868- 991-116-B
VK5MF 170,715- 599- 95-C
VK2BQY 83,985- 509- 55-B
VK2VFT 55,500- 370- 50-B

ZL4IJ 9417- 73- 43-B

South America

CE3BPC 877,008-1936-151-D

KA6CN5/HC1 68,838- 298- 77-B

WA1SQB/HC8 1,750,131-3579-163-D

LU1BR 472,290-1211-130-D

OA4ASX(K1MM,opr) 1,965,639-3877-169-C

PJ2FR 417,384-1054-132-B

PY3CR 209,952- 648-108-B
PY1NEZ 167,034- 679- 82-B
PY1ZBJ/8 137,562- 454-101-D
PY2YP 66,990- 365- 62-D
PT2TF 38,448- 267- 48-D
PY2BGO 29,025- 215- 45-C
PY2GWE 7980- 70- 38-D
PY1BKA 663- 17- 13-C
PY8HP 450- 15- 10-B
PY8ZLC 180- 10- 6-B

4M3AZC 1,112,004-2346-158-B

Low Band

Africa

ZS6DW 14,520- 110- 44-C

Asia

JA2BAY 51,744- 392- 44-C
JR1JFO 33,456- 272- 41-B
JA1PE 13,608- 168- 27-B
JA1LEY 594- 33- 6-B
JF1TEU 360- 20- 6-B
JA1BOK 108- 12- 3-A

Europe

DK3FB 39,648- 236- 56-D
DL8PC 37,649- 267- 47-C
DF9QO 30,831- 239- 43-C
DK1DU 648- 24- 9-D

EA4LH 146,952- 628- 78-D

G5CMX(N8ET,opr) 16,218- 159- 34-C

HA8UT 4800- 64- 25-B

LZ1WJ 975- 25- 13-B

OH1IJ 3588- 46- 26-D
OS6AH 1482- 38- 13-B

SP3JZR 384- 16- 8-B

UA3EAL 2907- 51- 19-B

UA2FBJ 870- 29- 10-B

UT5DL 13,206- 142- 31-B
UB5WE 5610- 85- 22-B

UP2OU 7125- 95- 25-B

North America

HI8JAG 279,414- 817-114-D

XE1TE 133,128- 516- 86-B

South America

HK6DWI 14,784- 112- 44-B

OA8K 2160- 40- 18-B

JA1PIG/PZ 11,811- 127- 31-C

Multi-Single

Asia

JA9YBA(JR2NKG,JA9s DZS, FSU LWB XAM,oprs) 137,940- 484- 95-D

JA8YXI(JA8s ERG JCR OYC QCB XYB,oprs) 88,200- 350- 84-D
JA1YPQ(Multiop) 72,036- 348- 69-B
JA3ZTU(JH3s OTS SBC SBE, oprs) 32,400- 240- 45-B

UK9UAO(UA9s UGS UOB,oprs) 555,014-1194-127-B
UK9CAE(UA9s CJK CKC,oprs) 247,539- 798-109-B
UK9ADY(UA9s ADH ADI AFZ, oprs) 192,888- 684- 94-B
UK9FAA(RA9FMJ,UA9s FAT FOL,oprs) 154,020- 604- 85-B
UK9HAC(3 oprs) 142,932- 554- 86-B
UK9CBD(2 oprs) 48,786- 346- 47-B
UK9OBI(3 oprs) 34,371- 201- 57-B
UKØSAV(3 oprs) 20,358- 174- 39-B
UK9HAD(3 oprs) 3243- 47- 23-B

UK7NAQ(UL7s NAC NAL NAT, oprs) 16,685- 219- 35-B

Europe

CT2ARA(CT2s AK AD BT CE CI CJ CM CP QN,oprs) 3,549,000-4732-250-D

DLØAA(DK8FZ,DL1YO,DL6KB DL8NU,oprs) 2,569,620-3790-226-C
DJ5IW(+OK9CW,DL1VU, DLØPT,OE2VEL) 922,746-1657-186-D
DA2QF(DA1s CE QS,DA2QE, DA4AA,DF2YS,oprs) 234,825- 775-101-C

DM2AYK(+DM2s CEK DTK DUK) 1,701,540-2740-207-C

EA3AIN(2 oprs) 706,560-2048-115-B

EA6CE(+EA6s CP ER ET EU) 1,491,840-2688-185-D

EI1DD(EI2CA,EI7CC,EI8CC, EI9V,oprs) 617,652-1197-172-B

F6EMT(Multiop) 2,418,492-3698-218-C
F6KAW(F6s ALX AOJ ASS BTX FBQ,oprs) 1,852,785-2955-209-B

G3OUR(G4s BUO EWJ EZN GFX,G8s LYB RHI,oprs) 1,861,416-3012-206-C
G3RRS(G3s CDZ SJK UKS VCT VPW ZPK,oprs) 1,793,376-2874-208-C
G3SSO(8 oprs) 1,172,358-2101-186-D
G4GXL(+G4DSE) 678,672-1571-144-C
G3XWZ/A(+G3HIC) 11,676- 139- 28-C

GW6GW(GW3KYA,GW4s BLE EAI HBK,GW8FXM,oprs) 953,676-1796-177-C

HAØKLE(6 oprs) 856,647-1527-187-C
HA5EIV(6 oprs) 505,890-1022-166-B
HA5KKC/2(6 oprs) 494,208-1056-156-B

HA7KSV(5 oprs) 372,957- 944-131-B
HA5KKB(3 oprs) 25,575- 155- 55-B
HA4KYH(3 oprs) 22,512- 134- 56-B
HA6KVD(3 oprs) 14,868- 118- 42-B
HA5KFU(3 oprs) 6120- 68- 30-B
HA8KVB(2 oprs) 2625- 35- 25-B

HB7BLQ(+HB9s AGC ALM BAL) 409,812- 962-142-C
HB7LF(HB9s BOQ BTU,oprs) 136,080- 504- 90-B

IØJX(+IØs IJ MGM) 2,818,590-3998-235-C
I1JJZ(+I1s DFS EVJ FNX KN LBH,IW1PDP,W3US) 2,347,011-3301-237-C

LA1K(LA2PV,LA3GW,LA5s EV KU,LA6s MP MU,LA8s BU KV NW,LA9HT,oprs) 385,047-1097-117-D
LA3T(LA1BP,LA3TQ,LA5II, LA7SP,oprs) 140,220- 492- 95-C

OH2AA(OH2s BEP BNP BQS BRW,oprs) 939,720-1910-164-D
OH1ZT(+OH1s JW MA ZG) 180,456- 584-103-B

OK1KRG(OK1s ALW DWA, oprs) 1,369,347-2317-197-C
OK1KPU(OK1s JAX JDX,oprs) 757,593-1791-141-C
OK3VSZ(Multiop) 117,549- 353-111-C
OK3KTY(Multiop) 70,488- 356- 66-C
OK1KTW(Multiop) 21,750- 125- 58-B
OK1KCF(Multiop) 2520- 40- 21-B

OZ7SAC(Multiop) 101,640- 385- 88-B

PAØGIN(+PA3ADC,PAØs GAM KEN) 688,860-1335-172-B
PAØTUM/A(+PAØs GNI HJK NRA PIY TAW) 294- 14- 7-B

SK6CM(SM6s CJK COZ EOI EPA ESW FFK IHF,oprs) 498,405-1115-149-C
SK6AW(SM6s CMU CVE DER DOS FJB HCX,oprs) 331,125- 883-125-D
SK7HW(SM7s BUR EKU IFK, oprs) 169,632- 589- 96-D
SK7GC(SM7s GTD IDF KAQ, oprs) 24,882- 143- 58-C

SP5PWK(SP5s AWV CLK DZJ, oprs) 992,439-1869-177-B
SP5PTR(SP5s CNF GBT,oprs) 5040- 56- 30-B
SP1PBW(SP1s AMU JPQ,oprs) 3294- 61- 18-C

UK3AAC(UA3s ACX AGX, oprs) 672,243-1567-143-B
UK3DAH(3 oprs) 427,482-1122-127-B
UK4WAR(Multiop) 127,464- 457- 94-B
UK3DAU(3 oprs) 63,495- 255- 83-B
UK6LKP(2 oprs) 44,254- 239- 62-B
UK4FAV(2 oprs) 32,472- 451- 54-B

UK5IAZ(4 oprs) 494,595-1137-145-B

UK5MAF(4 oprs) 449,004-1054-142-B
UK5IFM(2 oprs) 126,630- 469- 90-B
UK5QBE(Multiop) 123,624- 408-101-B
UK5EAQ(5 oprs) 51,972- 284- 61-B

UK2AAB(3 oprs) 24,021- 157- 51-B

UK2BAS(3 oprs) 1,103,976-2152-171-B
UK2BBK(UP2s BAS BBF MB, oprs) 370,427-1093-113-B

UK2GKW(2 oprs) 1,469,820-2620-187-B
UK2GAB(3 oprs) 39,690- 294- 45-B

YU4FRS(Multiop) 1,649,710-2570-201-D
YU3DJR(+YU2RTG, YU3TKB) 100,128- 596- 56-B

North America

OX5AF(+WB7UCK) 8160- 68- 40-B

VP2DXC(AB8Y,W8UVZ,WB8s LDH OFG,oprs) 4,925,154-6058-271-D

XE1MDX(XE1s FX GBM LCH OD OX,oprs) 3,084,480-4320-238-B

Oceania

VK8BG(+VK8NCT) 412,182- 898-153-B

ZL3BK(+ZL3FF) 1,175,979-1931-203-C
ZL2AH(Multiop) 730,146-1669-146-B

South America

FY7AK(F5GQ,FY7BC,oprs) 5,001,066-6267-266-D

5J4RCA(HK4s CKT DPT DUM, oprs) 2,290,431-3653-209-D

YV1AVO(+YV1s DIG TO) 2,425,500-3234-250-C

Multi-Multi

Asia

JA7YAA(Multiop) 1,313,760-2380-184-D
JA3YKC(JA3s ODC REU,JH3s PRR VOT,JR3RIU,JH4ETH, JA5s GZB TDH,oprs) 800,004-1636-163-D
JA4ZQA(JA4s CUU CVJ CVK, JR4s AZE BMG,oprs) 147,609- 497- 99-D

Europe

G4ANT(G3s JOC JQI LDI MPN TMA VZT XLL,G4BIY, G8HWD,oprs) 3,628,047-5281-229-B

YU4EXA(YU1s OIF OIQ OOL, YU4s VFO VKZ VPA VRM, oprs) 2,864,604-4462-214-D

North America

K1CO/PJ7(+K1DH,W1s PH XK IUU,WA1TFF,WB1EJI,K2s CI WR) 11,547,432-13182-292-D

Top Asian multi-multi scores on both phone and cw came from Tohoku University Radio Club, JA7YAA. Here (l to r) JA7KPK, JG1UJD and JA7UQA keep the rigs warm. Drs. Yagi and Uda were professors at the University and the Yagi antenna was invented right at Tohoku. Guess what type of antenna is used here on the high bands.

K8BPX (above), along with Mad River Radio Club buddies K8MR, K8ND and WD8ALG, put station FG7AR/FS7 on cw, multi-single style to the tune of 3.3 million points.

The Aland Islands were well represented in this year's DX Competition. Standing (l to r); OH3XT/OHØ, OHØXZ; seated: OH3XX/OHØ and OH3TV/OHØ.

DX

Single Operator

Africa

EA8RL 623,322-1071-194-B

ZS6WW 1,674,036-2548-219-B

5Z4CW 114,777- 327-117-B

Asia

HS1ABD 866,229-1729-167-D

JA1IBX 1,322,109-2129-207-D
JE1CKA(JAØCUV,opr) 1,276,776-2056-207-D
JA1BWA 828,976-1644-168-D
JA7DLE 572,355-1185-161-B
JA9CWJ 443,232-1026-144-D

JR3XEX 248,064- 646-128-B
JA7MLG 242,748- 613-132-B
JA8SW 235,914- 574-137-D
JH8HZA 185,256- 664- 93-B
JAØSWT/1 153,720- 427-120-B
JJ1SOE 152,550- 450-113-B
JG1JMH 138,852- 399-116-B
JA2WB 131,418- 447- 98-B
JA7FFN/1 118,800- 330-120-B
JA1JQY 111,072- 356-104-B
JK1ASQ 111,042- 398- 93-B
JA9LX 95,550- 350- 91-B
JA6AKW 92,565- 363- 85-B
JA7AEM 83,505- 293- 95-B
JA1VZM 73,014- 283- 86-B
JA2HUN/1 71,016- 269- 88-B
JA1WL 49,896- 231- 72-D
JA1THL 47,424- 247- 64-B
JG1WRN 38,133- 223- 57-B
JA2AYH 31,464- 152- 69-B
JA1KXT 31,110- 170- 61-B
JA5IQD 27,840- 160- 58-B
JG1GJO 25,668- 138- 63-B
JH2MFY 23,328- 144- 54-B
JF3NTS 13,284- 108- 41-B
JK1QNT 10,368- 96- 36-B
JR6CF 9990- 74- 45-B
JAØMJD 9477- 117- 27-B
JI1XKH 6450- 86- 25-B

JJ1QAH 5220- 58- 30-B
JJ1INO 4980- 83- 20-A

UF6CX 21,156- 164- 43-B

UV9CO 69,225- 325- 71-B

VU2GW 4557- 49- 31-B

4Z4TA 9393- 101- 31-B

Europe

DJØUY 307,545- 707-145-D
DK8AX 246,915- 531-155-B
DL7BQ 140,220- 410-114-D
DK8KC 92,904- 316- 98-B
DJ5GW 90,900- 300-101-B
DLØFP 75,810- 266- 95-D

DM3PQO 828,825-1285-215-D
DM3YOE 360,375- 775-155-D
DM3NKF 155,550- 425-122-B
DM5BA 64,881- 243- 89-B
DM2CWB 61,425- 315- 65-B
DM2DXD 57,084- 284- 67-C
DM3XZN 56,448- 224- 84-B
DM2CRJ 40,530- 193- 70-B

DM2BOB 17,087- 79- 51-B

EA2IA 1,930,698-2768-231-D
EA2HW 128,250- 409-114-B
EA3PI 50,640- 211- 80-B

EA6BD 129,876- 548- 79-B

EI3CP 711,900-1356-175-B
EI9J 500,103- 921-181-B
EI5DI 129,744- 408-106-B

F8VJ 879,264-1376-213-D
F9IQ 767,295-1445-177-B
F6ENO 499,776-1096-152-B
F5IN 373,038- 787-158-B
F9BB 107,856- 336-107-B
F8TM 93,600- 300-104-B
F6API 67,500- 250- 90-B
F6EQV 66,555- 261- 85-B
F6ENN 63,990- 237- 90-B
F6FGN 30,195- 183- 55-C
F6CCI 20,562- 149- 46-B

G3FXB 2,021,052-2761-244-B
G3UFY 628,446-1151-182-B
G2QT 566,100-1020-185-B
G3ESF 372,243- 743-167-B
G3APN 48,555- 195- 83-B

G2AJB 26,100- 150- 58-B

GU5CIA(K5MM,opr) 2,463,300-3220-255-B

GW3JI 536,136-1004-178-B
GW3NYY 192,786- 506-127-B

HA5BA 198,072- 504-131-B
HA1VE 197,274- 539-122-B
HA4XX 190,212- 524-121-B
HA5KF 129,108- 406-106-B
HA7TM 3734- 49- 22-D
HA5KDW 540- 15- 12-D

HB9NL 138,312- 339-136-B
HB7BOW 18,444- 106- 58-B

LA1OA 52,824- 248- 71-B

OE6HZG 185,598- 491-126-B

OH2PM 500,565-1105-151-C
OH7NW 70,848- 246- 96-C
OH5PT 59,400- 198-100-C

OK2BLG 251,580- 599-140-C
OK3RA 163,968- 448-122-B
OK3UG 160,515- 369-145-C

OK1DKW 154,845- 455-111-B
OK1DCU 122,952- 376-109-B
OK1KUZ 111,693- 376- 99-B
OK2SGW 111,132- 343-108-B
OK2BEC 72,675- 255- 95-C
OK3YCA 72,960- 120- 36-B
OK1TJ 11,550- 110- 35-B
OK3YCV 11,340- 90- 42-B
OK1KLC 9480- 79- 40-B
OK1KIR 48- 4- 4-B

ON4XG 329,607- 691-159-B

OZ1LO 2,091,432-2954-236-C
OZ1W 301,968- 699-144-B
OZ5WQ 156,210- 410-127-B

PA9TA 66,528- 224- 99-B
PA9CF 18,792- 108- 50-B

SM3EVR 1,299,087-2033-213-C
SM9GMG 763,902-1369-186-C
SM6BZE 390,630- 898-145-B
SM5CAK 238,494- 801- 98-C
SM9BDS 213,750- 570-125-C
SM6AYM 187,956- 454-138-B
SM9CCE 165,006- 534-103-C
SM5AHK 108,225- 325-111-C
SM9JHF 49,140- 210- 78-B
SM5RE 25,404- 146- 58-B
SM6DOK 17,985- 99- 55-B

SP8ECV 938,694-1549-202-B
SP2FKW 67,620- 322- 70-B
SP9DBA 59,400- 300- 66-B
SP5JTR 28,890- 214- 45-B
SP9CAV/9 11,904- 124- 32-B

UA2FCW 42,180- 185- 76-B
UA2DC 8448- 88- 32-B

UA6APP 300,750- 802-125-B
UA3AHF 40,755- 247- 55-B
UA3AAH 39,639- 181- 73-B
UA6AYX 5040- 60- 28-B
UA3IAK 1653- 29- 19-B

UB5ZDF 692,068-1228-177-B
UB5KAY 13,880- 115- 40-B

UC2AAD 38,232- 236- 54-B
UC2AS 26,649- 141- 63-B
UC2WAZ 24,453- 143- 57-B
UC2CKC 16,560- 120- 46-B
UC2CED 9690- 85- 38-B

UP2BBF 44,940- 214- 70-B

UQ2IC 34,155- 165- 69-B

UR2QD 37,449- 171- 73-B
UR2RHF 1824- 32- 19-B

YO3CR 306,720- 720-142-B
YO3AC 172,329- 527-109-C
YO8DD 12,267- 87- 47-C
YO9YE 11,550- 110- 35-B

YU1QCV 1,409,400-2175-216-D
YU2QB 292,185- 645-151-B
YU1QQL 223,224- 568-131-C
YU1QON 27,702- 162- 57-B
YU2BTU 2664- 37- 24-B

North America

HI8MOG 576,840-1265-152-C

HP1AC 69,255- 243- 95-B

J3ABN(WB4SGV,opr) 2,462,784-3232-254-D

KL7CW 360,960- 752-160-C

OX3RA 167,040- 580- 96-B

VP2MOC(K2YY,opr) 3,120,048-3688-282-D
VP2MBK(K1UU,opr) 25,284- 172- 49-B

VP2VI 2,321,520-2845-272-B

XE2NQ(K1AR,opr) 2,374,890-3010-263-B

4U1UN(K2SX,opr) 2,378,040-2980-266-C

Oceania

WH4AAA 119,952- 408- 98-B

KH6ND 1,982,508-2612-253-D
KH6NO 1,448,523-1987-243-D
KØEU/KH6 547,734- 946-193-B
KH6H 58,032- 312- 62-B

VK2AR 1,195,236-1953-204-B
VK2GW 464,058- 882-174-B
VK3QI 71,190- 226-105-B
VK5OR 46,209- 211- 73-B

ZL3BK 772,512-1238-208-C

South America

HC2SL 2,073,234-2966-233-D

W1BIH/PJ2 2,241,450-2930-255-D

PY1UHG 122,994- 357-114-B
PY1WA 52,392- 236- 74-B

YV1NX 982,224-1436-228-D

High Band

Africa

C9AAN 27,267- 149- 61-B

Z56GS 26,151- 379- 23-B

K4YT/5Y6 15,717- 169- 31-B

Asia

HZ1HZ 611,712-1416-144-B

JJ1BBQ 874,314-1799-162-B
JA7DAH 746,982-1566-159-D
JR1IMV 697,500-1500-155-B
JA7GAX 679,320-1480-153-D
JR1RNC 665,496-1404-158-B
JA2VUP 633,330-1362-155-B
JE3SFN 537,711-1187-151-D
JH3CXL 511,797-1193-143-D
JA1GTF 503,064-1096-153-C
JA1JKG 493,290-1134-145-C
JA2EMP 456,000-1000-152-D
JE2KPM 435,456-1008-144-B
JH3AIU 399,924- 965-138-B
JA7FTR 395,460-1014-130-D
JA2HQ 391,860- 933-140-B
JH3HVQ 343,476- 812-141-B
JA1OHD 336,936- 808-139-D
JA2TK 278,208- 672-138-B
JA1OCA 270,945- 669-135-B
JF1SEK 262,710- 695-126-B
JA7BIJ 253,692- 729-116-B
JA1DQT 238,014- 598-131-C
JH4HTR 229,582- 574-131-B
JH7BRG 212,613- 541-131-D
JF3CCN 205,965- 597-115-B
JR3COZ 200,880- 540-124-B
JA1AYC 184,437- 621- 99-B
JH2LZR 183,540- 532-115-B
JH8KAN 176,916- 641- 92-B
JH1MTR 172,044- 486-118-B
JA2BJC 164,268- 468-117-B
JI1KUV 146,187- 439-111-B
JA2MYA 145,590- 422-115-B
JA9VBJ 141,264- 436-108-D
JA2AJA 120,897- 399-101-D
JF1QJD 119,385- 365-109-B
JH2HIW 117,729- 381-103-B
JA2BJ 116,493- 377-105-B
JK1ATT 116,412- 436- 89-B
JA8UBV 113,022- 414- 91-B
JA1OP 107,811- 363- 99-B
JF1XQL 103,428- 338-102-B
JA1HQS 71,550- 318- 75-B
JA3BQU 64,350- 275- 78-B
JA9SY 60,750- 295- 81-B
JH9AQS 59,904- 256- 78-B
JA7JNF/1 58,017- 233- 83-B
JA7UFZ 57,591- 237- 81-B
JH7SFY 47,088- 327- 48-B
JA1BDI 46,224- 214- 72-B
JF1MVJ 45,360- 315- 48-B
JK1ZZS 42,560- 212- 80-B
JA1IZ 40,683- 191- 71-B
JK1DLQ 40,683- 191- 71-B
JH1WIX 39,852- 246- 54-B
JR1IOS 36,693- 151- 81-B
JR3WXA 33,708- 212- 53-B
JH4KEB 32,670- 198- 55-B
JI1HNC 32,595- 205- 53-B
JK1USB 32,505- 197- 55-B
JE2MDE 31,584- 224- 47-B
JH3WKE 30,600- 170- 60-B
JA9FT 30,030- 143- 70-C
JA3CS 26,352- 144- 61-B
JE1AYQ 26,082- 161- 54-B
JA1DFQ 25,920- 216- 40-B
JR2HDS 25,578- 203- 42-B
JA1BN 24,231- 197- 41-B
JA8ERG 22,344- 196- 38-B
JA3ZGB(JE3UWU),opr) 21,294- 169- 42-B
JI1PCN 20,625- 125- 55-B
JE3TYJ 19,188- 164- 39-B
JA1EEF 19,116- 118- 54-B
JF1FTU 18,696- 164- 38-B
JA1LXD 18,480- 112- 55-B
JA6AKV 18,384- 133- 46-B
JH4RKD 18,144- 126- 48-B
JR3LAG 17,430- 166- 35-B
JI1OSP 17,328- 152- 38-B
JA1CSB 16,280- 155- 36-B
JR4DZM 16,692- 107- 52-B
JA1EMQ 16,350- 109- 50-B
JA3HUL 15,870- 115- 46-B
JH4UVU 15,840- 120- 44-B
JH4DRB 15,762- 142- 37-B
JE2SOY 15,717- 169- 31-B
JH7FZI 15,561- 133- 39-B
JA7FEC 15,375- 125- 41-B
JA7AOU 14,100- 100- 47-D
JA1PS 13,959- 99- 47-B
JI1XLQ 13,572- 116- 39-B
JA5IU 13,392- 144- 31-B
JA2MIM 13,029- 101- 43-A
JE2HAU 12,987- 117- 37-B
JA3SLU 11,985- 111- 36-B
JA7DUD 11,880- 90- 44-B
JA2FSM 11,520- 80- 48-B
JA7ARW 11,481- 89- 43-B
JA3HU 10,560- 110- 32-B
JA3ARM 10,509- 113- 31-D
JR3WGU 9603- 97- 33-B
JF3LHO 9072- 84- 24-B
JE3UES 9000- 100- 30-B
JE2DOD 7548- 74- 34-B
JA1BZM 6720- 70- 32-B
JA1KPA 6480- 60- 36-B
JR1PUO 5187- 91- 19-B
JA4SRG 5130- 57- 30-B
JA1BGW 4830- 70- 24-B
JF2DJI 4752- 72- 22-B
JH1CNN 4608- 64- 24-B
JR2BDG 4599- 73- 21-B
JA5AWT 4410- 70- 21-B
JA7BAL 4368- 52- 28-C
JE3MWB 2904- 44- 22-B
JR1PUO 2880- 48- 20-B
JF1VDG 2520- 42- 20-B
JA0ZG/1 2346- 34- 23-A
JR6LP 2340- 52- 15-B
JH7WEE 2337- 41- 19-B
JE2JML 1920- 40- 16-B
JE2MOL 1836- 51- 12-B
JA1AVI 1800- 30- 20-B
JE3UER 1710- 38- 15-B
JA9AFU 972- 18- 18-B
JH2WBI 960- 32- 10-B
JA6PL 405- 15- 9-B
JQ1OWV 324- 12- 9-B
JR3QOV 315- 15- 7-A
JA6FYM 216- 12- 6-B
JA1AAT 90- 6- 5-B
JQ1FZG 60- 5- 4-B
JA2QR 36- 4- 3-A
JJ1PNN 36- 4- 3-B

JR1FYS/JD1 112,320- 360-104-B

JT1AN 12,210- 188- 66-B

UA9FAJ 331,731- 899-123-B
UA9MR 318,954- 901-118-B
UA9NN 250,560- 720-116-B
UA9OCI 242,400- 808-100-B
UA9QDH 204,462- 614-111-B
UA9QWB 123,165- 483- 85-B
UA9AAM 13,437- 425- 89-B
UA9LBM 89,496- 314- 84-B
UA9AED 77,490- 287- 90-B
UA9CBO 70,758- 445- 53-B
UA9JAY 54,036- 237- 76-B
UA9QAQ 51,246- 234- 73-B
UA9SGN 30,855- 187- 55-B
UA9CDM 6141- 89- 23-B
UW9PT 2580- 43- 20-B
UA9OGT 1458- 27- 18-B

UD6DFK 17,928- 166- 36-B
UD6BW 24- 4- 2-B

UF6BN 7395- 85- 29-B

UH8DC 383,439- 961-133-B

UI8LC 6975- 75- 31-B
UI8TAA 96- 8- 4-B

UJ8AQ 3528- 49- 24-B
UJ8AP 1836- 36- 17-B

UL7QF 156,312- 501-104-B
UL7LCQ 25,803- 183- 47-B
UL7GBD 17,205- 155- 37-B
UL7TA 13,113- 141- 31-B
UL7CBS 2139- 31- 23-B
UL7PBY 441- 21- 7-B

UM8MBA 66,822- 259- 86-B

VU2GO 63,840- 280- 76-B

4Z4MB 470,400-1120-140-C

Europe

DJ9ON 490,680-1160-141-C
DF7FH 358,656- 934-128-D
DK8BI 151,500- 500-101-C
DJ9IV 150,096- 424-118-B
DJ5GG 138,345- 401-115-B
DA1PX 121,176- 594- 68-B
DK3GI 58,212- 231- 84-D
DF3DN 51,480- 220- 78-C
DK2ZF 48,000- 250- 68-B
DF4NW 45,000- 200- 75-B
DL9HP 30,573- 237- 43-
DL1RB 27,468- 216- 42-B
DK4HD 13,056- 128- 34-B
DK9MB 9900- 100- 33-B
DL1NE 4290- 55- 26-B
DA2JA 300- 10- 10-B

DM2BLG 89,397- 387- 77-B
DM35BM 48,132- 191- 84-B
DM4WFF 25,245- 165- 51-B
DM2CXE 22,620- 145- 52-B
DM2CLM 22,344- 133- 56-B
DM2CTM 17,775- 137- 45-B
DM2BWK/A 16,464- 112- 49-B
DM2BUB 15,912- 137- 39-B
DM2AJH 8910- 90- 33-B
DM2FFL 8580- 110- 26-B
DM3UPL 5610- 56- 34-B
DM4SWL 5124- 61- 28-B
DM3HM 3948- 53- 22-C
DM2CHN 2640- 40- 22-B
DM4ZCO 2208- 32- 23-B
DM3UE 1581- 31- 17-B
DM2CJN 1152- 32- 12-B
DM2AXB 621- 23- 9-B

EA2QP 847,080-1810-156-D
EA7XQ 192,790- 463-110-C
EA7AAW 94,620- 332- 95-B
EA3ALV 88,740- 290-102-B
EA1JO 42,525- 189- 75-C
EA5ND 8280- 69- 40-B
EA4BV 1452- 33- 22-B

EI2BB 578,418-1294-149-B
EI8CZ 37,185- 185- 67-B

F6DCQ 186,813- 561-111-B
F3DA 66,600- 300- 74-B
F5DM 20,124- 172- 39-B
F6ETW 17,199- 117- 49-B
F3AT 16,200- 150- 54-B
F6AXX 6786- 78- 29-B
F6DMV 2736- 38- 24-B
F2PC 759- 23- 11-B

G3TBK 434,280-1024-140-B
G3MZV 425,741-1021-137-B
G3CYL 169,376- 581-137-B
G3YBH 98,982- 351- 94-B
G4DDL 89,010- 345- 86-B
G6NK 8667- 107- 27-B
G4CSB 7980- 76- 35-B

GM3LYY 160,740- 470-114-B
GM3NHQ 79,560- 312- 85-B
GM4EJI 26,082- 138- 63-B

GU4CHY 114,162- 359-106-B

HA7MC 147,798- 483-102-B
HA9KLF 118,800- 400- 99-B
HA1ZD 114,052- 377- 92-B
HA4YG 90,450- 335- 90-B
HA2KMB 82,236- 308- 89-B
HA4YQ 72,816- 328- 74-B
HA3HE 25,800- 215- 40-B
HA1TD 19,425- 175- 37-B
HA3QJ 16,638- 149- 37-C
HA7PQ 12,726- 101- 42-B
HA4XR 12,138- 119- 34-B
HA6NP 12,090- 130- 31-B
HA3HZ 6930- 77- 30-B
HA3GO 2775- 37- 25-C
HG7TQ 1440- 40- 12-B
HA7UJ 828- 23- 12-B

HB7AGH 208,278- 551-126-B
HB7BU 8400- 80- 35-B

II1KUI 767,904-1684-152-C
I4DVT 458,352-1061-144-C
TT8VDQ 205,380- 816- 84-B
I1HJP 108,654- 398- 91-B
I@XXR 67,689- 327- 69-A
I7LMR 51,010- 405- 42-B

LA5SH 318,096- 752-141-B
LA3UG 38,208- 199- 64-B
LA3QJ 23,055- 145- 53-B
LA7XB 16,074- 141- 38-B
LA2Q 7659- 69- 37-B
LA3BO 1980- 33- 20-B

LX1ML 46,500- 250- 62-B

LZ1XL 18,000- 120- 50-C
LZ2KR 15,480- 172- 30-B
LZ1RF 14,382- 141- 34-B

OE1NPW/3 442,395-1017-145-C

OH6AC 696,714-1538-151-D
OH6GO 450,864-1212-124-D
OH6ZAB 450,018-1087-118-D
OH2BSS 222,525- 645-115-D
OH6RC 152,928- 531- 96-B
OH1AD 139,776- 453-104-C
OH6UC 138,648- 424-109-C
OH2BSQ 102,723- 353- 97-B
OH1YR 84,564- 324- 87-B
OH3AA 74,646- 286- 87-D
OH5ZM 59,052- 259- 76-B
OH5KJ/7 41,808- 208- 67-B
OH6MM 40,194- 203- 66-B
OH3RU 38,592- 201- 64-B
OH1EH 35,280- 210- 56-B
OH1HS 32,886- 189- 58-C
OH3MM 22,950- 170- 45-B
OH6GD 21,240- 120- 59-B
OH1FM 20,625- 125- 55-B
OH2PQ 19,665- 115- 57-B
OH1EG 7378- 79- 31-B
OH1LU 7128- 88- 27-C
OH2BN 6930- 70- 33-B
OH3VE 6264- 72- 29-B
OH9TD 2625- 35- 25-B
OH9PH 1632- 32- 17-B
OH2SE 1620- 30- 18-A
OH1EB 1326- 26- 17-B
OH3RF 1104- 23- 16-A

OH2KI 924- 28- 11-B
OH7TV 168- 8- 7-B

OK1VK 523,688-1202-148-B
OK3DM 525,690-1298-135-D
OK2KMR(OK2SEQ,opr) 333,336- 817-136-B
OK3IF 112,785- 365-103-B
OK3KAP(OK3CGY,opr) 106,191- 437- 81-C
OK1FCA 105,429- 311-113-B
OK1MIN 104,082- 418- 83-B
OK3CES 65,853- 271- 81-B
OK2SPS 42,303- 239- 59-B
OK1KUR(OK3CLD,opr) 41,736- 296- 47-B
OK2KRT 41,064- 236- 58-B
OK1CIJ 41,004- 204- 67-C
OK2QX 39,639- 181- 73-D
OK1FV 35,316- 218- 43-C
OK1DKR 33,123- 181- 61-B
OK2PBG 32,724- 202- 54-B
OK1JHR 29,106- 198- 49-B
OK3CAN 28,767- 223- 43-B
OK2SAR 28,224- 195- 49-B
OK3CO 24,072- 236- 34-B
OK2BJU 20,670- 130- 53-B
OK1A5Q 20,424- 148- 46-B
OK3CYU 18,522- 126- 49-B
OK2BPK 16,218- 106- 51-B
OK2FON 14,490- 138- 35-B
OK2PS 12,955- 95- 43-B
OK1AVG 11,703- 83- 43-B
OK1DMJ 11,136- 128- 29-B
OK1AOU 9870- 94- 35-B
OK1ASG 8820- 105- 28-B
OK1AII 6980- 77- 30-B
OK1OXP 4836- 62- 26-B
OK1DFD 3105- 45- 23-B
OK1BBJ 2967- 43- 23-C
OK2TBC 2829- 41- 23-B
OK1AIA 2448- 34- 24-B
OK1AOJ 1209- 31- 13-B
OK2SMO 1053- 27- 13-B
OK3YDP 924- 30- 11-B
OK1VYQ 630- 21- 10-A
OK1KCE 486- 12- 9-B
OK1MSO 462- 14- 11-B
OK2BGN 279- 31- 3-B
OK2LN 273- 13- 7-B
OK2ABU 27- 3- 3-B

ON6FD 380,100- 905-140-B
ON6ZW 162,360- 492-110-B
ON5WL 31,878- 231- 46-B

OZ1DQX 322,530- 827-130-C
OZ1FGS 243,540- 660-123-B
OZ1BII 147,702- 478-103-B
OZ6XR 123,420- 484- 85-B
OZ3PE 72,924- 236-103-B
OZ1DYU 54,144- 188- 96-B
OZ5QU 51,704- 188- 92-B
OZ2PG 26,460- 210- 42-B
OZ8ND 25,920- 120- 72-B
OZ1EE 24,108- 196- 41-C
OZ4HW 14,490- 138- 35-B
OZ5C1 11,868- 92- 43-B
OZ7GG 6417- 69- 3-B
OZ6KS 6231- 67- 31-B
OZ8E 108- 6- 6-A

PA0UV 247,212- 654-126-B
PA0CLC 235,510- 478-165-B
PA0NIE/A 203,940- 618-110-B
PA0EP 149,142- 469-106-B
PA0WTY 129,696- 386-112-B
PA0FRS 99,084- 344- 89-B
PA0LOU 69,402- 269- 86-B
PA0GT 61,410- 230- 89-B
PA0DIN 18,711- 99- 63-B
PI1PT 15,744- 128- 41-B
PA0ANK 6891- 69- 33-A
PA0PBC 5700- 50- 38-B

SM5ACQ 268,584- 722-124-B
SM6EUZ 218,625- 583-125-C
SM3DXV 180,468- 557-108-B
SM9CCM 136,404- 421-108-B
SM5AKT 104,160- 260-124-B
SM7WIN 99,792- 396- 84-B
SM5CCT 67,728- 272- 83-A
SM6BXV 58,311- 209- 93-C
SM6JHO 52,668- 266- 66-B
SM2BFH 45,162- 193- 78-C
SM5CSS 43,050- 175- 82-C
SK6AB(SM7EAN,opr) 42,290- 314- 45-C
SM7HEC 31,590- 130- 81-B
SM5DYC 29,248- 153- 64-B
SM7CZC 12,960- 80- 54-A
SM7EH 7533- 96- 27-C
SM7GGK 4446- 57- 26-B
SM6CBM 4172- 50- 28-B
SM6JVV 3774- 74- 27-B
SM5DUT 2394- 42- 19-C

SP5BR 129,744- 408-106-B
SP9CTW 123,927- 412-101-C
SP6DMJ 37,944- 204- 62-C
SP5BRR 34,026- 214- 53-B
SP8HVN 22,092- 263- 28-B
SP8HMK 14,859- 127- 39-B
SP7KTE(SP7IFM,opr) 8424- 104- 27-B
SP9JBE 4872- 56- 29-B
SP9EQS 4422- 67- 22-B
SP9CVV 2070- 46- 15-B
SP7AVW 1008- 24- 14-B
SP7AW 300- 10- 10-C

UW1YY 410,184- 844-162-B
UA1CQ 409,575-1075-127-B
UA4CK 254,610- 738-115-B
UA3QAQ 239,460- 614-130-B
UA4PAU 219,198- 614-119-B
UA3DFK 201,201- 737- 81-B
UK4WAR 141,372- 462-102-B
UA4HDV 126,825- 475- 89-B
UA3AGL 108,813- 437- 83-B
UW6CV 94,944- 368- 86-B
UA3EZ 93,912- 364- 86-B
UA4AMBP/ 87,294- 338- 86-B
UA4ACA 69,580- 298- 82-B
UA6AJG 62,250- 250- 83-B
UA4ABO 54,672- 272- 67-B
UA4PAA 49,140- 234- 70-B
UA4CDC 43,152- 232- 62-B
UA3AFO 39,564- 314- 42-B
UA2FZ 34,776- 207- 56-B
UA6ABS 32,250- 250- 43-B
UA3GO 30,396- 149- 68-B
UA4YAT 28,122- 218- 43-B
UA6AXX 25,542- 198- 43-B
UA3RDH 23,996- 151- 52-B
UA4FCZ 23,247- 189- 41-B
UA4ACD 22,776- 146- 52-B
UA1WEA 20,148- 146- 46-B
UA1ARF 19,836- 174- 38-B
UA3TR 19,680- 160- 41-B
UA1QOB 18,648- 168- 37-B
UA1UF 15,840- 120- 44-B
UA3TAG 15,729- 107- 49-B
UA3TOP 12,771- 99- 43-B
UA3EAT 11,718- 126- 31-B
UA3AHZ 11,644- 104- 37-B
UA4WBJ 10,584- 84- 42-B

UA6AKT 10,584- 98- 36-B
UA3DAM 10,179- 117- 29-B
UA4WAG 10,192- 94- 36-B
UA3ADO 9810- 109- 30-B
UA1WBG 9801- 121- 27-B
UA4PGO 8091- 87- 31-B
UA3AAJ 5772- 74- 26-B
UA4QK 4896- 68- 24-B
UV3AP 3600- 50- 30-B
UA3XW 2880- 40- 24-B
UK3EAL 2448- 48- 17-B
UA1ADN 2106- 39- 18-B
UA1CFF 336- 14- 8-B

UB5LDP 358,020- 918-130-B
UB5VY 344,487- 803-143-B
UB5LR 316,060- 554-130-B
UB5UIA 160,392- 682- 82-B
UB5DW 104,232- 344-101-B
UY5UI 73,272- 284- 86-B
UK5DAA(UB5YK,opr) 53,235- 273- 65-B
UB5AAL 48,312- 244- 66-B
UT5LF 46,644- 299- 52-B
UB5NCF 32,490- 285- 38-B
UB5JQN 32,670- 242- 45-B
UB5HQ 19,998- 202- 33-B
UB5RS 19,305- 165- 39-B
UB5HEK 19,140- 110- 58-B
UB5ZBF 10,302- 101- 34-B
UT5SY 10,260- 114- 30-B
UB5UDC 8568- 102- 28-B
UB5HDN 7392- 88- 28-B
UB5EAX 5850- 75- 26-B
UT5HP 5775- 77- 25-B
UB5EEW 5460- 65- 28-B
UB5JIM 5280- 55- 32-B
UB5NAO 4740- 79- 20-B
UB5JIQ 3744- 52- 24-B
UB5OE 1170- 26- 15-B

UC2WBI 43,200- 300- 48-B
UC2ACA 31,860- 177- 60-B
UC2ACL 3900- 65- 20-A

UO5OWN 8370- 90- 31-B

UP2BAT 683,421-1451-157-B
UP2BAR 444,312-1089-136-B
UP2BAO 286,224- 712-134-B
UP2QM 120,852- 373-108-B
UP2PCQ 29,355- 197- 40-B
UP2REI 27,219- 211- 43-B
UP2PAQ 8613- 99- 29-C
UP2BFU 3078- 57- 18-B

UQ2GCN 944,826-2006-157-B
UQ2GHJ 44,100- 350- 42-A

UR2RSA 81,090- 510- 53-B
UR2OI 1170- 30- 13-B
UR2RHK 546- 14- 13-B

YO3JX 190,512- 567-112-B
YO2BLO 176,886- 634- 93-B
YO9APJ/3 83,100- 277-100-B
YO8FR 72,489- 343- 73-B
YO2IS 27,720- 210- 44-B
YO6AFP 10,584- 98- 36-B
YO9HP 4959- 87- 19-B
YO3JW 4800- 80- 20-A
YO2BIN 4025- 61- 22-B
YO2BEO 2460- 41- 20-B
YO2RA 1440- 32- 15-B

YU1KV 1,033,956-2238-154-D
YU2BHI 398,376-1006-132-B
YU4VOY 368,310- 902-135-C
YU2RTC 324,156- 908-119-C
YU2RGB 249,858- 661-126-B
YU1OPG 4554- 66- 23-D
YU1OTA 4368- 56- 26-B
YU1SF 48- 4- 4-B

North America

KL7JER 344,040- 940-122-B
AL7O 39,516- 178- 74-B
KL7IBT 30,024- 139- 72-A
KL7GN 14,874- 134- 47-C

OX5AF 20,898- 129- 54-B

Oceania

W7LPF/DU2 26,790- 235- 38-C
N7ET/DU6 120- 8- 5-A

KH6CKJ 563,667-1261-149-B
KH6JTW 259,656- 698-120-B
KH6CP 52,560- 219- 80-B
KH6JWK 22,620- 116- 65-B
KH6JTE 2277- 33- 23-B

KX6BQ(W5IL,opr) 23,769- 139- 57-D

ZL1AFW 95,475- 335- 95-B

South America

CE3XV 177,498- 519-114-D

CP5NK 6042- 53- 38-B

PY1ARS 30,096- 228- 44-B
PY8ZLC 14,274- 122- 39-B
PY2YP 14,208- 128- 37-B
PY1BOA 14,175- 135- 35-B
PY3CB 8280- 69- 40-B
PY2FNE 4758- 61- 26-B

Low Band

Africa

EL2AV 66,591- 453- 49-D

Asia

JH1RFM 38,073- 259- 49-B
UA9BE 31,059- 203- 51-D
JF1TFC 12,420- 138- 30-B
JH2ZUN(JA3XIS,opr) 11,310- 130- 29-B
JG3GQA 2520- 56- 15-B
JA3QZW/1 1650- 50- 11-B
JA1JIX 1551- 47- 11-B
JA1LEY 1200- 40- 10-B
JH1JGZ 960- 40- 8-B
JH7BDS 825- 25- 11-D
JA1BOK 645- 129- 5-A
JR2NTC 594- 33- 9-A
JF1SVV 504- 24- 7-B
JF3EZG 450- 30- 5-B
JE2GMQ 390- 26- 5-B
JA9VFM/1 18- 3- 2-A
JA1OUM 12- 2- 2-B

UW9FB 3504- 73- 16-B

Europe

DK9PY 39,694- 453- 66-D
DLØXX(DK3KD,opr) 27,135- 201- 45-D

DM2CUJ 48,441- 241- 67-B
DM3XM 43,560- 264- 55-C
DM3BF 24,948- 189- 44-B
DM2DLE 6642- 83- 27-C
DM2CIM 5844- 88- 21-B
DM2FTL 480- 21- 8-B

F8ZF 50,634- 291- 58-B

G5CMX(N8ET,opr) 65,340- 363- 60-B

HA8UT 15,504- 136- 38-B
HA3PT 8475- 113- 25-B
HA7UG 7056- 84- 28-B
HA5KI 3600- 50- 24-B
HA7SQ 1008- 24- 14-B
HA3KGY 648- 24- 9-B

I1ZEU 26,220- 230- 38-C

LA9DW 14,625- 125- 39-B

LZ1YG 1440- 32- 15-B

OK1ALW 95,013- 459- 69-C
OK1DCP 3540- 59- 20-A
OK2BUH 2655- 59- 15-B
OK3TDO 1122- 34- 11-B
OK2BMA 264- 11- 8-A

ON6BC 92,664- 429- 72-B

OZ1ERC 46,746- 294- 53-B

PA3AIC 1694- 77- 22-B

SM6EHV 37,620- 228- 55-C
SM0BVQ 1470- 35- 14-C

SP8MJ 5808- 88- 22-C
SP9ASS 4032- 56- 24-B

UA3EAL 23,247- 189- 41-B
UA3AGX 486- 18- 9-A

UT5JD 39,825- 295- 45-B
UB5UWG 8820- 105- 28-B

UC2XX 5412- 82- 22-B

UO5ODA 726- 22- 11-B

UP2NV 40,545- 265- 51-B
UP2OU 25,392- 184- 46-B

UQ2GDW 51,645- 313- 55-B
UQ2GFN 35,343- 231- 61-B
UQ2GEC 4158- 63- 22-B

YO3BEJ 26,751- 241- 37-B
YO3BYF 315- 15- 7-B

YU3DCK 6882- 74- 31-B

North America

HI8LC 20,700- 150- 46-B

Oceania

KH6AM (68,636- 611- 92-D

VR3AH 237,876- 787-116-B

ZL2TX 27,900- 186- 50-B

South America

WA4UAZ/HC1 242,100- 807-100-C

HK3YH 45,045- 231- 68-B

Multi-Single

Africa

C5ABX(N6VR,WA6VNR,opr5) 861,270-1511-190-B

LL2EV(+EL2OM) 773,220-1841-140-D

Asia

JA1YFL(JA8JCJ,JR2BNF, JG1LAV,opr5) 1,214,784-1824-222-D

JA3YKC(JA3s ODC REU,JH3s PKS VOT,JR3s RIU KEG, JH4ETH,opr5) 1,181,880-1876-210-D

JA3ZRT(JH3PKS,JH4ETH, JA9UDU,opr5) 34,020- 180- 63-D

UK7CAC(UL7s CAZ CBP,opr5) 6882- 74- 31-B

UK9ADY(UA9s ADH ADI AFZ AJA,opr5) 845,688-1688-167-B

UK9HAC(UA9s HBH HBQ, opr5) 612,450-1361-150-B

UK0QAH(UA0s QDC QDL QWN,opr5) 332,622-1087-102-B

UK0ZAF(Multiop) 219,788- 987-108-B

UK9CBD(UA9CBM,UW9CW, opr5) 224,448- 668-112-B

UK0FAD(Multiop) 172,260- 660- 87-B

UK0LAD(Multiop) 63,612- 372- 57-B

UK0KAN(UA0s KBR KBV, opr5) 39,690- 270- 49-B

UK9SAD(Multiop) 35,190- 255- 46-B

UK9KAD(Multiop) 33,276- 236- 47-B

Europe

DL0AA(DJ5PA,DK2ZO, DL1YD,DL3BK,DL6KB, DL8NU,opr5) 2,209,908-3019-244-D

OK0TU(DK1PD,DK5GB, OK6QI,OK5GX,DL7s LH ZN, DL8TW,DJ9NX,opr5) 1,923,636-2596-247-D

DL0VW(DF1OC,DF3OL,opr5) 101,286- 331-102-B

EA7TL(+EA7ALG) 1,004,295-1633-205-B

EA3DUB(EA3s AIR AVV OG XH XZ,opr5) 262,977- 613-143-B

G3OUR(G3s CWI YGF,G4s BUO EWJ EZN GFX,opr5) 1,792,815-2943-235-B

G3TXF(+G3SXW) 1,232,448-1834-224-B

HA0KLE(6 opr5) 759,177-1259-201-C

HA1KSA(5 opr5) 586,637-1211-189-C

HA7KSV(4 opr5) 678,186-1322-171-B

HA7KLC(4 opr5) 382,239- 891-143-B

HA9KPU(4 opr5) 382,077- 801-159-B

HA3KMK(3 opr5) 344,634- 809-142-C

HA2KRZ(6 opr5) 300,105- 741-135-B

HA5KHG(5 opr5) 285,120- 704-135-B

HA3KNA(6 opr5) 228,750- 610-125-B

HA8KBE(4 opr5) 226,431- 543-139-B

HA5KKB(2 opr5) 194,856- 523-124-B

HA5KFU(2 opr5) 179,568- 516-116-B

HA6KVD(2 opr5) 150,228- 468-107-B

HA3KHB/P(5 opr5) 149,283- 513- 97-C

HA0KLU(6 opr5) 121,659- 379-107-B

HA6KZS(4 opr5) 109,074- 371- 98-B

HA8KWO(3 opr5) 63,600- 265- 80-D

HA2KME(4 opr5) 38,784- 202- 64-B

HA1KSL(2 opr5) 27,789- 157- 59-C

HA0KLL(2 opr5) 315- 21- 9-B

HB7LF(HB9s BFU BHI BIG BOQ BTU,opr5) 148,500- 450-110-C

I4MGM(+I0JX) 1,984,296-2851-232-C

I3FIY(+I3SJT C QLM) 1,354,434-2071-218-C

LA3T(LA3TQ,LA7SP,opr5) 117,488- 478- 82-D

LA1K(LA3GW,LA5MT, LA6WP,opr5) 104,652- 323-108-C

LY1KFZ(Multiop) 2139- 31- 23-B

M1I(M1C,W3US,opr5) 421,800- 925-152-C

OH2AA(OH2s BNP BQS BRW DS,opr5) 1,032,684-1831-188-D

OH0PA(OH1PA,OH1CW,opr5) 18,444- 116- 53-B

OK5TLG/P(OK1s DFW MMW, opr5) 1,518,933-2291-221-C

OK3RKA(Multiop) 257,508- 622-138-B

OK1KTW(Multiop) 116,145- 435- 89-B

OK1KPZ(Multiop) 77,100- 257-100-B

OK3KVE(OK3s CMM CWQ, opr5) 75,480- 296- 85-B

OK3VSZ(Multiop) 61,977- 283- 73-C

OK1KCI(Multiop) 61,893- 299- 69-C

ON6AH(ON5s AV IQ,ON6s AH MH QR VL,ON7s ZV JL,opr5) 41,664- 224- 62-B

PA0VLA(Multiop) 32,880- 274-100-B

PA0TUM/A(+PA0s GNI HJK NRA PIY TAW) 3420- 57- 20-B

SK7CE(SM7s DXX EBC ESE EJE FUE HPD IPB ITN NM RN, opr5) 631,800-1170-180-C

SM0AQD(+SM0GMZ) 504,735-1045-161-C

SL0D1(Multiop) 441,504-1008-146-C

SK6AW(SM6s CDG CVF DFR DJI DOS,opr5) 434,214- 946-153-C

SK7GC(Multiop) 8967- 61- 49-C

UK3LAC(UA3s LAC LMJ LN, opr5) 1,044,415-1965-177-B

UK3DAH(Multiop) 980,796-1739-188-B

UK6APA(UA6s APR ARX, opr5) 471,960-1140-138-B

UK1ZAO(UA1s ZCZ ZBQ ZV, opr5) 350,754-1103-106-B

UK4FAV(Multiop) 221,100- 550-134-B

UK1AFA(Multiop) 208,320- 620-112-B

UK3ACR(Multiop) 184,464- 549-112-B

UK3OAU(Multiop) 164,268- 507-108-B

UK4WAC(Multiop) 149,175- 425-117-B

UK3EAA(Multiop) 90,450- 335- 90-B

UK3WAA(Multiop) 33,600- 175- 64-B

UK3XAM(Multiop) 33,600- 200- 56-B

UK6HAR(UA6s HDY HEJ HGL, opr5) 30,450- 175- 58-B

UK6LTF(Multiop) 8736- 104- 28-B

UK3TAN(3 opr5) 6075- 81- 25-B

UK3EAL(2 opr5) 2448- 48- 17-B

UK5IAZ(Multiop) 893,133-1741-171-B

UK5MAF(UB5MDC,UY5LK, opr5) 587,543-1149-169-B

UK5UBB(Multiop) 383,625- 825-155-B

UK5QBE(UB5QBG,UY5CW, opr5) 324,660- 773-140-B

UK5JAO(Multiop) 277,749- 729-127-B

UK5IFM(Multiop) 250,470- 759-110-B

UK5EDX(Multiop) 19,305- 143- 45-B

UK5MDM(Multiop) 15,318- 138- 37-B

UK5HAB(Multiop) 4992- 64- 26-B

UK2ABC(UA2FCZ,UC2ACU, opr5) 568,890-1290-147-B

UK2WAF(Multiop) 405,162-1098-123-B

UK2AAB(Multiop) 392,460- 844-155-B

UK2BAS(Multiop) 1,860,624-2832-219-B

UK2PCR(UP2s BBX BCR BCT BDF BFI BFL DO,opr5) 975,741-1651-197-B

UK2GKW(Multiop) 2,033,775-3013-225-B

UK2GAC(UQ2s GDX GIW GIN GIY,opr5) 951,774-2173-146-B

UK2GAB(Multiop) 430,050-1175-122-B

UK2GDZ(Multiop) 296,286- 874-113-B

UK2GAZ(Multiop) 18,144- 144- 42-B

YO6KNL(YO6s AKW HQ,opr5) 297,255- 745-133-B

YO6KBM(YO6s ADP DB,opr5) 2964- 38- 26-C

YU4FRS(Multiop) 1,776,040-2694-220-D

YU1ELM(YU1s OFT OOW OPI OQZ,opr5) 864,084-1508-191-D

YU3DJR(+YU2R FG,YU3s TKB TNO) 255,420- 645-132-B

North America

W2AEE/C6A(WA2s ARF ZKY, AE9B,opr5) 1,504,652-2292-277-B

FG7AR/FS7(+K8s BPX MR ND, WD8ALG) 3,379,368-4052-278-B

HH2I(+W8RWU) 2,563,916-3041-292-C

XE2FU(+K5s LZO RC WA ZD) 4,222,725-4615-305-D

Oceania

KH6TM(+KH6IKL) 424,359- 837-169-B

ZL2AH(Multiop) 173,568- 512-114-B

Multi-Multi

Asia

JA7YAA(Multiop) 1,855,368-2824-219-D

JA9YBA(JA9s DZS FSU GLL LWB,JH2FKX,JH2NKG,opr5) 1,732,464-2724-212-D

JA2YKA(JA4UDP,JH2QXG) 1,362,312-2226-204-B

JA1YXP(JF1VVR,JH1HGD, JK1s EPI OUQ,JA8MRV, JA9XUF,opr5) 1,310,319-2173-201-D

JA7YAF(JA7s RHJ UES UIW, JH7s CSU SJH WKQ,opr5) 1,123,470-1971-190-B

JA2YCZ(JR2BSY,JR2LUM, opr5) 181,152- 592-102-B

Europe

DL0KF(DF3LP,DF6LH,DJ8FR, DJ7SW,DJ2BV,DJ4FZ,DJ4SO, DF8LD,opr5) 1,623,024-2601-208-D

HA5KFL(6 opr5) 1,572,960-2320-226-B

HA5KA(2 opr5) 32,148- 188- 57-B

OH5AB(OH5s BB KH UO RO, opr5) 130,968- 408-107-C

Oceania

VK5WC(VK3s MQ SZ,opr5) 376,329- 799-157-B

From the left (far left photo) AB8Y, WB8OFG, visitor; KV4KV, WB8LDH and W8UVZ. The rigs, the antennas and some of the local flora at VP2DXC th top North American phone multi-single, number 2 worldwide.

W/VE

Single Operator

1

Connecticut

K1PR 1,602,018-1674-319-D
W1XX 639,506- 881-242-D
K1WB 632,772- 868-243-D
K1THP 108,837- 261-139-D
K1EM 21,420- 105- 68-D

Eastern Massachusetts

AB1A 545,040- 757-240-D
K1MM(N1EE,opr) 401,778- 663-202-D
K1MEM 122,763- 271-151-D

New Hampshire

K1GQ 937,365-1045-299-D
K1MBQ 339,000- 565-200-D
WA1TZV 37,752- 143- 86-D
WA1YTW 2976- 32- 31-D

Rhode Island

WB1CRG 404,352- 624-216-D

Western Massachusetts

K1BW 1,273,920-1327-320-D
K1ST 368,466- 566-217-D
K1KNQ 7680- 64- 40-D

2

Eastern New York

K2XA 609,174- 775-261-D
W2IB 258,408- 444-164-D
WA2AUB 46,200- 140-110-D
K2GBH 14,091- 77- 61-D

New York City - L.I.

N2GC 332,856- 536-207-B
W2SGK 124,695- 255-163-D
W2ZPG 3978- 39- 34-B

Northern New Jersey

N2LT 1,178,712-1284-306-D
N7TT/2 753,936- 904-278-D
W2GD 710,400- 925-256-D
K2BK 395,808- 608-217-D
W2RQ 237,168- 432-183-D
WA2ZWH 148,212- 358-138-B
W1GD 115,200- 256-150-D

W2SQ 57,015- 181-105-D

Southern New Jersey

N2MR 517,650- 725-238-D
WA2VYA 503,328- 784-214-D
N2VW 472,392- 644-233-D
AA2Z 412,965- 665-207-D
W2KI 314,496- 504-208-B
AB2E 294,624- 528-186-D
AI2O 208,350- 463-150-D
W2REH 199,044- 388-171-D
W2PAU 131,040- 273-160-D
W2YC 108,336- 264-133-D
W2FHY 39,780- 156- 85-D
N2AWH 21,504- 112- 64-B
K2JF 6814- 57- 34-B

Western New York

W2RR(WA2AOG,opr) 174,960- 360-162-D
W2QIP 111,219- 283-131-D
KB2HF 90,675- 254-119-C
K2VV 11,055- 67- 55-D

3

Delaware

W3NX 217,140- 385-188-D
W3WD 94,464- 256-123-D
AD3V 59,706- 186-107-B

Eastern Pennsylvania

W3BGN 1,406,899-1579-297-D
N3BB 1,242,738-1409-294-D
N3DA 1,157,598-1326-291-D
W3FV 750,465- 961-255-D
W3MA 678,897- 939-241-D
K3MWV 519,951- 659-263-D
K3ZA 483,975- 717-225-D
W3HJ 445,332- 629-236-D
K3II 395,592- 622-212-D
K3WOK 224,100- 415-180-D
W3YEV 181,116- 387-156-D
WB3CIW 163,800- 350-156-D
AF3E 150,396- 332-151-D
AB3Z 64,449- 231- 93-B
W3KFQ 48,900- 163-100-D
W3AP 24,570- 105- 78-D
N3RW 23,910- 134- 67-B
W3ALB 13,200- 80- 55-D

Maryland - D.C.

W3QRF(K3QQ,opr) 1,326,975-1361-325-D
K3TJ 813,804- 929-293-D
N3UN 544,677- 701-259-D
WA3DSD 436,392- 627-233-D
W3UJ 372,371- 589-213-D
N3IJ 364,572- 533-228-C
WB3AVN 303,024- 472-214-D
K3IU 165,900- 350-158-D
K3AV 88,125- 235-125-C

Western Pennsylvania

K3FR 110,250- 245-150-D

K3TP 29,160- 120- 81-D

4

Georgia

W4UUH 81,252- 244-111-B
WA4OPV 13,359- 73- 61-D

Kentucky

WA4UBM 33,852- 124- 91-B

North Carolina

WA4TLI 502,260- 761-220-D
N4AA 298,800- 498-200-D

South Carolina

K4II 220,176- 417-176-D
K4WJR 40,977- 157- 87-C

Southern Florida

K4CL 135,324- 358-126-D
W4HVU 65,340- 180-121-D

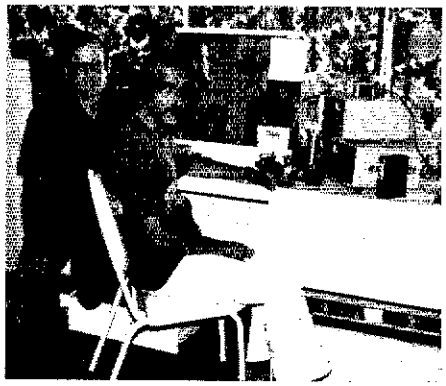
Tennessee

K4XU 654,544- 739-232-D
KF4H 176,418- 363-162-D

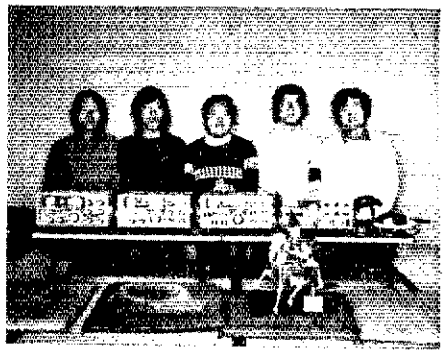
Virginia

N4RV 1,236,384-1272-324-D

J3ABN (WB4SGV) had to borrow the mast to support his inverted Vs and sloper antennas (he used all wire antennas). Phil averaged over 100 QSOs per hour over the entire cw weekend.



Ray (l), C5ABX/N6VR and Joe, C5ABZ/WA6VNR. C5ABX multi-single cw.



JA7YAF, the Morioka First High School ARC, operators in the multi-multi — cw category, left to right are: JH7CSU, JH7SJH, JA7UES, JH7WKQ and JA7RHJ.

W4QAW 524,610- 670-261-D
KG4W 494,982- 771-214-B
W4EI 415,350- 650-213-D
N4RA 263,250- 450-195-D
W4XR 131,670- 285-154-D
K4ZA 112,530- 242-155-D
WA4NTP 74,340- 236-105-D
K8SVH 65,772- 203-108-B
W4KMS 43,785- 139-105-D
W5ILR/4 8178- 56- 47-D

5

Louisiana

K5KLA 803,088-1144-234-D
W5OB 110,550- 275-134-D

New Mexico

W5YZ 297,540- 580-171-D

Northern Texas

AF5K 628,992-1008-208-D
W5GN 363,972- 619-196-D
N5JB 360,360- 770-156-D
WD5EWP 165,186- 399-138-D
W5YGX 162,153- 419-129-C
N5UA 33,615- 135- 83-D
WB5OON 30,225- 155- 65-B
N5AUI 28,320- 160- 59-D
N5AXR 16,632- 99- 56-D

Oklahoma

W5JME 148,500- 430-150-D

Southern Texas

K5DX 473,802- 778-204-D
WA5IYX 40,182- 181- 74-C
WB5QNA 39,280- 147- 80-D
W5RRR(W5LSZ,opr) 27,612- 118- 78-D

6

East Bay

W6BH(WA6IQM,opr) 1,501,302-1978-253-D

Los Angeles

N6AR 786,960-1093-240-D
N6TW 276,474- 649-142-D
N6HE 70,245- 223-105-B
W6EL 25,308- 114- 74-D

Orange

K6HR(N6IN,opr) 1,253,799-2019-207-D
W6YMV 75,582- 247-102-D

Santa Barbara

N6MB 373,504- 616-148-D
N6VR 13,825- 96- 48-D

San Diego

KB6IJ 80,769- 247-109-D

San Francisco

N6OJ 376,125-1003-125-D
W6PM 83,928- 269-104-D
W6WB 63,840- 224- 95-D

Santa Clara Valley

W6BJB 158,004- 627- 84-D
K6BR 157,074- 557- 94-D
AA6QX 77,805- 273- 95-D
WB6VSC 77,328- 358- 72-D
W6SC 53,295- 209- 85-D
W6YVK 23,590- 157- 50-B
N6AN 16,224- 104- 52-D
WD4ELG/6 2190- 73- 10-B

San Joaquin Valley

W6BYH 19,488- 116- 56-D

7

Arizona

N7RK 283,920- 520-182-D
K7NO 158,952- 358-148-D
W7ZMO 19,840- 120- 44-C

Montana

W7IYW 290,625- 775-125-D
WA7OBH 5280- 55- 32-B

Nevada

K7SFN 79,680- 320- 83-D
WA7KNK 9702- 66- 49-D
W7JKA 5994- 74- 27-C

Oregon

WB7ABK 749,424-1201-208-D
W7IVX 575,292-1004-191-D
W7ZR 467,400- 950-164-D
W7XN 308,616- 616-167-D
WA7IHN 306,180- 810-126-D
K7DMM 8466- 83- 34-B

Utah

N7DF 385,875-1029-125-C
W7HS 76,053- 251-101-D

Washington

K7RI(K7TI,opr) 1,214,400-2300-176-D
W7BRU 202,692- 532-127-D
K7WQD 142,713- 471-101-B
K7ZA 114,432- 298-128-D
K7UR 81,405- 335- 81-D
N7AM 42,411- 211- 67-D

8

Michigan

N8JW 837,540- 990-282-D
WD8CRY 282,978- 474-199-D
K8SIA 115,710- 266-145-C
K8QT 60,480- 192-105-D
N8RW 1482- 26- 19-D

Ohio

K8MN 409,266- 689-198-D
WD8ALG 165,480- 394-140-D
KA8BAC 149,721- 349-143-B
WB8ZJW 133,056- 264-168-D
W8YGR 52,668- 154-114-B
WB8LFO 44,388- 137-108-D
WB8HLI 25,872- 112- 77-D
W8SQ 22,050- 105- 70-D
K8BA 1932- 28- 23-B

9

Illinois

K9BGL 591,120- 821-240-D
KB9ET 497,385- 734-229-B
W9QFV 364,420- 620-197-D
W9RW 175,900- 380-160-D
K9MK 60,216- 193-104-B
K9BQL 26,448- 116- 76-D
W9JUI 21,630- 103- 70-D
WB9EBO 3652- 37- 32-D

Indiana

W92RX 1,442,955-1577-305-D
W9LT 770,775-1075-239-D
N9RC 55,536- 178-104-D

Wisconsin

W9QP 383,508- 603-212-D
K9QXY 289,938- 506-191-D
WB9PCQ 26,733- 133- 67-C
WD9GRI 969- 19- 17-B

Ø

Colorado

K7LR/Ø 669,441-1369-163-D

Iowa

WØEJ 291,456- 506-192-D
WØVX 223,560- 460-162-D
WØSR 137,195- 309-148-D
KØGT 43,359- 149- 97-D

Kansas

WØIUB 318,528- 552-192-D
WBØBMB 130,326- 406-107-D
ABØX 33,507- 153- 73-D

Missouri

WØGNX 193,224- 388-166-B
WØQWS/M 17,280- 90- 64-B

North Dakota

KØQQ 118,293- 301-131-C

South Dakota

KØZZ 969,984-1263-256-D

VE

Quebec

VE2AYU 421,830- 654-215-D

Ontario

VE3KZ 97,137- 251-192-B
VE3FEA 46,968- 152-103-D

Manitoba

VE4EW 281,358- 539-174-D

Saskatchewan

VE5RA 466,408- 808-192-D

Alberta

VE6AGV 132,240- 380-116-D
CZ6MP 74,700- 415- 60-B
VE6LB 9855- 74- 45-D

British Columbia

VE7BTV 944,520-1852-170-D
VE7CMK 207,648- 616-112-D

High Band

1

Connecticut

K1VTM 462,990-1403-110-D
W1ZM(K1EJ,opr) 332,304- 688-161-D
K1YXG 215,670- 455-158-B
K1VDF 210,816- 484-144-D
W1KKF 152,685- 377-135-D
AD1S 100,500- 264-129-B
WA1ZDW 99,735- 305-109-B
WA1YEC 91,368- 282-108-B
K1TN 81,900- 326- 84-D
K1WJL 55,944- 259- 72-B
N1JW 54,495- 173-105-B
W1BWS 50,032- 186-104-D
W1DO 30,000- 100-100-D
WA1FCN 19,488- 112- 58-B
KA1DS 7020- 60- 39-B
WB1FNK 3483- 43- 27-B
WB1CRH 2652- 34- 26-B

Eastern Massachusetts

WA1UZH 645,810-1045-206-D
W1YN 599,841- 913-219-D
AA1M(WA1AER,opr) 577,440-1203-160-D
WB1ANT 415,773- 783-177-D
K1LS 292,056- 560-172-D
KA1CH 172,887- 403-143-D
W1FM 146,610- 362-135-B
W1PST 111,960- 311-120-D
W1CWU 45,156- 213- 71-B
K1RB 24,948- 108- 77-B
K1LXJ 17,490- 106- 55-B
K1GRB 13,311- 87- 51-C
W1GXT 12,600- 100- 42-C
W1PLJ 7140- 70- 34-D
WA1JVT 3234- 49- 22-B
N1RC 147- 7- 7-B

Maine

W1OO 606,621- 883-229-D
K1SA 91,773- 277-103-D
W1MN 65,400- 218-100-D
WA1PDG 16,830- 110- 51-B
W1CTR 627- 19- 11-B

New Hampshire

W1UR 684,180-1086-210-D
KA1CHK 48,060- 178- 90-B
AC1J 32,526- 139- 78-B
W1ICU 25,842- 118- 73-D

Rhode Island

N1ACU 312,840- 632-165-D
WB1EKH 40,626- 185- 74-B
K1KX 2883- 31- 31-B

Vermont

W1ETV 12,375- 75- 55-C

Western Massachusetts

W1AUT 277,764- 286-158-D
W1GG 216,867- 449-161-D
K1FIR 169,848- 384-144-D
N1CQ 107,046- 313-114-D
K1SF 59,400- 180-110-C

2

Eastern New York

K2MN 100,620- 260-129-B
WA2LJM 63,648- 204-104-D
WA2HFT 60,264- 186-108-B
N2WR 47,064- 212- 74-D
WA2RNX 21,609- 147- 49-B
N2FS 7326- 74- 33-D
W2DW 2964- 38- 26-D
WB2AXJ 867- 17- 17-B
KB2FC 780- 20- 13-B

New York City - L. I.

W2MOY 195,216- 392-166-D
WB2VHP 192,552- 452-142-D
K2MFY 166,740- 397-140-B
W2NBJ 99,857- 217-107-D
W2GKZ 60,165- 191-105-D
W2OTS 36,381- 181- 67-C
WB2HIQ 34,410- 155- 74-B
W2KZE 34,380- 191- 60-C
N2OZ 34,125- 175- 65-D
WA2ISH 25,185- 115- 73-D
WA2NEJ 23,040- 128- 60-C
K2OVS 19,200- 80- 80-B
WB2PXA 17,271- 101- 57-D
W2AYJ 17,100- 100- 57-D
WA2EWJ 14,691- 83- 59-B
AC2P 10,260- 76- 45-D
WA2GVG 10,143- 69- 49-B
WA2JCX 9246- 67- 46-B
K2CMV 7659- 69- 37-B
WA2UZD 6960- 58- 40-B
K2TY 5346- 54- 33-D
W2QAN 4089- 47- 29-C
W2INJ 3840- 40- 32-D
WA2TV 3393- 39- 29-D
WB2DWP 2112- 32- 22-B
W2IYS 1890- 35- 18-B
WB2GVD 1053- 27- 13-C
W2CZZ 702- 18- 13-B
W2YKQ(K2IDB,opr) 198- 11- 6-C

Northern New Jersey

N9RR 303,030- 555-182-D
AE2A 227,240- 463-160-D
W2ZZ 120,663- 327-123-D
WB2PDG 76,719- 239-107-D
W2HN 73,248- 218-112-D
N2IC 71,820- 228-105-D
K2ZGC 56,880- 205- 92-D
W2WJN 32,568- 118- 92-D
WB2RAL 17,934- 98- 61-B
W2UL 9648- 67- 48-D

Southern New Jersey

N2CW 443,880- 685-216-D
N2CG 179,100- 398-150-D
WA2NBM 175,446- 361-162-D
WB2VFK 166,842- 403-138-B
W2FGY 153,576- 324-158-B
K2TJ 121,584- 298-136-D
WB2BW 91,800- 300-102-D
WA2WJL 74,793- 233-107-B
K2ZSY 69,252- 199-116-B
W2NS 63,882- 234- 91-D
K2SNK 54,825- 215- 85-D
W2GKJ 42,480- 177- 80-C
W2SDO 28,194- 127- 74-D
N2HI 24,408- 113- 72-D
AB2Y 21,450- 110- 65-D
WB2GJT 17,688- 88- 67-D
K2TD 17,136- 102- 56-D
W2OWA 16,695- 105- 53-D
WB2SST 9450- 70- 45-D
W2GTN 6084- 52- 39-B
K2HPV 3999- 43- 31-B
W2XN 2730- 35- 26-D
WA2OOX 2205- 35- 21-B
W2CN 1716- 26- 22-C

Western New York

K2GXT(WA1QGC,opr) 347,130- 609-190-D
N2HR 242,520- 470-172-D
WB2ITR 206,016- 464-148-D
WB2QOF 162,336- 347-156-D
WB2ATO 98,298- 254-129-D
WA2ECA 94,656- 272-116-D
KB2DE 75,114- 214-117-B
WB2ABD 49,878- 163-102-B
WA2GNE 44,550- 165- 90-D
W2FUI 31,050- 138- 75-B
W2PHT 19,776- 103- 64-B
WB2LJK 14,094- 87- 54-B
KA2BEG 11,250- 75- 50-C
W2HG 9447- 67- 47-D

3

Delaware

K3HBP 87,750- 250-117-D

Eastern Pennsylvania

K3VW 623,360- 910-232-D
K3ND 594,305- 822-241-D
W3GRW 289,575- 495-195-D
WA3YJV(K2PH,opr) 213,219- 447-159-D
WA3NHO 184,338- 462-133-D
N3IK 76,230- 231-110-B
W3BB 72,765- 245- 99-D
W3ETB 63,282- 199-106-D
WB3JYO 58,725- 225- 87-B
WB3JKG 43,143- 197- 73-B
K3NL 26,937- 123- 73-D
WB3JYY 18,144- 108- 56-B
K3TGM(K3PPI,opr) 14,688- 96- 51-B
WB3JYZ 10,800- 100- 36-C
W3PN 10,602- 93- 38-D
WB3FVJ 9102- 82- 37-D
WB3DCT 9000- 75- 40-D
WB3JZE 7380- 82- 30-B
K3JGJ 6528- 64- 34-C
W3GRS 5520- 46- 40-D
WA3YTI 3225- 43- 25-B
K3GYS 672- 16- 14-C

Maryland - D. C.

W3GG 648,000-1000-216-D
W3EWL 524,232- 809-216-D
K2ITG/3 358,752- 592-202-D
K3WS 335,724- 554-202-D
K3SA 299,250- 525-190-D
WA3EEE 223,473- 457-163-D
W3AZ 156,408- 343-152-D
W3PWO 122,616- 262-156-D
N3EC 116,109- 291-133-D
W3HVM 106,128- 283-129-D
W3HRD 103,356- 319-108-D
W3XO 59,697- 201- 99-D
WB3CGI 50,052- 172- 97-D
W3IGJ 23,790- 122- 65-D
WA3RDX 14,664- 94- 52-D
WA3UUO 13,320- 111- 40-B
K3DQ 2139- 31- 23-B
W3TUX 2052- 36- 19-B
W3FQE 624- 16- 13-B

Western Pennsylvania

W3IW 143,040- 320-149-D
K3RN 137,274- 334-137-D
AF3B 66,033- 253- 87-C
W3KHQ 58,536- 271- 72-D
K3HFB 54,648- 198- 92-C
W3HWJ 52,065- 195- 89-D
W3YX 40,545- 158- 85-C
W3PIX 38,610- 165- 78-D
N3AEU 3132- 36- 29-B

4

Alabama

N4KG 842,400-1200-234-D
AC4X 215,520- 449-160-D
KI4M 129,198- 353-122-D
WA4MIT 70,488- 264- 89-C
K4ZGB 65,565- 235- 93-D
WD4PZN 1296- 24- 18-B

Georgia

K4BAI 117,459- 421- 93-D
W4DXI 108,780- 259-140-D
W4BFB 81,180- 246-110-D
WD4HER 54,495- 173-105-C
WA4HNL 23,256- 136- 57-D
K4KKJ 18,900- 105- 60-D
K4EZ 16,632- 99- 56-D
W4ET 6903- 59- 39-B
AK4T 6552- 52- 42-D
W4JFL 2508- 38- 22-C

Kentucky

N4XM 441,864- 722-204-D
WA4QMG 317,772- 582-188-C
WA4GQV 129,492- 445- 97-D
WB4PRU 55,272- 196- 94-D
WD4FXX 18,297- 107- 57-C

North Carolina

N4UH 632,520-1004-210-D
WA4NHP 426,624- 704-202-D
K4UWH 329,670- 594-185-D
WA4DAN 321,264- 582-184-B
K4GEH 286,740- 540-177-D
K4QVK 240,981- 481-167-D
WD4AAM 219,705- 485-151-D
WA4ZMM 175,500- 376-156-D
WD4JFR 49,692- 202- 82-C
W4UW 46,926- 158- 99-D
K4HHM 22,770- 110- 69-D
WD4LVZ 19,902- 107- 62-B
W4OMW 2940- 35- 28-D

Northern Florida

W4ZTW 335,016- 594-188-D
WB4OKY 118,404- 286-138-B

South Carolina

WB4IUX 99,614- 263-126-C
WD4NNP 24,840- 120- 69-B
WD4PMU 13,140- 73- 60-B
WD4LLC 2610- 30- 29-B

Southern Florida

WA4NPO 66,690- 247- 90-C
WD4FGI 29,394- 142- 69-D
WA4FYZ 27,765- 123- 75-B
VE3BTQ/W4 20,235- 95- 71-B
W4YN 13,416- 104- 43-C
WA4TKA 2997- 37- 27-B

Tennessee

AB4H	616,341-	983-209-D	
WB4TRJ	317,400-	578-184-D	
WB4QLT	270,396-	518-174-D	
WA4EAV	227,088-	456-166-D	
W4JD	154,212-	362-142-D	
AA4KT	149,142-	371-134-C	
WB4FSN	78,372-	311- 84-B	
K4LN	72,594-	222-109-C	
N4IR	68,684-	229-102-D	
W4ZWZ	58,212-	231- 84-D	
K4TAZ	56,160-	195- 96-B	
W4EAL(WA4ZZU,opr)	54,054-	198- 91-D	
W4RIM	53,568-	192- 93-D	
W4FCC	46,920-	184- 85-D	
AA4TP	36,120-	140- 86-B	
WA4VUW	28,512-	144- 66-D	
KB4KA	24,108-	98- 82-B	
W4OGG	17,343-	123- 47-B	
AA4TN	15,000-	100- 50-D	
WB4WHE	10,575-	75- 47-B	

Virginia

N4NW	585,858-	962-203-D	
N4MM	343,224-	504-227-D	
W4MYA	329,220-	590-186-D	
K4GKD	198,069-	641-103-D	
WB4VMB	185,428-	396-156-D	
KB4O	161,100-	358-150-D	
WA4MAV	70,380-	230-102-B	
W4YE	62,856-	216- 97-D	
W4FRU	60,738-	191-106-D	
W4JVN	57,954-	257- 74-D	
WB4FIH	56,334-	229- 82-C	
KIER/4	39,342-	158- 83-D	
W4OM	35,955-	141- 86-D	
W4JVU	21,735-	115- 63-D	
N4DW	19,890-	102- 65-C	
K4OAQ	17,976-	107- 56-B	
W4GI	16,170-	110- 49-D	
W4IQ	8295-	97- 35-D	
N4XG	5016-	44- 38-B	
W4VAN	4956-	59- 28-D	
WB4YPT	3762-	38- 33-D	

5

Arkansas

WD5HSX	77,010-	302- 85-D	
W5EU	4653-	47- 33-C	
KA5BML	2736-	38- 24-B	

Louisiana

WA5IGD	301,398-	526-191-D	
K5KV	275,238-	587-158-D	
K5UA	247,998-	601-132-D	
K5EOA	176,778-	366-161-D	
K5GUU	144,399-	379-127-D	
W5WG	90,909-	259-117-D	
W5HEZ	84,963-	223-127-D	
WB5ZRD	76,950-	285- 90-D	
WB5LSH	67,626-	221-102-D	
WD5GCD	14,190-	86- 55-B	
KB5FI	8610-	70- 41-B	
WB5YLT	312-	13- 8-D	

Mississippi

N5AZK	234,000-	500-156-D	
W5MUG	90,297-	237-127-C	
K5YPV	23,400-	120- 65-B	

Northern Texas

W5FO	675,675-	1001-225-D	
K5RX	229,740-	547-140-D	
K5LAC	228,912-	502-152-D	
N5RM	114,192-	366-104-D	
K5NNI	58,656-	250- 78-B	
W5SOD	44,688-	196- 76-D	
K5AQ	24,882-	143- 58-D	
N5BT	20,160-	112- 60-B	
WD5ABF	17,304-	103- 56-B	
KA5CDZ	16,038-	99- 54-D	
K5MCB	13,695-	83- 55-B	
WB5TRL	12,852-	132- 39-B	
N5UJ	5427-	67- 27-B	
K5RQ	3480-	40- 29-D	
WB5VXH	1440-	60- 8-B	
W5TEN	189-	9- 7-D	

Oklahoma

N5CG	615,474-	1103-186-D	
K5GL	92,898-	397- 78-D	
AE5Y	82,986-	281-102-C	
WA5MLT	26,160-	116- 75-C	
WD5IOF	363-	11- 11-B	

Southern Texas

K5WA	333,120-	694-160-D	
K5BZU	291,384-	568-171-D	
WB5FND(WA5QVC,opr)	263,388-	467-188-D	
N5HB	120,744-	344-117-C	
K5RF	76,152-	334- 76-B	
K5SF	72,216-	236-102-D	
W5KCR	48,786-	173- 94-D	
K5RC	25,392-	98- 92-D	
N5WW	8844-	67- 44-D	
K5RVF	5310-	59- 30-D	
W5IYR	2925-	39- 25-B	
W5OSJ	27-	3- 3-D	
W5FIP	24-	4- 2-A	

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East Bay

WA6BOB	127,224-	456- 93-D	
WA6RPF	102,168-	396- 86-D	
K6ATV	73,188-	321- 76-B	
N6NG	48,411-	163- 99-D	

Los Angeles

WD6DJY(WB6LMN,opr)	168,480-	390-144-D	
W6CN	163,800-	455-120-D	
W6AQ	120,291-	397-101-D	
WB6RXW	55,176-	242- 76-B	
K6YRA	44,928-	192- 78-D	
W6OK	36,864-	192- 64-D	
WA6TAF	33,456-	319- 35-B	
K6GVL	24,720-	103- 80-D	
WA6BIE	18,906-	137- 46-B	
WB6YTV	9076-	47- 56-B	
AI6Z	2601-	51- 17-B	
W6RQV	450-	15- 10-D	
K6HAU	288-	12- 8-B	

Orange

N6PE	56,400-	235- 80-D	
K6TXA	31,860-	177- 60-D	
KA7CHX/6	27,864-	219- 43-C	
W6SGU	22,326-	122- 61-B	

Santa Barbara

K6WJ	160,371-	519-103-B	
WA6IJZ	16,530-	190- 29-B	
W6KPJ	3829-	41- 23-B	
N6AFI	1224-	34- 12-B	
K6VMN	483-	23- 7-B	

Santa Clara Valley

WB6DFX	461,754-	1006-153-D	
WB6GFJ	313,467-	649-161-D	
WA6TKT	247,776-	928- 89-D	
AF6S	215,880-	514-140-D	
K6ITL	77,361-	241-107-D	
N6UW	45,000-	200- 75-D	
K6SMH	42,750-	250- 57-B	
AJ6V	28,140-	268- 35-D	
N6OM	27,081-	153- 59-D	
N6NF	12,402-	78- 53-D	
W6ISQ	10,656-	74- 48-D	
W6QDE	7140-	68- 35-D	
K6ZX	4590-	45- 34-D	
K6PU	2331-	37- 21-B	
K6DC	1932-	28- 23-D	
WD6CHF	1125-	25- 15-B	

San Diego

WA6DBC	615,978-	1342-153-D	
W6ABT	78,458-	231-106-D	
WA6WSI	58,050-	225- 86-D	
W6SDL	135-	9- 5-B	

San Francisco

N6CT	607,473-	1341-151-D	
WB6FCR	131,220-	486- 90-D	
AF6F	122,511-	421- 97-D	
WD6EEQ	50,076-	321- 52-B	
WB6NBR	10,908-	101- 36-B	

San Joaquin Valley

N6LK	76,329-	257- 99-D	
K6YK	10,764-	69- 52-D	
WD6FLB	5994-	74- 27-C	

Sacramento Valley

W6GO	232,125-	619-125-D	
K6SG	40,950-	195- 70-D	
N6JV	17,856-	124- 48-D	
WA6ZDZ	7521-	109- 23-C	
N6JM	1665-	37- 15-C	
K6FO	1296-	36- 12-B	
W6NKR	966-	23- 14-D	

7

Arizona

K6LL/7	994,227-	1961-169-D	
W7AYY	261,738-	666-131-D	
W7QS	129,696-	386-112-D	

Idaho

K8TCV	43,230-	262- 55-C	
K0STI/7	11,856-	104- 38-D	

Montana

W7FIN	10,332-	82- 42-B	

Nevada

W7TVF	65,664-	342- 64-B	
W7YKN	49,608-	213- 78-C	
W7JUO	1848-	28- 22-C	

Oregon

W7EJ	985,578-	1507-218-D	
W7FP	367,392-	712-172-D	
AF7S	95,926-	250- 78-B	
W7YAQ	42,930-	203- 70-B	
K7AA	27,666-	174- 53-D	
WA7TTM	15,435-	105- 49-D	

Utah

WB7SVQ	81,000-	360- 75-B	

Washington

K7GEX	345,204-	892-129-D	
W7BUN	237,618-	921- 86-D	
K7SS	115,710-	406- 95-D	
WA7PUE	64,050-	305- 70-B	
K7NF	22,200-	185- 40-D	
WB7ALT	18,513-	187- 33-B	
W7KT	17,388-	138- 42-D	
K7CVL	16,059-	107- 53-D	
WB7UXK	13,332-	101- 44-C	
K7LXC	11,934-	117- 34-C	
KA7BAY	9393-	101- 31-B	
N7OX	6300-	84- 25-D	
K7JCI	3792-	79- 16-B	
W7DOQ	2412-	67- 12-B	
K7EFB	2088-	58- 12-B	
N7ABA	972-	27- 12-B	

Wyoming

WB7RGN	92,910-	326- 95-D	
W7PSO	25,296-	124- 68-D	
WA@LJN/7	84-	7- 4-B	

8

Michigan

W8TWA	433,884-	692-209-D	
AA8G	332,856-	603-184-D	
W8NWO	189,336-	392-161-D	
K8CV	114,696-	324-118-D	
K8GG	95,106-	242-131-D	
K8TMK	98,399-	232-127-D	
AD8X	50,796-	204- 83-B	
WD8KXN	34,881-	151- 77-B	
WB8AAX	20,736-	96- 72-C	
WD8JRL	13,770-	85- 54-D	
KB8AI	8094-	71- 38-B	
W8LCU	761-	59- 43-A	
WD8CSA	2880-	48- 20-D	

Ohio

WB8JBM(WB8OQP,opr)	553,110-	895-206-D	
K8MR	414,324-	677-204-D	
WB8VPA	248,994-	477-174-D	
K8HV	241,824-	458-176-D	
N8KK	204,225-	389-175-D	
W8KKF	181,440-	378-160-D	
W8UPH	142,044-	356-132-D	
W8CBR	139,020-	331-140-D	
W8CBA	133,152-	304-146-D	
K8DJC	130,707-	309-141-D	
WD8MQV	123,849-	297-139-B	
N8FU	98,868-	308-107-C	
W8NXF	93,696-	244-128-D	
WD8MRF	71,904-	214-112-C	
AI8K	69,600-	200-116-D	
K8FL	65,520-	273- 80-D	
K8IC	61,236-	189-108-D	
K8EF	24,486-	106- 77-B	
WD8ILW	23,958-	121- 66-D	
AF8O	22,032-	108- 68-B	
K8KR	19,116-	108- 59-D	
WA8MPW	13,770-	85- 54-D	
W8DWP	6105-	55- 37-B	
W8EQG	4860-	45- 36-B	
N8LM	4692-	46- 34-D	
WB8WKP	1254-	22- 19-D	
N8AQR	468-	13- 12-B	
W8XT	108-	6- 6-B	

West Virginia

AE8Q	102,102-	286-119-D	
W8WVM	39,744-	138- 96-B	
N8ACQ	18,849-	103- 61-D	
WA8VZO	14,268-	116- 41-B	

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Illinois

K9QX	1,107,540-	1466-252-D	
K9RN	294,300-	654-150-C	
K9HWL	251,080-	581-140-D	
W9TA	242,346-	478-169-D	
W9UVM	228,636-	438-174-D	
W9BW	215,904-	416-173-D	
K4VUD/9	205,065-	441-155-D	
K9JDV	163,533-	361-151-D	
K9MNT	100,284-	274-122-D	
K9IW	92,250-	250-123-D	
WD9IIX	87,930-	254-115-D	
N9GB	70,200-	225-104-B	
K9GSG	57,888-	201- 96-D	
W9IVB	47,790-	177- 90-C	
KA9CQM	20,502-	102- 67-B	
WD9IIC	19,206-	97- 66-B	
W9TNZ	14,814-	82- 59-B	
WB9QHV	13,584-	88- 52-B	
W9QWM	11,826-	73- 54-B	
KB9EW	10,293-	73- 47-B	
WD9DPT	9216-	64- 48-C	
N9ANP	6519-	53- 41-B	
WD9AEU	4968-	46- 36-C	
WD9CVA	4554-	46- 33-B	
AA9F	3420-	38- 30-B	
W9VA	2394-	38- 21-D	
W9REC	1377-	27- 17-B	
WD9DPN	855-	19- 15-B	
W9HPG	429-	13- 11-B	
N9AHY	420-	14- 10-B	
WD9GUF	108-	6- 6-B	

Indiana

W9RE	1,068,957-	1431-249-D	
WB9POH	318,069-	599-177-D	
N9MM	89,250-	250-119-D	
W9LQ	78,570-	194-135-D	
K9VQK	37,200-	155- 80-D	
WB9UKE	23,112-	107- 72-B	
N9AFU	9417-	73- 43-B	
WB9IWN	9348-	76- 41-B	
K9LVK	9024-	64- 47-C	
W9BS	3190-	42- 25-B	
K1TH/9	2244-	34- 22-B	

Wisconsin

W9AMM	146,286-	301-162-D	
K9XJ	133,635-	295-151-D	
WB9ZJW	117,507-	299-131-B	
WB9ZBL	110,889-	333-111-D	
WD9CWJ	91,332-	288-118-C	
WB9CPV	77,994-	206-118-B	
W9TGL	72,594-	206-117-D	
W9EQP	45,318-	166- 91-D	
WB9NOV	41,712-	176- 79-D	
W9RF	40,248-	156- 86-C	
W9LQO	34,524-	137- 84-D	
WB9MPF	28,677-	121- 79-B	
WB9PGX	23,184-	112- 69-B	
W9OEJ	22,326-	122- 61-B	
WB9UUE	15,840-	88- 60-D	
N9EZ	7200-	60- 40-C	
N9AAY	5355-	51- 35-B	
W9HE	2640-	40- 22-D	
W9MYG	1827-	29- 21-D	
W9GU	780-	20- 13-D	
K9GDF	27-	3- 3-D	

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Colorado

WØYK	1,012,320-	1776-190-D	
KØZFL	144,282-	278-173-B	
KØPVI	32,400-	270- 40-D	
NØTK	27,258-	154- 59-D	
KØYBX	8526-	98- 39-B	
AGØL	3360-	56- 20-B	
KØPEL	2520-	35- 24-D	
WØRTB	2160-	30- 24-C	

Iowa

WØWP	353,430-	630-187-B	
WØMJN	125,640-	349-120-D	
WØIZ	112,194-	271-138-C	
WBØZTN	111,756-	268-139-B	
WDØABC	91,080-	264-115-B	
WØHUP	85,890-	230- 81-D	
WØHJ	39,816-	158- 84-D	
WØSML	35,112-	152- 77-D	
WØPPF	29,370-	110- 89-D	
WAØDCB	26,418-	119- 74-D	
KØXD	15,264-	96- 53-D	
KØNN	8256-	64- 43-D	
WDØAYT	7347-	79- 31-B	

Kansas

WBØISW	146,580-	349-140-D	
KØLD	57,300-	191-100-D	
WØGW	18,930-	105- 61-D	
WAØBCW	10,971-	69- 53-D	
WBØTNY	6510-	70- 31-B	

Minnesota

WØUO	474,117-	749-211-D	
WAØPUJ	268,272-	486-184-D	
WØUC	199,926-	383-174-B	
KØFV	87,348-	251-116-D	
NØAT	54,684-	217- 84-D	
WØLP	29,250-	126- 75-D	
NØACH	2925-	39- 25-D	

Missouri

WØPUD	221,760-	448-165-D	
WØJU	79,765-	296- 89-D	
WØPKO	61,560-	216- 95-D	
WØDHN	54,720-	190- 96-D	
KØIFL	34,560-	160- 72-D	
NØAQK	33,966-	153- 74-B	
WBØWQZ	1368-	24- 19-D	

Nebraska

KØGND	66,528-	224- 99-D	

North Dakota

WØRIB	2904-	44- 22-B	

South Dakota

WDØBHV	17,100-	114- 50-B	
WDØHWX	144-	8- 6-B	

VE

Maritime - Newfoundland

VO2CW	99,045-	355- 93-B	
VE1BNN	88,704-	357- 84-D	
VO1LA	63,813-	239- 89-B	
VE1FW	1848-	44- 14-B	

Quebec

VE2WA	206,298-	438-157-D	
VE2ENK	108,414-	317-114-C	
VE2XL	42,624-	192- 74-B	
VE2FIT	26,056-	193- 45-B	
VE2GE	19,845-	135- 49-D	
VE2FMH	5580-	60- 31-C	

Ontario

VE3BVD	913,920-	1280-238-D	
VE3DLR	369,600-	616-200-D	
VE3DUS	219,633-	409-179-D	
VE3HHS	175,764-	388-151-D	
VE3IKN	174,636-	378-154-D	
VE3KIK	6908-	59- 39-D	

Manitoba

VE4SW	303,405-	565-179-D	
VE4CF	74,970-	245-102-C	
VE4ADV	16,188-	142- 38-B	
VE4ACH	8424-	78- 36-B	

Saskatchewan

VE5JQ	858-	22- 13-A	

Alberta

VE6LU	139,446-	366-127-D	
VE6CQY	118,872-	308- 78-D	
VE6AYI	59,400-	360- 55-D	
VE6ALD	288-	12- 8-B	

British Columbia

VE7AQF	344,076-	1082-106-D	
VE7ARQ	335,629-	867-129-C	
VE7AQR	169,524-	554-102-D	

Low Band

1

Connecticut

AA1K	6750-	50- 45-B	

Eastern Massachusetts

W1FC	136,530-	410-111-D	
W1BB	216-	9- 8-B	

2

Eastern New York

K2IGW	46,284-	203- 76-D	

New York City - L. I.

K2YGM	5979-	73- 41-D	
K2SX	2346-	34- 23-D	
WB2AMU	756-	18- 14-B	

Northern New Jersey

WA2IFS	6954-	61- 38-D	
K2LP	3645-	45- 27-D	

Southern New Jersey

WB2VFT	30,222-	138- 73-B	

3

Eastern Pennsylvania

W3PC	4692-	46- 34-D	

4

Georgia

K4VT	48,546-	186- 87-D	

Kentucky

WB4FOT	3024-	36- 28-B	

North Carolina

KE4I	4836-	52- 31-C	

Virginia

W4HBK	22,446-	129- 58-D	
AA4M	15,660-	87- 60-D	
W4EZ	7722-	66- 39-D	

5

Arkansas

K5UR	15,732-	92- 57-D	

Mississippi

N5FG	5049-	51- 33-D	

Oklahoma

WB5MSU	48-	4- 4-B	

Southern Texas

K5NA	3078-	38- 27-D	

6

San Francisco

AE6U	2496-	52- 16-D	

7

Idaho

N7SW	2964-	38- 25-D	

8

Michigan

K8SMC	30,150-	134- 75-D	

Ohio

K8WW	4056-	52- 26-D	

West Virginia

W8LRL	147-	7- 7-C	

9

Illinois

WB9TIY	6120-	51- 40-B	

Wisconsin

W9RN	24,495-	115- 71-D	

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Kansas

WAØTKJ	8118-	66- 41-D	

VE

Ontario

VE3BBN	3276-	42- 26-B	

Manitoba

VE4SL	495-	15- 11-D	

Multi-Single

1

Connecticut

K1ZZ(+K1TO,W1VO)	1,742,715-	1655-351-D	
K1RU(Multiop)	1,168,853-	1307-293-D	
K1FPJ(+W1YS LJ OD)	461,838-	806-191-D	
K1XA(+W1GNC)	277,182-	531-174-D	
N1MM(+K1XM)	229,311-	513-149-D	
W1VV(+K1WA)	214,305-	456-157-D	
WA1PMA(+WB1HCA)	85,560-	248-115-B	

Eastern Massachusetts

W1CF(+K1s UA VR,W1ZA, N@ND)	1,560,867-	1631-319-D	
W1MX(K1SX,N1RC,WB2CWQ, KB3EP,WB9NFQ,oprs)	249,210-	426-195-D	
W1BK(+N1CW)	94,518-	267-118-D	

New Hampshire

K1FL(+AB1X,AD1Y,AE1B, K1s GW HI JXK)	415,989-	651-213-D	

Rhode Island

K1AD(AF1O,WA2WDE, WA3ZTW,oprs)	607,860-	921-220-D	

Vermont

K1IK(+WA1YTW)	513,843-	677-253-D	

Western Massachusetts

K1RQ(+W1ZT,WB1AUL)	779,328-	984-264-D	

2

Eastern New York

W2XL(+WA2s KLV KTR MBB)	368,508-	574-214-D	
WA2CAC(+WB2s GWO JIV NZE)	76,275-	225-113-D	
WA2KCL(+WA2s JQK QEH UKP, WB2PEJ)	40,587-	163- 83-D	
K2OIX(+WB2QOH)	25,254-	122- 69-D	

New York City - L. I.

WA2LQO(Multiop)	387,930-	615-194-D	
WA2JAS(KA2s CLO ELB,WA2s ASZ JBY SEL,WB2s FEK QEU, WN2VVH,oprs)	206,136-	409-168-D	

Northern New Jersey

N2OL(+N2HE)	300,048-	658-152-D	
N2WM(+W2VY)	76,230-	210-121-B	

Southern New Jersey

N2MM(+K2TD,N2ME,N3EG)	936,012-	1013-308-D	
K2FL(+N2ATX)	619,080-	737-280-D	
W2UI(+N3KR)	376,202-	633-198-D	

WB2JGP(+N2AHT,WB2K5S, K3HBP) 109,536- 326-112-D

Western New York

K2ZW(+WB1FIG,KB2GQ, WA2FHF,WB2s DYJ PJM †KM ULC) 213,693- 437-163-D
W2TPB(+K2SBV,WB2s MNA RWW,WA3WBC,K6MNT) 84,396- 258-109-B

3

Eastern Pennsylvania

K3NZ(+K3OO) 1,284,120-1476-290-D
N3AD(+Net) 952,614-1052-299-D
N3ED(+Net) 876,900- 925-316-D
K3KNH(K3SME,WA3FZQ, oprs) 623,007- 899-231-D
W3DHM(+Net) 526,080- 685-256-D
K3UC(+AD3F,K3s SY VDU, WA3VQK,WB3EVL) 506,319- 737-229-D
KB3AG(+WB2YOT) 432,000- 750-192-D
W3HYJ(+Net) 265,227- 419-211-D
W3KV(+Net) 182,748- 388-187-D
W3EVW(+Net) 163,530- 345-158-D
W3EHZ(Multiop) 4998- 49- 34-B

Maryland - D. C.

K3RA(+WA3VUQ) 819,747- 939-291-D
W3GNQ(+Net) 606,943- 713-237-D
WA3EKL(+KB3EI) 380,952- 572-222-D
W3UO(+Net) 169,533- 351-161-D
K3TW(+Net) 147,063- 329-149-D
N3RL(+Net) 18,792- 87- 72-D

Western Pennsylvania

W3YI(AA3T,AC3C,WA3TBL, oprs) 343,200- 443-183-D
K3QMR(+WB3s LCD LEC) 174,195- 395-147-D
KA3BFX(+K3KRA,KA3AWS, W3PI) 131,238- 317-136-D
K3LL/3(+WA3GDS,WB3IWW) 4371- 47- 31-B

4

Georgia

W4NT(K4s JPD LRJ,N4s HI RJ SV,oprs) 41,664- 224- 62-D

North Carolina

AA4S(+Net) 39,960- 148- 90-D

Southern Florida

N4RR(+AE4H,W2HPF, WA2EKW) 1,515,304-1656-303-D
WA4LZR(WA2RAZ,K4XF, N4RU,WA4PTT,WB8TGA,oprs) 740,151-1041-237-D

Tennessee

WD4LFD(+W4OVN) 233,334- 447-174-D

Virginia

K4VX(+K4YEP,K4CMF) 1,663,116-1523-364-D

N4HB(+N4ZJ,W4BAI,WA4KNP, WB4BVY) 1,283,040-1320-324-D
WA4WYN(+K4KBL,WA4s FKK WPO) 794,088-1076-246-D
W4DM(+W4EZ) 330,078- 542-203-D
W4RW(+AA4I,WA7PDW) 289,680- 568-170-D
K4NCP(WA4s AXT WKY,oprs) 239,610- 490-163-B

5

Louisiana

WB5TPK(W5SWE,KA5BQW, WB5TEQ,WD5JQB,oprs) 248,520- 436-190-D

Northern Texas

K5JA(+K5s MR NW ZD RX, WA5ZWC) 2,061,105-2195-313-D
K5EE(+K5FUV,N5TR) 631,971- 989-213-D
N5JC(+AI5s I X,N5AJW,WB5s LNH TXK) 222,423- 491-151-D

Southern Texas

W5AC(K5s GN VK,WB5YOT, WD5DLZ,oprs) 864,864-1144-252-D

6

East Bay

K6XO(+Net) 639,000-1065-200-D
K6HIH(Multiop) 120,312- 357- 72-D
WD6AWR(+AG6D,WA6s DDM ## RTX) 51,708- 278- 62-D
K6UWR(+Net) 19,890- 130- 51-D

Los Angeles

W6YRA(WB2DRM,AI6K, KA6DW,N6BGM,WB6LHO, WD6BAY,oprs) 454,005-1121-135-D

Orange

W6VLD(W3CEQ,N6KN,WA6s DPQ EUN,WB9LDD,oprs) 882,312-1516-194-D
WA6JAH(+KA6DUE,WA6SRI) 2592- 72- 12-D

Santa Barbara

KB6I(AA6RX,N6TR,WA6OTU, oprs) 1,018,497-1609-211-D

San Diego

W6RDF(K6XT,N6s KA ND RM ZI,oprs) 1,338,744-1844-242-D

San Francisco

W6BIP(+WA6s OJI PYN) 540,540-1092-165-D

Santa Clara Valley

K6OQ(W6OKK,WB6DSV,oprs) 1,285,488-1808-237-D
K6HNZ(+Net) 726,549-1217-199-D
AA6G(+Net) 354,090- 814-145-D
AA6UO(+W1ARR) 320,880- 764-140-D
K6KLY(+W6XB,WA6KBZ) 293,436- 494-198-D
WB6EXW(+Net) 249,959- 571-143-D

WD6EPV(+Net) 117,528- 472- 83-D
W6ZYC(+Net) 76,383- 207-123-D
W6CFK(+K6TXR) 35,460- 197- 60-C

San Joaquin Valley

KB6AR(+KB6CC) 179,820- 540-111-D

7

Arizona

K7SP(+W6LH,WA6HJV,N4QS, AA7A,K7JVR,KA7CAI,N7AJI, WA7ODP,WB7s ESZ OOX) 1,201,590-1690-237-D
W7MAP(+AC7U,K7CI,WB7OUW) 713,139-1171-203-D

Nevada

WB7OQW(+K7OX,WB7s PIJ UIJ) 820,308-1388-197-D

Washington

N7RO(+W7s DQM EKM, WA7ZWG,WB7DYB) 833,976-1404-198-D
WB7BFK(+K5WTA,WB7AQX) 627,255-1315-159-D
WB7DHC(+W7FEO,WB7EEH, WB3FNC) 138,741- 449-103-B
K7FR(+WB7s FFF VHK) 34,109- 181- 63-D
W7DK(WB7s QNP WMM,oprs) 6162- 79- 26-D

8

Michigan

AG8W(+AC8Y,AI8D,K8CLF MJZ) 1,004,394-1462-229-D
K8XX(+KBQO) 704,220- 970-242-D
AE8W(+WD8RIN) 28,968- 136- 71-D

Ohio

K8CMO(+KB8EI,W8CEF, WB8ZJY) 457,302- 756-199-D
K8URE(+WA8EEA,N8AG) 392,805- 609-215-D
N8RA(+N8AID) 333,900- 742-150-D
WB8UCW(+KA8CTE,KB8AV, WD8MKC) 102,555- 265-129-B

West Virginia

N8AK(+WB4ZJO,K8HUH, W8LYW) 344,217- 641-179-D

9

Illinois

K9KU(+WA9ZPR) 1,192,722-1451-274-D
AA9D(+WD9s DXC EBQ) 382,464- 664-192-D
W9YH(Multiop) 248,688- 471-176-D
WB9LDH(W9MON,WB9THA, WD9JFB,oprs) 3360- 56- 20-B

Indiana

WA9NPM(+N9NS,W9OBF) 616,860- 894-230-D

Wisconsin

WB9QCY(+WD9DEE) 60,168- 184-109-D

WB9TXJ(+WB9TXI) 35,964- 162- 74-C

Ø

Colorado

WØMYN(+KØFX,WAØECN) 772,416-1192-216-D

Iowa

KØINR(+KØLUZ,KBØFP, WAØTVV,WDØCOO) 568,404- 831-228-D
KØJSY(+ADØF,KØAT) 506,736- 782-216-D
WBØOYA(+WBØUFL) 139,650- 350-133-D

Kansas

KØCS(+ABØs X W,AEØK,KØs UAA VBU,WBØs BMB TNY UXI) 668,400-1144-200-D
KØVGB(+WBØOUS) 344,568- 586-196-D
NØJO(+WBØVYR) 61,110- 210- 97-D
AGØJ(+KAØBCW) 6660- 60- 37-D

Minnesota

KØKX(+KØWWX) 1,021,968-1128-302-D
KØSVW(+AFØQ,KØEVE) 395,148- 596-221-D

Missouri

WØVWW(+K3IGA,KØRWL, WAØGKZ,KAØAQZ,WBØs BMB LFY UZJ VHN) 447,816- 794-188-D

South Dakota

NØACL(+WBØPJB) 142,164- 359-132-D

VE

Maritime

VE1DXA(VE1s AIH BNN MX, WB2RLK,oprs) 1,567,512-1593-328-D
VE1UNB(VE1s BCZ BEC BHA BJC QT,oprs) 959,958-1226-261-D

Ontario

VE3DFH(+AC8W,K8DD,VE3s CDZ JFO) 313,536- 568-184-D
VE3UM/3(VE3s BGJ BYU CTY ENK EST GZU ICR IZB,oprs) 175,956- 473-124-D

Alberta

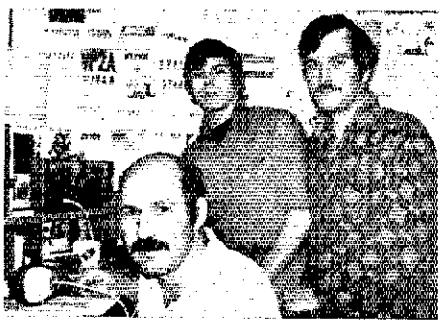
VE6WQ(+VE6KW) 1,142,037-1677-227-D

Multi - Multi

1

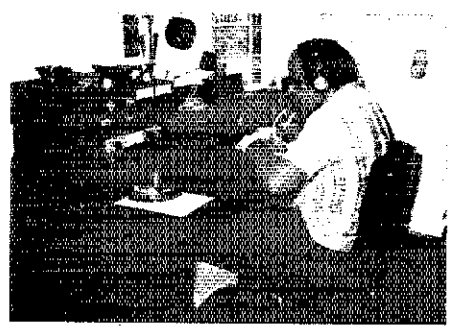
W2PV(+AE1C,K1s DQ OME RX ZM,K2s DM TR VV,W3AZD, K9ESI 6,812,991-4293-529-D
N2AA(+K1KI,W1PM,K2s BQ GL NG SS TT UR,N2WT, WA2SFB,WB2VYA) 6,332,760-4308-490-D
W4BVV(+K1JX,WA1QZH,K2BA W3s IUJ ZZ,WA3AMH, WD4AXM) 5,121,732-3542-482-D
W3AU(Multiop) 4,520,478-3319-454-D

K8LX(+K8s GM MD,N8s EA UM,W8WW,WA8s TBQ YVR ZDT,WB8ALP,WN8PEE) 4,074,561-3387-401-D
W3FA(+K3ZZ,N3GB,W3s ABC XY,WA3s ECT KCY ZAS,NEII) 4,039,035-2959-455-D
KØRF(K1AR,KØGU,NØs BA CP, WØs CP UA UN,WBØCMM, WDØDSU,oprs) 4,033,155-3787-355-D
W2YV(+K1s EB TA,K2OY, W2YX,N2NT,K3UA) 3,955,287-3017-437-D
K2UA(+K2BU,N2SS,WA2HGM, KA3BKR,K5VNJ) 3,775,680-3040-414-D
W3LPL(+K3s NA RT,W3MR, WB3DNL,W6AXX) 3,237,960-2453-440-D
W3MM(+K1PT,K3GM,N3VV) 3,207,120-2576-415-D
K9HMB(+K9s GL GS HDE MR NO RS,N9APM,WØs TK TM, WB9SMU)2,921,280-2720-358-D
W1RR(K1IU,W1s FJ KM, WB1HIX,oprs) 2,876,581-2439-393-D
K3WW(+K3WJV,N3DM, WA3LUY) 2,708,835-2155-419-D
N6RO(+K6RM,WA6KXN, K9LBQ) 2,640,390-2830-311-D
K6NA(+N6s RJ SO SV,W6YA) 2,604,672-2856-304-D
WA7NIN(+K6VVA,N6s SF TJ, WB7TYF)2,461,350-2690-305-D
W3WJD(+K3JLT,N3RD,W3XU, WA3LRO) 2,452,995-2265-361-D
K6ZM(N6s KB LC VV,WA6DGX WB6DEO,oprs) 2,153,208-2485-292-D
W4DR(+K4s BKX JYM,N4ND, W4MYA,WA4ZAJ,WD4REE) 2,004,672-2360-280-D
N6TU(+N6s KT QW,WB6RIU) 2,001,951-2217-301-D
N6IG(+K6MYC,W6TPH, WB6GSZ) 1,880,928-2177-288-D
N6BT(+WD6AGJ) 1,811,448-2172-278-D
K3RL(+AA3B,K3s FD GQJ) 1,727,469-1569-367-D
W6MSF(AA6UO,N6AUV,WA6s HCI VEF,oprs) 1,587,960-2005-264-D
W6YX(KIKH,NIOO,W2JU, WA6ITV,N7MH,W8ZT,oprs) 1,487,412-2092-237-D
K5KG(+W9AJX,AD5W,K5LZO W5SJS) 1,324,134-1582-279-D
K6XV(+K6PJY,N6FJ) 1,103,676-1877-196-D
K6RU(+WB6SHD) 1,101,326-1684-218-D
K6OYE(+KA6B,WA6RPF) 1,019,712-1504-226-D
N6RZ(+AA6T,WA6OCV, WB6CBJ) 908,019-1491-203-D
W3BI(Multiop) 892,440-1110-268-D
N6VQ(Multiop) 861,892-1572-187-D
W6XX(Multiop) 852,255-1605-177-D
K6RV(+AI6V) 801,288-1436-186-D
W3GU(+K3CY) 763,422- 946-269-D
AI6V(K5GQE,KB6F,oprs) 724,527-1083-223-D
N3HW(+WA2BFW) 576,198- 807-238-D
K6AYA(Multiop) 514,359- 853-201-D
KØUP(+KØSCM) 311,952- 536-194-D
N1AU(+K1CE,WA1WZJ) 304,110- 548-186-C
W3KT(Multiop) 225,498- 413-182-D
W6YKM(Multiop) 92,568- 406- 76-D
W6QT(N6AVJ,K6CSL,WA6BOB oprs) 66,043- 277- 73-D



K8AQM, WB8ZFB and WA8ARS of K8AQM, M-S, cw, Michigan.

I5NSR — top European high-band QRP score on phone.



4M3AZC (YV3AZC) — better than 1 megapoint in the high-band category on phone.

All Band

1

Connecticut

W1ZM(K1ZM,opr) 1,610,043-1693-317-D
K1ZZ 1,527,414-1774-287-D
K1PR(K1TO,opr) 1,519,086-1802-281-D
K1CO 425,040- 805-176-D
W1VV 157,986- 402-131-D
W1BWS 149,634- 306-163-D
K1VDF 141,510- 445-106-D
W1BL 137,895- 317-145-D

K1WA 100,098- 249-134-B
W1CNU 51,612- 187- 92-B
W1AB 2244- 34- 22-D

Eastern Massachusetts

W1ZA(WA1LKX,opr) 1,858,206-2051-302-D
W1CF(N@ND,opr) 1,133,424-1389-272-D
W1LK 772,122-1042-247-D
K1VR 746,025-1015-245-D
W1FJ 694,647- 977-237-D
W1PL 172,272- 388-148-D
W1UJU 156,450- 359-149-D
W1CWU 134,589- 377-119-B
K1MEM 34,602- 158- 73-D
N1DC 21,357- 113- 63-B

Maine

W1QQ 540,222-1006-179-D

New Hampshire

K1GQ 1,975,248-2064-319-D
K1RX 638,361-999-213-D
K1MBQ 353,379- 697-169-D

Rhode Island

WA1WXB 58,206- 178-109-B

Western Massachusetts

K1BW 846,750-1129-250-D
W1GG 423,255- 695-203-D
K1AU 16,356- 94- 58-B

2

Eastern New York

W2IB 1,526,868-1743-292-D
W2AZO 893,382-1246-239-D
W2XL 383,088- 694-184-D
WA2AUB 213,588- 349-204-D
W2AWF 96,480- 268-120-D
K2XA 85,749- 283-101-D
K2GBH 36,666- 194- 63-D
W2DW 22,176- 112- 66-D

New York City - L. I.

W2GGE 678,375-1005-225-D

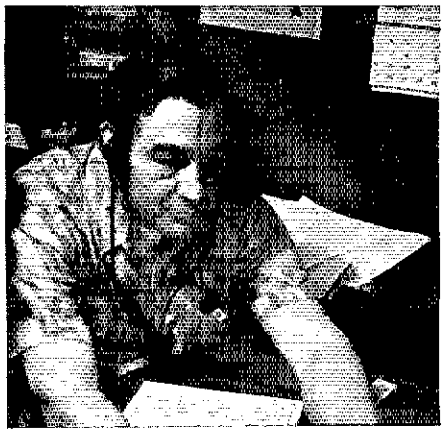
N2GC 613,818- 842-243-B
K2MFY 438,533- 669-219-B
N2UN 380,050- 612-207-C
W2HLI 240,786- 546-147-D
W2GKZ 154,224- 378-136-D
W2SGK 127,575- 315-136-D
W2GC 111,600- 300-124-D
WA2ISH 45,318- 182- 83-D
W2CZZ 14,112- 84- 56-B
K2TV 9180- 85- 36-D
K2CNF 4092- 44- 31-B

Northern New Jersey

N2LT 1,505,055-1865-269-D
K2BMI 1,426-320-1680-283-D
W2GD 1,201,008-1528-262-D

The ops at CT2ARA, number three, worldwide, multi-single, phone. From the left by rows, working down: CT2AO, CT2SH, CT2CE, CT2CM, CT2QN, Mr. Cliff (DX Hound), CT2AK, CT2CP CT2CJ and CT2BT.

GW6GW, multi-single, phone. Standing (l to r). GW3KYA, GW4EAI, GW4HBK, GW8SAI. Seated; GW8FXM and GW4BLE.



WBØBMB at KØRWL M-S, cw, Missouri.

N7TT/2 804,796-1137-236-D
W2YC 441,000- 700-210-D
W2RP 347,616- 568-204-D
N2IC 316,200- 620-170-D
WA2ZWH 243,900- 542-150-B
WB2RTF 223,008- 404-184-C
W1GD/2 156,492- 322-162-D
W2VJN 94,695- 295-107-D
W2SQ 63,630- 210-101-D
AB2N 29,568- 128- 77-B

Southern New Jersey

W2REH 1,301,454-1386-313-D
W2SUA 640,918-1108-293-D
WA2VYA 790-847-1261-209-D
W2KI 559,104- 896-208-D
N2MR 425,184- 688-206-C
AB2E 406,560- 770-176-D
W2PAU 245,022- 421-194-D
K2TD 176,154- 374-157-D
AB2W 151,866- 429-118-D
K2HPV 88,434- 289-102-B
WB2SST 85,542- 269-106-D
WB2VNU 82,503- 309- 89-B
W2EA 59,685- 205- 97-B
WA2CUW 17,568- 96- 61-B
W2CN 14,976- 96- 52-C

Western New York

K2VV 1,214,040-1510-268-D
W2QIP 244,791- 461-177-D
W2FUI 89,958- 319- 94-B
W2RR(WA2AOG,opr) 33,366- 166- 67-D
N2RT 4320- 40- 36-B

3

Delaware

W3GL 26,112- 136- 64-B

Eastern Pennsylvania

W3BGN 1,514,244-1964-257-D
N3BB 1,170,960-1435-272-D
W3MA 630,978-1021-206-D
W3FV 489,084- 769-212-D
W3GU 466,284- 793-196-D
W3OV 454,545- 819-185-D
K3CY 396,864- 689-192-D
W3AARK 298,890- 615-162-B
K3NI 251,412- 511-164-D
W3BB 186,219- 513-121-D
W3ZJ 112,500- 300-125-D
W3KFQ 88,788- 302- 98-D
W3YFV 58,566- 227- 86-D
W3AAP 25,515- 135- 63-D
W3VA 22,450- 110- 65-B
N3RW 16,335- 99- 55-C
AF3E 14,025- 85- 55-B
W3EHZ 7812- 62- 42-B
WB3JZE 2178- 33- 22-B
W3HMR 1566- 29- 18-D

Maryland - D. C.

W3LPL 1,595,367-1721-309-D
K3RA 1,329,255-1635-271-D
K3TW 1,228,740-1511-270-D
W3GRF 814,716-1113-244-D
K3SA 596,037- 899-221-D
K3AO 561,168- 866-216-D
W3GN 508,644- 796-213-D
N3UN 453,051- 709-213-D
WA3DSD 418,608- 684-204-D
W3UJ 393,690- 640-205-D
W3GNQ 381,276- 714-178-D
W1FLM/3 329,280- 784-140-D
N3II 285,120- 540-176-B
W3AZ 224,676- 474-158-D
K3APM 143,448- 344-139-D
N3OS 127,104- 331-128-C
W3HVQ 96,330- 247-130-C
WB3BRF 37,584- 144- 87-B
W3GN 25,146- 127- 66-B
K3DQ 15,000- 100- 50-B
K3KMO 5088- 53- 32-B
W3PEV 1323- 21- 21-B

Western Pennsylvania

K3LR 1,193,148-1518-262-D
K3MD 655,698-1061-206-D

4

Alabama

N4KG 927,816-1154-268-D

Georgia

N4HI 734,706-1029-238-D
W4QUN 212,346- 502-141-D
AA4U 161,634- 341-158-B
K4EZ 74,763- 213-117-D
KB4HZ 59,946- 206- 97-B
N4TZ 51,840- 160-108-B

Kentucky

N4AR 1,579,989-1861-283-D
N4XM 533,337- 763-233-D
WB4FOT 216,175- 497-145-B

North Carolina

AA4S 1,128,528-1383-272-D
K4UWH 265,629- 637-139-D
W4QMW 115,710- 290-133-D
K4JEX 58,764- 166-118-B
WA4VMZ 4945- 65- 61-C
N4UH 6300- 50- 42-D

Northern Florida

W2AW/4 107,973- 279-129-B

South Carolina

K4II 667,899- 853-261-D
K4WJR 184,875- 425-145-C
W4LS 91,140- 217-140-B
WB4IUX 84,591- 241-117-D

Southern Florida

N4XR 195,600- 326-200-B
W4LOO 159,600- 350-152-D
K4CL 120,696- 376-107-D
N4AW 41,031- 141- 97-B

Tennessee

K4XU 1,253,502-1503-278-D
AA4KB 663,390-1053-210-D
N4IR 283,800- 550-172-D
KF4H 228,096- 528-144-D
W4NIX 144,243- 341-141-D
K4FQ 22,050- 98- 75-D

Virginia

K4PQL 1,391,040-1656-280-D
N4RV 1,006,992-1296-259-D
W4HBK 939,600-1305-240-D
W4YE 633,150- 938-225-D
W4EJ 589,572- 927-212-D
N4DW 579,846- 802-241-C
N4UA 525,360- 796-220-D
W4DM 506,688- 832-203-D
N4MB 496,944- 812-204-D
N4ND 460,926- 883-174-D
N4RA 339,234- 574-197-D
W4XR 335,358- 601-186-D
K4OAQ 303,048- 552-183-D
W4NH 237,546- 498-159-D
K4SYH/4 181,638- 398-157-C
K4ZA 88,236- 228-129-D
K4CMF/4 85,800- 286-100-D
W4ZM 67,032- 228- 98-D
W4PK 44,436- 161- 92-D
N5BA/4 35,376- 134- 88-D
N4YJ 22,644- 111- 68-B
AA4FF 864- 24- 12-B

5

Arkansas

W5RUH 71,610- 217-110-B
WA5SOG 38,250- 150- 85-C

Louisiana

K5KU 953,856-1388-229-D
W5OB 189,588- 427-148-D

Mississippi

W5XX 736,320-1040-236-D

New Mexico

W5JW 742,290-1135-218-D
W5YZ 524,433- 791-221-D
WB5OWL 72,468- 244- 99-C

Northern Texas

W5UN 990,132-1154-286-D
N5JB 972,921-1537-211-D
N5RM 579,474-1022-189-D
AF5K 384,492- 716-179-D
W5VGX 294,840- 585-168-B
K5AQ 223,272- 443-168-D
WB5OON 68,634- 246- 93-B
WD5ABF 46,368- 168- 92-B
KA5ATY 24,924- 124- 67-B
N5BT 20,832- 112- 62-B
N5UA 17,649- 111- 53-D
AG5N 11,760- 70- 56-B
K5TJ 10,710- 105- 34-D

Oklahoma

WB6FHK/5 77,592- 244-106-D

Southern Texas

N5AW 765,864- 967-264-B
WB5FND(WA3OVC,opr) 369,675- 775-159-D
W5PF 100,899- 303-111-B
K5BDS 46,992- 178- 88-B
W5DUI 24,495- 115- 71-C
K5DX 2775- 37- 25-B

6

East Bay

N6RO 1,347,225-1633-275-D

Los Angeles

N6AR 861,984-1168-246-D
N6TW 230,928- 566-136-D
WA&TLA 198,288- 459-144-D
K6MP 116,280- 323-120-C
W7CB/6 80,352- 248-108-D
W6PYV 77,970- 226-115-B

Orange

K6RR(N6IN,opr) 711,786-1223-194-D
WA6JAH 323,466- 754-143-D
N6HI 22,143- 121- 61-B

Santa Barbara

W6KPJ 198,492- 476-139-B

Santa Clara Valley

N6BT 1,199,676-1556-257-D
N6TU 1,012,152-1448-233-D
N6AN 369,292- 834-146-D
W6SC 302,604- 668-151-D
K6RM 276,006- 586-157-D
AF6S 243,516- 446-182-D
K6XM 180,840- 440-137-D
N6UW 81,540- 302- 90-D
N6OM 56,502- 219- 86-D
K6OMB 46,728- 236- 66-C
K6MA 44,880- 220- 68-D
N6NF 816- 17- 16-D

San Diego

K6NA 1,080,378-1458-247-D
KB6IJ 100,488- 316-106-D
W6ABT 98,553- 247-133-D
K6NY 54,498- 293- 62-C

San Francisco

W6WB 386,660- 529-180-D
W6PM 279,240- 520-179-D

San Joaquin Valley

W6BVM 114,777- 351-109-D
W6BYH 104,085- 257-135-D

Sacramento Valley

N6JV 774,648-1218-212-D
K6SG 446,958- 801-186-D
W6NKR 99,840- 260-128-D
N6EA 28,782- 123- 78-D

7

Arizona

W7IR 959,595-1295-247-D
W7ZMD 225,120- 469-160-D
K7NO 209,790- 585-126-D
W2GGL/7 89,100- 275-108-D

Idaho

AC7P 117,234- 334-117-C
K7TAK 18,354- 133- 46-C

Montana

K7QA 404,244- 788-171-D
W7JYW 196,200- 654-100-D

Nevada

W7JKA 49,368- 187- 88-C

Oregon

W7NI 812,448-1302-208-D
W7IVX 302,292- 622-162-D
W7ZR 23,220- 129- 60-D

Utah

N7DF 639,426-1349-158-D
W7HS 189,648- 439-144-B

Washington

K7RI(W7WA,opr) 1,374,840-2010-228-D
K7ZA 617,463-1089-189-D
K7DZ 265,482- 686-129-D
N7AM 195,750- 522-125-D
W7BCS 16,536- 104- 53-B

Wyoming

N7NG 766,818-1131-226-D

8

Michigan

N8JW 931,356-1262-246-D
K8GL 725,604-1012-239-D
K8SIA 89,577- 269-111-C
N8RW 27,930- 133- 70-D
K8CV 25,728- 134- 64-D
K8KIC 11,700- 100- 39-B

Ohio

K8NZ 1,392,882-1726-269-D
K8JK 611,004- 863-238-D
K8MN 273,735-1658-165-D
W8QWI 251,856- 528-159-D
W8GOC 243,678- 475-171-B
W8ZCQ 162,210- 386-140-D
N8BC 156,510- 370-141-C
W8II 129,846- 323-134-D
W8BO 123,735- 365-113-C
W8RSW 98,049- 203-161-D
AA8Z 72,369- 187-129-B
W8YGR 51,039- 159-107-B
W8LHV 45,330- 179- 90-D
W8NPF 38,916- 138- 94-D
K8DL 31,680- 120- 88-D

West Virginia

K8OQL 73,224- 216-113-D

9

Illinois

K9DX 1,619,568-1956-276-D
W9RW 641,277-1053-203-D
K9BGL 639,783-1061-201-D
W9CH 189,354- 418-151-B
W9AG 155,928- 358-146-D
WD9IIC 103,320- 328-105-C
N9TI 43,254- 178- 81-D
W9PNE 22,464- 104- 72-B
W9MKL 18,231- 103- 59-D
W9VA 14,400- 100- 48-D

Indiana

N9MM 1,564,140-1990-262-D
N9AFU 86,292- 282-102-B
N9RC 6324- 68- 31-D
WD9CIS 1056- 22- 16-B

Wisconsin

W9QP 533,082- 902-197-D
K9EYA 362,544- 728-166-D
W9HE 239,568- 496-161-D

Ø

Colorado

KØFX 712,080-1290-184-D
K7LR/Ø 492,318-1013-162-D
AJØS 342,324- 771-148-D
NØTK 88,032- 262-112-D

Iowa

NØGA 573,420-1006-190-D
WØEJ 409,440- 853-160-D
WØCS(WBØYUI,opr) 302,430- 593-170-D
ADØF 72,300- 241-100-D
WØSR 19,440- 108- 60-D

Kansas

WØIUB 466,650- 850-183-D
WØWPL 31,950- 142- 75-B

Minnesota

WØUC 472,152- 764-206-B
WØYCR 380,100- 724-175-D
KØIHG 43,044- 211- 68-B

Missouri

WAØFBQ 205,860- 470-146-B
WØQWS 184,224- 404-152-B

Nebraska

KØUP 227,409- 637-119-D

South Dakota

KØZZ 1,211,100-1468-275-D

VE

Maritime

VE1AIH 403,908- 684-194-C
VE1FW 65,793- 241- 91-B

Quebec

VE2AYU 607,689- 951-213-D

Ontario

VE3GCE 181,545- 455-133-D
VE3KZ 156,775- 335-155-A

Alberta

VE6LU 438,948- 822-178-D
CZ6MP 128,700- 550- 78-B
VE6APN 79,615- 235-103-B

British Columbia

VE7ARQ 191,250- 510-125-D
VE7IQ 59,475- 305- 65-B

High Band

1

Connecticut

K1WR 563,814-1182-159-D
W1GNR 368,280- 792-155-D
W1KKF 360,729- 807-149-D
WA1FCN 225,072- 521-144-B
K1WJL 219,438- 501-146-B
WA1UUA 150,495- 396-127-B
WA1YEC 129,000- 430-100-B
WA1CCR 127,440- 360-118-B
N1AF 111,672- 423- 88-D
N1BW 74,292- 302- 82-C
KA1DS 45,135- 177- 85-B
WA1ZDW 26,718- 146- 61-B
KA1EA 1024- 48- 21-B
KA1BKM 2550- 34- 25-B
WB1FKU 1200- 25- 16-B
WB1CRH 378- 14- 9-B
K1TN 156- 13- 6-B
WB1FNK 48- 4- 4-B

Eastern Massachusetts

W1YN 805,140-1491-180-D
W1IHN 550,120-1040-176-D
WB1ANT 250,002- 646-129-D
WA1UZH 175,203- 567-103-D
W1WLW 167,466- 496-113-D
N1NN 60,060- 220- 91-B
W1YS 33,867- 213- 53-B
W1UU 31,098- 142- 73-B
KA1API 16,848- 108- 52-B
W1AQE 13,248- 138- 32-B
N1QY 4114- 62- 49-A
W1FM 3160- 68- 40-B
WB1CNM 4524- 57- 29-C
W1PLJ 3888- 54- 24-D
WA1YVT 3528- 42- 28-B
W1ORI 1350- 25- 18-B
K1MC 1248- 26- 16-B
K1JKA 1224- 24- 17-C
WA2EHV/1 459- 17- 9-B
WA1ORP 117- 13- 3-B

Maine

K1SA 626,940-1290-162-D
W1ERW 23,655- 95- 83-C

New Hampshire

W1PH 237,582- 591-134-D
AD1Y 214,272- 576-124-B
W1END 20,355- 115- 59-B

Rhode Island

K1AD(AF1O,opr) 260,396- 846-142-D
WB1HIX 324,351- 879-123-D
K1JA 314,157- 867-157-B
N1ACU 206,064- 636-108-D
WA1TFF 80,256- 304- 88-D
WB1EKH 67,914- 231- 98-B
K1KX 13,662- 69- 66-B

Vermont

W1ETV 166,164- 454-122-B
W1LY 72,140- 230-106-B
N1JB 14,364- 114- 42-B
K1IK 10,692- 132- 27-D

Western Massachusetts

W1AUT 323,544- 793-136-D
K1FIR 233,814- 586-133-D
K1DPB 207,432- 536-129-D
N1CQ 10,296- 88- 39-D
K1KNQ 6720- 70- 32-D

2

Eastern New York

W2AD 355,725- 765-155-D

WA2STM 135,750- 362-125-C
WA2LJM 129,519- 369-117-D
K2MN 110,550- 335-110-B
K2QH 54,315- 213- 85-C
WA2MBB 15,288- 91- 56-C
WA2KTR 11,040- 92- 40-B

New York City - L. I.

W2AYJ 175,428- 443-132-D
N2KW 160,314- 347-154-B
W2LPA 81,180- 246-110-B
K2OB 80,727- 379- 71-D
N2WR 58,320- 216- 90-D
W2AFM 55,200- 200- 92-B
N2KA 46,008- 216- 71-B
W2NCG 39,852- 162- 82-B
K2CMV 30,636- 138- 74-B
WA2EWJ 26,208- 112- 78-B
WB2HIQ 21,696- 113- 64-C
WB2QNF 19,551- 133- 49-D
K1TA/2 5544- 77- 24-B
WB2ENW 5487- 59- 31-B
W2ZPG 3744- 39- 32-B
K2OVS 1875- 25- 25-D
W2III 714- 17- 14-B
W2NBI 216- 9- 8-B

Northern New Jersey

AE2A 885,600-1440-205-D
NW2R/2 273,222- 705-129-D
W2ZZ 215,114- 618-141-D
W2HN 127,125- 339-125-D
WB2POG 101,898- 333-102-B
K2PF 68,676- 236- 97-C
AF2L 38,442- 149- 86-C
WA2AJX 5775- 55- 35-B
WB2RAL 5040- 56- 30-B
WB2PGZ 2850- 50- 17-D
W2UL 1224- 24- 17-D
WA2PQU 756- 54- 14-B

Southern New Jersey

N2CQ 529,890-1039-170-D
N2RM 408,240- 840-162-D
W2NS 155,652- 436-119-D
N2IT 149,916- 403-124-B
WA2NBM 61,692- 194-106-D
N2CM 54,708- 188- 97-B
N2AWH 49,599- 167- 99-B
W2XN 18,837- 161- 39-D
W2FGY 6630- 65- 34-C
W2HAZ 5280- 55- 32-D
N2CW 3519- 51- 23-D

Western New York

WA2ECA(WB2ABD,opr)
468,180- 867-180-D
WA2MBW(WB2BJC,opr)
393,888- 746-176-D
W2FTY 183,270- 410-147-B
WA2LOG 173,910- 374-155-D
K2SPO 151,938- 367-138-D
W2ABM 128,043- 347-123-D
WB2LJK 102,708- 317-108-B
WA2ORX 89,490- 314- 95-D
WA2EFA 87,768- 276-106-D
KB2HF 45,378- 199- 76-D
W2PHT 42,579- 171- 83-B
WB2TUM 41,328- 164- 84-B
W2SEC 33,966- 153- 74-D
W2HG 17,472- 104- 56-D
WB2NRK 7215- 65- 37-B
K2UAN 1488- 31- 16-B

3

Delaware

K3HBP 179,820- 405-148-D

Eastern Pennsylvania

K3VW 720,720-1092-220-D
K3ND 480,161- 741-207-D
WA3YIV(K2PH,opr)
292,484- 661-148-D
N3FT 245,820- 482-170-D
W3GRS 225,984- 428-176-D
K3UC 225,456- 488-164-D
N3IHW 183,180- 545-112-D
N3IK 148,782- 362-137-B
K3ZA 102,168- 396- 86-D
W3PN 30,438- 178- 57-D
N3VV 27,054- 167- 54-D
K3WOK 11,520- 80- 48-D
WB3JYY 2925- 39- 25-B

Maryland

K3HPG 464,718-1061-146-C
W3EWL 430,950- 850-169-D
W3DOS(N4ZR,opr)
399,396- 802-166-D
W3PZW 99,462- 274-121-D
W3HVM 63,480- 230- 92-D
W3IGJ 53,667- 201- 89-D
W3EE 19,716- 106- 62-C
W3KS 12,636- 78- 54-D
K3ZJ 5724- 53- 36-D
W3FQE 648- 18- 12-C

Western Pennsylvania

K3KO 265,761- 579-153-B
WB3KAF 53,133- 199- 89-B
W3RNH 2898- 42- 23-B
KA3APH 1440- 24- 20-B

4

Alabama

WN4KKN 638,352-1209-176-C
AC4X 70,752- 268- 88-D
K4MLR 6750- 75- 30-B
K4GUS 864- 18- 16-B

Georgia

K4BAI 452,682- 909-166-D
N4SV 346,236- 671-172-C
W4WKI 173,800- 414-140-D
W4BFR 150,519- 383-131-D
W4JHL 34,164- 156- 73-C
WB4RRC 33,390- 159- 70-C
K4LDI 20,116- 108- 59-B
W3IW/4 16,218- 102- 53-B
W4ET 12,240- 85- 48-B
WB4WRM 1380- 23- 20-C

Kentucky

KF4O 366,795- 855-143-D
WB4PRIJ 325,194- 653-166-D
WA4QMQ 61,971- 227- 91-B

North Carolina

WA4DAN 347,256- 742-156-B
AA4NN 183,870- 454-135-D
K4GFH 7137- 61- 39-D
WD4CTA 3960- 40- 33-B
WB4YZA 360- 12- 10-A

Northern Florida

WA4TKA 7290- 81- 30-B
W4EEO 1782- 27- 22-C
N4KF 546- 14- 13-A
WB4YEY 144- 8- 6-C

South Carolina

WB4TDH 492,030- 994-165-D

Southern Florida

WA4OML 70,560- 240- 98-D
W4YN 64,578- 228- 94-C
KD4N 39,420- 180- 73-B
WD4AHZ 23,328- 162- 48-B
WA4LZR(N4RU,opr)
45- 5- 3-D

Tennessee

AB4H 618,270-1114-185-D
W4JD 250,344- 549-152-D
AA4AK 140,538- 397-118-B
K4LN 106,605- 309-115-D
WB4WHE 49,440- 206- 80-B
AA4TP 38,865- 164- 79-B
W4OGG 14,577- 113- 43-C
AA4KT 13,728- 104- 44-B
AA4H 7866- 69- 38-B

Virginia

N4ZJ 421,920- 879-160-D
W4OEL 202,920- 445-152-D
W4MYA 161,700- 550- 98-D
N4MM 132,486- 311-142-D
W4GF 55,926- 239- 78-D
W4DKL 68,634- 246- 93-D
N4XG 51,066- 185- 92-B
WD4KUK 44,928- 288- 52-D
W4WMS 36,549- 131- 93-D
WD4EXG 19,488- 116- 56-B
WD4GCE 8883- 63- 47-C

5

Arkansas

WB5NBC 319,290- 734-145-B
W5EIJ 5049- 51- 33-C

Louisiana

WA5NUK 297,528- 644-154-D
WA5IGD 182,652- 491-124-D
W5WG 135,399- 373-121-D
K5EOA 66,150- 245- 90-D
W5HEZ 11,850- 79- 50-D

Mississippi

AE5H 45,966- 163- 94-B
K5YPV 14,400- 100- 48-C

New Mexico

W5TVX 36,660- 260- 47-B

Northern Texas

W5MYA 842,622-1502-187-D
W5FO 841,866-1454-193-D
N5CR 835,029-1521-183-D
K5RX 662,160-1240-178-D
K5LP 337,431- 821-137-D
N5ND 197,679- 503-131-D
K5BDX 108,702- 366- 99-B
W5QF 30,030- 182- 55-B
W5SOD 28,161- 149- 63-D
K2SCU/5 25,344- 132- 64-D
W5VCS 17,484- 94- 62-C
W5TEN 14,625- 125- 39-D
N2CU/5 1275- 25- 17-B
WB5VXH 384- 32- 4-B

Oklahoma

N5CG 192,096- 736- 87-D
AE5Y 76,230- 363- 70-C
K0JPX/5 28,743- 143- 67-B

Southern Texas

WB5NXH(K1EA,opr)
837,640-1485-188-D
K9WA(KA5CHW,opr)
680,184-1206-188-D
K5SF 399,600- 900-148-D
W5GO 272,592- 631-144-D
N5HB 179,196- 436-137-C
W5RRR(W5LSZ,opr)
125,189- 316-131-D
N5WW 83,808- 291- 96-D
K5DB 75,888- 372- 68-D
W5OSJ 13,689- 169- 27-D
AC5R 7020- 78- 30-B
W5IYR 2052- 36- 19-B
WA5IYX 1767- 31- 19-C

6

East Bay

K6ATV 180,234- 589-102-B
W6EYC 18,640- 103- 60-B

Los Angeles

N6ZZ 514,329- 991-173-D
AI6Z 72,594- 327- 74-B
K6KWN 42,846- 193- 74-B
W6RZ 29,376- 204- 48-B
N6OB 14,250- 125- 38-D
K6KH 153- 17- 3-B

Orange

K6TXA 183,573- 523-117-D
N6PE 121,695- 427- 95-D
W6HDY 27,081- 153- 59-D
WD6FLV 11,289- 71- 53-B
K6ZT 4278- 46- 31-B

Santa Barbara

K6ASB 14,964- 116- 43-B
W6OUL 11,466- 91- 42-D
K6IGZ 9072- 112- 27-B

Santa Clara Valley

W6CYX 158,898- 746- 71-D
N7KA/6 123,409- 433- 95-D
W6ATO 71,760- 289- 80-D
WA6TKT 39,015- 158- 85-D
K6SMH 31,806- 171- 62-B
AJ6V 25,080- 209- 40-D
W6SYL 17,820- 108- 55-C
W1ARR/6 14,976- 128- 39-D
W8AW/6 12,513- 97- 43-B
K6PU 9720- 81- 40-C
W6SUJ 9384- 68- 46-D

San Diego

K6MC 121,437- 309-131-D
WA6EJL 61,056- 424- 48-D
N6KW 12,705- 121- 35-B
AA6EE 1974- 47- 14-B

San Francisco

N6CT 512,148-1274-134-D
WA6TOE 92,781- 607- 61-B
WD6EEQ 8505- 105- 27-B

San Joaquin Valley

N6DS 28,188- 108- 86-C
W6MMH 378- 18- 7-D

Sacramento Valley

AA6DX 186,327- 603-103-B
K6FO 43,260- 206- 70-C
W6GO 30,861- 127- 81-D
N6JM 23,808- 128- 62-C
W6BIL 8085- 55- 49-D
W6SX 144- 8- 6-B

7

Arizona

K6LL/7 863,940-1694-170-D
W7AYY 258,564- 743-116-D
K7JVR 122,943- 383-107-D
N7MW 45,018- 183- 82-D

Idaho

WB7RBV 61,650- 274- 75-B

Nevada

WB7OQW(K7OX,opr)
528,264-1276-138-D
WA7YHP 324,000- 800-135-D
W7TVF 90,024- 484- 62-B

Oregon

WA7IHN(AF7S,opr)
265,707- 757-117-D
W7YAQ 90,915- 319- 95-B
W7TWL 25,707- 209- 41-B
W7WHY 19,440- 270- 72-D

Utah

W7LGG 33,123- 181- 61-D
WB7SVQ 10,530- 117- 30-B

Washington

N7DX 436,293-1017-143-D
W7IIT 157,300- 524-100-D
W7NP 145,791- 501- 97-D
WD8IUN 96,660- 537- 60-D
K7NF 77,778- 298- 87-D
W7AJS 37,824- 197- 64-B
WB7ALT 15,030- 167- 30-C
W7EKM 10,881- 93- 39-D
W7BYK 10,200- 100- 34-B
W7KRM 5757- 101- 19-C
AE7X 216- 18- 4-B

Wyoming

K7EY 5070- 65- 26-B

8

Michigan

KB8EC 339,786- 878-129-D
WB8AAX 194,712- 488-133-C
WD8IXV 90,216- 358- 84-D
W8WVU 60,705- 213- 95-B
K8OT 57,570- 190-101-D
WA8FTA 31,212- 204- 51-A
K8LJG 22,440- 170- 44-C
K8MVZ 17,628- 113- 52-B
K8QWG 13,986- 126- 37-B
W8JJ 6834- 67- 34-A
WD8CSA 5382- 46- 39-D
W8TW 4368- 56- 26-B
WD8KXN 252- 12- 7-B
WD8NKA 3- 1- 1-B
WB8TVD 3- 1- 1-B

Ohio

W8WPC(N9AQ,opr)
724,059-1277-189-D
K8BA 272,250- 825-110-D
K8HV 170,562- 434-131-D
W8UPH 152,490- 442-115-D
WB8KKI 148,992- 388-128-B
N8FU 141,264- 436-108-C
K8KR 119,700- 350-114-D
N8LM 69,936- 248- 94-D
W8HO 66,126- 206-107-B
W8DWP 13,860- 132- 35-C
K8US 9900- 100- 33-D
W8XT 6018- 59- 34-B
AI8K 3807- 47- 27-D
W8FCS 3690- 41- 30-A
W8EAO 3108- 37- 28-B

West Virginia

W8BZ 35,604- 138- 86-D
W8CDV 13,416- 104- 43-D
W8JWX 8643- 67- 43-B

9

Illinois

W9OA 598,755-1115-179-D
W9BW 475,040- 998-160-D
W9RN 457,083- 891-171-C
W9HWL 447,492- 838-178-D
K9AB 249,783- 599-139-D
K9IL 224,700- 535-139-D
W9JGV 189,220- 420-147-D
K9IW 81,504- 283- 96-D
W9HPG 71,577- 241- 99-B
KB9EW 69,498- 234- 99-B
K9UQN 55,736- 242- 88-D
AF9C 48,672- 169- 96-B
W9JI 39,474- 258- 51-D
WD9IIX 38,160- 212- 60-D
W9RY 35,100- 150- 78-D
W9YYG 29,256- 212- 46-D
WA9REN 24,624- 114- 72-B
W9REC 24,090- 110- 73-C
W9QWM 22,656- 128- 59-B
W9IVB 21,060- 130- 54-C
W9TNZ 17,748- 102- 58-B
KA9BML 16,929- 99- 57-B
AF9Q 7992- 74- 36-B
AA9F 7257- 59- 41-C
WA9FFZ 7254- 62- 39-B
W9WR 4743- 51- 31-B
W9FSD 4224- 44- 32-B
WB9SMU 672- 16- 14-B
WB9ZED 378- 14- 9-B
W9TA 3- 1- 1-D

Indiana

K9FN 389,280- 811-160-D
W9RE 329,175- 825-133-D
W9JOO 71,811- 237-101-C
K9LVK 34,419- 149- 77-C
K9VQK 24,003- 127- 63-D
K1TH/9 7344- 72- 34-B
K9UJ 2940- 35- 28-B
W9LT 2838- 43- 22-D
K9UIJ 2394- 38- 21-C

Wisconsin

K9OM 437,052- 946-154-D
W9NA 408,153- 901-151-D
W9GIL 403,168- 756-176-D
N9EZ 150,543- 389-189-C
W9GSR 111,585- 335-111-D
W9WI 68,985- 219-105-C
WB9YLR 43,920- 240- 61-D
K9GDF 7320- 61- 40-D
KA9COE 5022- 62- 27-C
WD9BCM 990- 22- 15-B

0

Colorado

W0YK 629,880-1448-145-D
K0ZFL 145,800- 300-162-B
N0DV 109,725- 385- 95-B
WA0ECN 83,424- 316- 88-D
K0KV 36,360- 202- 60-B
K0GUY 34,776- 138- 84-B
KA0CLS 8064- 84- 32-B
WD0DYH/N 2268- 36- 24-B

Iowa

W0SF 593,313-1487-133-D
W0WP 480,240- 920-174-B
W0FO 416,835- 885-157-D
K0AT 318,648- 781-136-D
WB0PYD 237,222- 573-138-B
W0IZ 232,725- 535-145-B
WB0ZTN 147,375- 393-125-C
K0LUZ 64,350- 286- 75-B
W0HJ 36,354- 166- 73-D
W0SML 4185- 45- 31-B
W0VX 1260- 35- 12-B

Kansas

AB0X 231,732- 628-123-D
W0YR 49,209- 349- 47-D
KA0BCW 12,480- 80- 52-D

Minnesota

W0UO 649,770-1210-179-D
K0IR 330,888- 811-136-D
W0HW 302,292- 622-162-D
N0AT 225,145- 641-116-D
W0SA 191,100- 490-130-D
WA0KDI 80,640- 280- 96-D
W0LP 55,080- 216- 85-D
N0AJJ 42,525- 175- 81-B
WD0CNR 37,248- 194- 64-C
W0WDW 23,241- 127- 61-B
WB0UKI 15,180- 110- 46-B
KA0CXK 9840- 80- 41-B

Missouri

N0TT 447,564- 988-151-D
W0JU 114,750- 425- 90-D
AC0A 103,329- 267-129-D
AG0U 42,120- 195- 72-B
W0PKO 31,356- 156- 67-D
WD0GSY 8769- 79- 37-B
AE0K 3864- 46- 28-D

Nebraska

WA0SDE 966- 23- 14-B

North Dakota

K0QQ 17,835- 145- 41-B
W0RIB 1287- 39- 11-C

VE

Maritimes

VE1MY 248,064- 608-136-B
VE1BNN 39,606- 161- 82-D
VE1ANU 30,636- 138- 74-C
VO1AW 12,393- 81- 51-B

Quebec

VE2WA 339,138- 681-166-D
VE2HY 11,628- 102- 38-B
VE2EAR 4050- 50- 27-B

Ontario

VE3BVD 451,401- 901-167-D
VE3DUS 175,500- 450-130-D
VE3DAP 161,196- 404-133-B
VE3JAQ 154,836- 506-102-D
VE3JCV 102,555- 265-129-B
VE3DZV 63,954- 209-102-D
VE3WW 29,376- 153- 64-B
VE3FEA 2508- 38- 22-C

Manitoba

VE4ADV 69,960- 265- 88-B
VE4SW 16,512- 192- 86-D
VE4EW 9408- 56- 56-B

Saskatchewan

VE5JQ 9108- 92- 33-A
VE5TT 7488- 96- 26-B

Alberta

VE6KW 734,400-1440-170-D
VE6AYI 482,052-1156-139-D

British Columbia

VE7AV 43,365- 295- 49-C
VE7CMK 14,652- 132- 37-B

Low Band

1

Connecticut

K1VTM 131,220- 540- 81-D
W1XK 43,602- 169- 86-D
AA1K 22,248- 103- 72-B

Eastern Massachusetts

W1BB/1 1368- 24- 19-B

Maine

W1MN 5346- 66- 27-D

Rhode Island

K1TZQ 74,151- 321- 77-D
WIGL 59,502- 211- 94-D

2

New York City - L. I.

W2ER 159,636- 502-106-D
WB2AMU 13,524- 92- 49-C
K2YGM 4230- 47- 30-D

Northern New Jersey

AC2U 86,670- 270-107-D
K2LP 16,983- 111- 51-D

Southern New Jersey

WB2VFT 126- 7- 6-B

Western New York

WA2SON 10,476- 97- 36-D

3

Eastern Pennsylvania

W3PC 17,169- 97- 59-D
WB3DCT 9009- 77- 39-D

Maryland - D. C.

WB3AVN 101,505- 335-101-D
K3CU 75- 5- 5-B

Western Pennsylvania

K3FR 1296- 24- 18-D
AF3B 351- 13- 9-C

4

Georgia

N4OL 55,620- 206- 90-D

Kentucky

K4FU 41,625- 185- 75-D

North Carolina

KE4I 216- 9- 8-C

Northern Florida

K4IEX 18,468- 108- 57-D

South Carolina

N4LL 37,422- 162- 77-D

Virginia

WB4BVY 97,902- 333- 98-D
AA4M 69,972- 238- 98-D
W4UQ 59,130- 219- 90-D
W4KFC 7245- 69- 35-D
W4EZ 3108- 37- 28-D

5

Arkansas

K5UR 67,716- 228- 99-D

Louisiana

K5UA 28,161- 149- 63-D

New Mexico

WA5YTX 3420- 38- 30-D

Northern Texas

N5UM 19,992- 136- 49-D
WD5EWP 2808- 36- 26-D

Southern Texas

W5WQN 27,900- 150- 62-D

6

San Francisco

AE6U 6498- 57- 38-D

Sacramento Valley

N6DM 11,178- 81- 46-D

7

Arizona

AA7A 21,717- 127- 57-D

Washington

K7UR 167,772- 681- 82-D
K7WA 12,864- 134- 32-B

Wyoming

W7PSO 1404- 26- 18-D

8

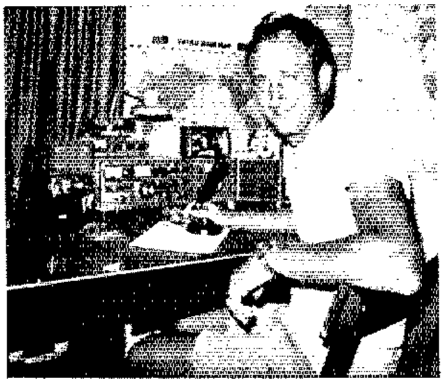
Michigan

W8UVZ 73,866- 283- 87-D
W8TWA 29,296- 124- 68-D
AC8Y 14,040- 120- 39-D

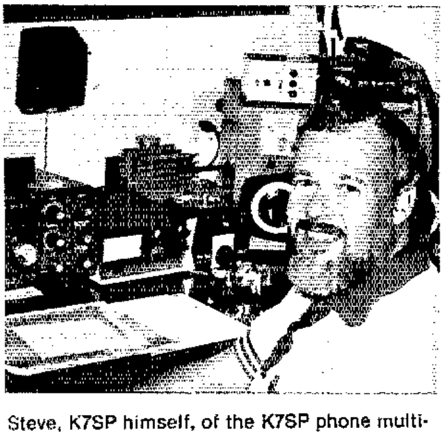
Ohio

K8WW 24,624- 144- 57-D
K8IP 1260- 21- 20-D
WD8QMP 1020- 20- 17-B

With 90 years of contest experience between them, K6RU (left) and N6GG, with help from NØMU (not shown), put multi-multi station K6RU on for the cw weekend.



CPO David, KG6JHW (N300), runs 160 watts to a cl-36 antenna at 52 feet on phone from his duty station on Guam.



Steve, K7SP himself, of the K7SP phone multi-single from Arizona.

West Virginia

W8LRL 816- 17- 16-C

9

Illinois

WB9TIY 11,352- 86- 44-B

Indiana

N9DX 64,758- 251- 86-D
W9NFC 468- 13- 12-B

Wisconsin

W9RN 37,274- 163- 66-D

Ø

Kansas

WAØTKJ 19,278- 102- 63-D
KØVGB 147- 7- 7-D

Minnesota

KØKX 36,036- 231- 52-D

VE

Maritime

VE1AXT 24,180- 130- 62-B

Saskatchewan

VE5RA 42,300- 235- 60-D

Multi - Single

1

Connecticut

K1RU(+K1YR) 1,485,717-1927-257-D
K1XA(+W1GNC) 1,062,600-1540-230-D
N1MM(+K1XM,WB1ALW) 938,250-1390-225-D
W1XX(+W1JKS) 807,324-1373-196-D

Eastern Massachusetts

K1LL(+N2FB) 1,158,003-1671-231-D
AB1F(+AB1X) 83,460- 260-107-B

Maine

WB1EGT(+W1DLC,KA1AAJ) 18,126- 106- 57-B

New Hampshire

WA1TZV(+K1IO,WA2NFL) 80,868- 293- 92-D

Western Massachusetts

K1RQ(+W1ZT,WB1AUL) 985,680-1369-240-C

2

New York City - L. I.

WA2LQO(Multiop) 317,547- 619-171-D

Northern New Jersey

K2BK(+W2IFK) 700,104- 941-248-D
N2WM(+W2VY) 76,275- 225-113-B

Southern New Jersey

N2MM(+N2ME,K2TD) 1,217,106-1366-297-D
K2FL(+N2ATX) 479,856- 769-208-D
W2UI(+Net) 465,117- 787-197-D

Western New York

K2JPM(+WB2s LRU MRS) 91,740- 278-110-B
N2ADA(+WA2VEZ) 23,659- 137- 59-B

3

Eastern Pennsylvania

N3AD(+N3DA) 1,519,545-1717-295-D
N3ED(+Net) 1,278,624-1402-304-D
K3NZ(+K300) 1,258,824-1652-254-D
N3AW(+N3AFU) 969,900-1325-244-D
K3SME(+K3KNH,WA3FZQ) 702,933-1309-179-D
W3NZ(+Net) 681,504- 916-248-D
W3KT(+Net) 353,190- 610-193-D
W3KV(+Net) 307,304- 536-188-D
W3EVW(+Net) 242,880- 506-160-D

Maryland - D. C.

W3AU(Multiop) 2,072,448-2056-336-D
W3GG(+K3RT,N3AM) 1,086,072-1534-236-D
K3IU(+Net) 577,080- 840-229-D
W3UO(+Net) 377,607- 659-191-D
N3TR(+K3EST,K4FJ,K1EK) 272,976- 517-176-D
N3RL(+Net) 206,550- 405-170-D

Western Pennsylvania

K3UA(+W3AS,WA3s FET JFW) 1,130,766-1417-266-D
K3RN(+K3s BSY TT) 744,000-1032-250-D
K3WT(+K3s TP VX,N3EE, W3YQ) 661,902-1031-214-D
K3QMR(+WB3s KKX LCD LPC, WN3CWW) 454,947-1091-139-D

4

Alabama

W4CUE(K4ELY,KA4DVL, N4s AID QB,W4AZE,WA4s DGI JWZ QIN UCT,WB4VSH, WD4s BXA EZA JUH,oprs) 219,285- 443-165-D
N4AU(+K4IZN,WA4s BBC MTG) 200,079- 473-141-D
K4KZE(+WB5VHH) 48,735- 171- 95-B

North Carolina

K4NYV(+WA4DKZ) 224,256- 584-128-D

Northern Florida

W4WS(N4OO,W4YA,oprs) 1,010,250-1347-250-D
N4UF(+WA4PVT,WB4YEY) 481,425- 917-175-D
WD4IIO(W4ILE,WD4FNX, N8AWM,oprs) 95,571- 287-111-B

Southern Florida

N4RR(+AE4H,N4s BP TO UM OW,WA4YWE,WB4OSN) 1,961,175-1975-331-D

Virginia

K4VX(+K4YEP) 1,635,333-1811-301-D
W4RW(+N4YE,WB4FDT) 217,620- 465-156-D
WA4FKK(+W3DJI) 168,831- 481-117-B
K4RZ(+Net) 139,695- 335-139-D

5

Northern Texas

K5JA(+K5MR,N5s AU TR, WA5ZWC) 1,458,468-1914-254-D
K5EE(+N5TR) 356,184- 776-153-D

Southern Texas

W5AC(K5GN,WB5YOT,oprs) 1,342,899-1593-281-D
K5NA(+K5GA) 940,383-1201-261-D
K5KG(+AD5W) 764,640-1062-240-D
AD5Q(+WB5WHR,WD5KBU) 312,768- 724-144-B

6

East Bay

K6XO(+N6NE) 877,725-1245-235-D
K6HIH(+Net) 608,367-1361-149-D

Los Angeles

AA6RX(+WA6OTU) 74,538- 303- 82-D
W6VIO(N6s MP WU,oprs) 19,926- 123- 54-C

Santa Clara Valley

N6IG(+K6MYC,W6TPH) 1,678,950-1950-287-D
N6RZ(+AA6T,WA6OCV,WB6s CBJ SHD) 835,548-1372-203-D
K6DC(+Net) 506,022- 902-187-D
K6ZX(+Net) 261,855- 529-165-D
AA6G(+Net) 193,152- 503-128-D
WB6VSC(+K6STI) 181,602- 513-118-D
N6QW(+Net) 76,626- 258- 99-D
WD6EPV(+Net) 52,584- 313- 56-D
WB6EXW(+Net) 3306- 38- 29-D

San Francisco

W6BIP(+AA6GM,WA6DJI) 629,880-1160-181-D

San Joaquin Valley

K6AO(+Net) 234,549- 511-153-D
K6YK(+Net) 97,569- 293-111-D
W6YKM(Multiop) 23,040- 128- 60-D

Sacramento Valley

K6RLY(+K6CSL) 112,896- 448- 84-D

7

Arizona

N7CW(+N4QS) 255,621- 613-139-D

Oregon

W7CG 106,812- 276-129-D

Washington

K7WQD(+K7OEW,N7TU, WA7RKJ) 756,702-1557-162-D

8

Michigan

W8GLC(+AA8K,AC8W) 309,510- 570-181-D
K8AQM(+WA8ARS,WB8ZFB) 235,350- 523-150-D
WB8RUQ(+WB8RUR) 59,220- 210- 94-B
AE8W(+WD8RIN) 26,640- 120- 74-D

Ohio

AD8P(+W8FN,WB8WMB) 1,082,142-1522-237-D
WB8JBM(AA8S,N8CQ,WB8s DQP LSN YQJ,oprs) 980,226-1534-213-D
K8DG(+WB8YSD,WD8AUB) 604,206-1206-167-D

9

Indiana

N9NS(+W9s LF OBF) 634,014-1194-177-D

Ø

Colorado

KØUK(+NØACW,WØKEA) 543,000-1000-181-D
WDØGXR(+KAØBFY) 10,260- 114- 30-B

Iowa

KØMM(+K9UIY) 1,054,485-1605-219-D
WAØTVV(+KØINR,NØADI) 472,590- 885-178-D

Minnesota

WØHP(+WØZZ,NØBG) 1,508,544-1728-291-D
AA4MD/Ø(+KBØAA) 176,148- 466-126-D

Missouri

KØRWL(ABØW,KØs VBU WTW,KAØAQZ,WØVWW, WAØZHY,WBØs BMB LFY UZJ, oprs) 504,648- 978-172-D

North Dakota

WØHSC(KAØCVI,NØDL, WDØAJS,oprs) 5445- 55- 33-B

Multi - Multi

N2AA(+K1KI,W1PM,K2s BQ GL NG SS TT UR,N2WT, WA2SFB,WB2VYA) 5,867,856-4624-423-D
W4BVV(+K1s JX XX,K2BA, K3KU,W3s IUU ZZ,WA3AMH, K4YF,WD4AXM) 5,778,663-4271-451-D
N3RS(+K3JLT,N3RD,W3XU, WA3LRO) 5,308,287-4457-397-D
W3MM(+K1PT,K3s GM II, N3LR,W3RJ,WB3HEQ) 4,891,410-3910-417-D
W3FA(+K3s NA TA ZZ,W3s ABC XY,WA3s KCY ZAS, N8II) 4,805,001-3897-411-D
K8LX(+K8s GM MD,N8EA,W8s KPL WA ZF,WA8ZDT) 4,160,451-3863-359-D
W7FU(+AH6Z,K7s HBN SS TI, N7ZZ,WA1KKM) 4,115,286-4011-342-D
K3WW(+K3s VA WJV,WA3LUY) 3,943,884-3238-406-D
W9TM(K9s BG GL GS HMB KM KU NO RF RS,oprs) 3,907,008-3648-357-D
KØRF(+KØGU,NØs BA CP RR, WØs CP UA UN) 3,879,354-3602-359-D
W1RR(+K1IU,N1EE,W1s KM TSP) 3,465,882-3114-371-D
WA7NIN(+K6VVA,N6s SF TJ TV,K6KM,WB7TYF) 3,446,688-3568-322-D
W2YV(+N2NT) 2,902,392-2986-324-D
K3RL(+AA3B,K3GQJ,W3BI) 2,814,669-2673-351-D
N6ND(+N6s EW KA RM ZI, W6UQF) 2,287,260-2910-262-D
K6ZM(N6s KB LC,WA6DGX, oprs) 2,193,360-2470-206-D
K6XV(+K6PJY,N6s FJ VV) 2,158,107-2597-277-D
W6MSF(AA6UD,WA6VEF, oprs) 1,848,840-2170-284-D
K2UA(+WA2HGM) 1,465,536-1796-272-D
K6RV(+N6s OP XI,WA6VAT) 1,424,643-1877-253-D
N6TA(+WA6s HCI PYI) 1,404,702-2001-234-D
K6OYE(+K9LBQ) 1,337,760-1858-240-D
K6OQ(W6OKK,WB6DSV, WD6AID,oprs) 1,313,520-1684-260-D
K6RU(+N6GG,NØMU) 1,274,130-1815-234-D
AI6V(+KB6F) 1,163,880-1590-244-D
W6XX(Multiop) 802,530-1446-185-D
K6AYA(+WA6OEC) 761,292-1197-212-D
W6YX(K1KH,N1OO,W2JU, WA6ITV,N7MM,W8ZI,oprs) 684,378-1158-197-D
W3NX(+AD3V) 584,892- 844-231-D
N1AU(+K1CE,WA1YML) 76,077- 237-107-D
WBØHAH(+WA6FUZ,WBØVUJ, WDØs FKG HRV) 19,140- 145- 44-D

Check Logs

Phone

W2HAZ,KN2QWO,W2ZVJ, W3KB,WB4FTU,W4NOS, W5JMN(+WD5HER),N6BCY, WB6RWJ,W6BYB/7,N7AII, K7INM,W7LDJ,WD8DPT, WA9GFR,WD9GJS,WD9HWY, K9KWL,WAØTKJ,WØWUU, W1PWK,W1YG,K2VAH, WB2WVG,K4CHN,WA4BTG, WA4QCY,WB4ZCP,K6FM, VE1ANU,VE3IPR,VE7AJ, DM2BFK,DM2CTF,DM2FBN, DM2GGL/A,DM3XZN, DM4SDA,DM-EA-9278IG, F6BJA,FE7ØZZ,FP8DX,HR1OP, HRØQL,I1HAG,I3MAU, JH3BJN/4,KL7JFV,LA9LO, OH2BAC,OK1JST,OK1MSJ, OK3KFF,OX3AK,OX3RA, OX3ZM,PA3ABZ,PAØNRD, PT2LS,PT7AW,SM2COR, SM5FTM,SM7BBV,SM7RS, SP4KNC,SP6PZB(SP6FAF, SP9FIH,oprs),UA1CQ, UA3DEA,UA3DFV,UA3DGI, UA3DNK,RA3DPD,UA3TAM, UA4HAD,RB5JCJ,UA6LXZ, UA9FDW,UA9OS,UAØADR, UAØLEO,UAØSGL,UB5ABK, UB5DW,UB5EID,UC2OAZ, UK3XAA,UK4UAC,UK5ECV, UK5EDB,UK5IBM,UK7LAF, UK9CAA,UKØAAC,UKØLAK, UQ2DZ,UQ2GDQ,UR2MG, UW6CV,UV3DN,UV3MM, UW3RR,VE1CE,VP2MDW (WA9KUW,opr),VK7UBC(N7RO, opr),YO6LV,YO2BLO,YV5HOA, ZF1SV,ZS6CS,4U1ITU,6Y5GL

CW

WB1CRI/N,W1PWK,W1YG, W2MEI,W2OBX,N3AQV,K3DR, WB3GAV,WB3IXF,N4APK, N4BMN,N4UF/M,WB5UWF, N6HE,W6BYB/7,N7DH,W7GDX, W7TE,WD8OEP,W9CG,W9FSD, W9IJ,KØLD,KAØASU, WØYBV,DK3OI,DM2ADC, DM2BTO,DM2BUI,DM2CBB, DM2CCM,DM2CGB/A, DM2DGE,DM2GDL,DM2GHL, DM3WMJ,DM4OM,DM4REE, DM4YSL,DM4YUL,DM5ZDL, HA5DJ,HA5KKK,I2XXR, JH3BJN/4,LA2SQ,LZ1UA, LZ2JF,LZ2KRR,LZ2LP,OH3TQ, OK1AWH,OK1GS,OK1IAR, OK1MWN,OK1ND,OX3OB, PA3AAY,PAØPLM,PAØGN, PT7AW,PY1VT,PY4WWW, SM2COR,SM5BDV,SM6APB, SM7BVV,SM7BYP,SM7TV, SMØDSF,SMØIX,SP1PEA, SP2GIR,SP3HRN,SP5AGU, SP5CBA,SP5GKN,SP7HOV, SP9PDF,UA1AWO,UA1NBD, UA1OCT,UA1ODK,UA1TAC, UA1TCO,UA1WAP,UA1ZCW, UA1ZWW,UA3ADC,UA3DFV, UA3DHH,UA3DJK,UA3DLD, UA3DNK,UA3ECL,UA3LCC, UA3PBE,UA3SY,UA3TAM, UA3WBA,RA3YCP,UA4AY, UA4FAT,UA4HFR,UA4LAS, UA4WAW,UA6AVD,UA6AWE, UA6EAE,UA9AAB,UA9ADG, UA9CAM,UA9FCA,UA9HBJ, UA9MAX,UA9MY,UA9OBG, UA9OEK,UA9OFB,UA9UOB, UA9WOD,UA9XAB,UA9YBY, UAØAAK,UAØACJ,UAØBBR, UAØCCR,UAØIAW,UAØJDD, UAØLI,UB5DAF,UB5JGM, UB5LAY,UB5MCS,UB5QCP, UB5UBU,UB5UR,UB5VY, UB5UWB,UB5WCT,UB5ZCT, UG6GAF,UK1ABC,UK2AAG, UK2BAT,UK2GJL,UK3AAC, UK3RAD,UK5JAF,UK5SAG, UK6GAO,UK9CAE,UKØACQ, UL7GAA,UL7PBI,UO5OEW, UP2BFH,UP2PAP,UQ2GEI, UW3WZ,UW9VH,VE3AEJ, YO3KSC,YO4ATW,YO4BEW, YU2RTC,YU3DOX,YU3TRI, YU4EXA,ZS6AJS,FE7ØZZ

Disqualifications

W5BJA(W5MYA,opr)

Public Service

Conducted By Robert J. Halprin,* K1XA

A Tale of Two Nets

Yes friends, each time there is an emergency, we have a rerun of that classic film "The Good, the Bad and the Ugly," or at least the audio portion thereof. Recently, the good was the Hurricane Traffic Net on 14,303 kHz, the bad was the Hurricane Watch Net on 14,325. What was the ugly? No, no, not your conductor. The ugly was the intentional interference committed by the lunatic fringe of our fraternity.

George Naftzinger, W4PPC, assisted by Evelyn Gauzens, W4WYR, and others, was the prime mover of the 14,303 net. He was there, day after day, doing a good job of net controling, through Hurricanes David and Frederic. Reportedly, his lungs may be going to Cooperstown. His voice was a calming factor on the frequency, providing the stability that television viewers get from Walter Cronkite or Johnny Carson.

This net was a main link with the Commonwealth of Dominica. W4PPC maintained a regular schedule with J73A (operated by KP2A, J7DAJ and W4UY) at the Red Cross. All sorts of traffic were handled, including information relative to the League's shipment of emergency vhf equipment to the island. The Dominican Republic (not to be confused with Dominica) was also represented by HI8XDJ and HI7XWL. The net continued amidst the Hurricane Frederic emergency, handling a good deal of health and welfare traffic to Mississippi, Alabama and Florida. Of course, this was only one of the multitude of nets activated.

Why focus on 14,303? The reasons are twofold. One, because the conduct of the net was in such sharp contrast to others of its ilk (more later). Two, because of the unique feature of direct National Traffic System liaison. W4PPC emphatically encouraged, promoted and relied upon the system and its operators who were dispatched to 14,303. It was interesting to note that as the days wore on, your typical 20-meter denizen began putting messages into nominal ARRL format. Very educational. Prior to that, NTS operators were accepting traffic in informal form, so to speak, and then making it proper, which is fine.

NTS hasn't really expanded well with the times. For example, Central and South America are the areas most susceptible to communications disruptions, yet little in the way of expansion has occurred. There have been some initial efforts but nothing of substance. The Phase III satellite, as discussed here two issues ago, may be the best bet in this regard. And it's also true that many domestic emergencies have historically lacked NTS tie-in.

Let's be fair. Life is a two-way street. While NTS operators have been guilty of not being aggressive enough in offering their services, at other times they have indeed done so and the result was a cold shoulder by the spur-of-the-moment emergency net control. We were very fortunate, in this case, to have an individual in charge who was astute and enlightened. Another point that bears mentioning is that participation in independent nets by NTS operators, especially in an emergency, does not denigrate NTS one iota. In fact, in the case of the W4PPC congregation, it promoted NTS.

NTS operators have the smarts not to transmit unless required. In an emergency, inconsequential transmissions must be curtailed and net discipline must be maintained. It's a pity that the unchecked hordes of 20 meters (and elsewhere) don't grasp this simple concept. Thus, the people who need to be straightened out probably won't read this. Maybe we ought to print "stay off the air unless needed" on the cover of *QST*, or in "Hints and Kinks." Hams feel a great need to become officially part of the emergency effort, as if bellowing "QRU QRV for all traffic into Oshkosh" will put them in that great dupe sheet in the sky.

This leads back to the Hurricane Watch Net on 14,325 kHz. Does this net have a role? Guess so. Providing storm tracking information and coordinates is a noble *raison d'etre*, especially as a service to Caribbean amateurs who don't have easy access to our mass media. But if that's the case, why was this frequency bumper-to-bumper with talkative Americans, mostly outside the affected areas?

Many letters have been received here protesting the intentional interference inflicted on this well-meaning group. We certainly appreciate the sentiments expressed and it is very important for us to know what the amateur community is thinking. However, use that letter-writing energy more wisely. Send a letter to your congressman. Congress is the one and only group that can increase FCC's budget and enforcement powers, so that jammers can be apprehended.

And now the bad news. It's clear that intentional QRM is often a direct result of inept net controlling (or inept DX operating on a list or DX net). The superiority of the 14,303 operation demonstrated this. Furthermore, are the two or 10 who tune up on the net any more villianous than the 200 who shriek "get a dummy load" or "the frequency is in use, turkey"? A little decorum never hurts. The conclusion of the Labor Day weekend ameliorated the situation. Most of the intentional QRMers went back to work, their prison furloughs expired, or whatever.

Getting back to the Hurricane Health and Welfare Traffic Net for a moment, this net provides the means for NTS to extend its lines of communication into new territory in an organized fashion. W4PPC could be NTS's ambassador of goodwill to independent nets on 20 and 15, which are most concerned with traffic going to the Southern Hemisphere. Detente with these groups is a real possibility.

W4PPC seeks even closer identification with NTS, as a matter of fact. The Hurricane Traffic Net does not fit into the local, section, region and area NTS structure and we are not going back to the Continental Traffic Net concept. But suppose we anoint 14,303 kHz as an official NTS calling/emergency frequency? TCC stations will monitor this frequency for traffic during an emergency, while it could be used during normal times for TCC schedules and NTS confabs. It was said that this frequency was what the Phase III satellite channel will sound like, only without "the bird." The ARRL calling/emergency frequencies in days of yore were a complete flop, but this particular idea may play. This effort works for ARTS (Amateur Radio Telegraph Society); reference their traffic totals in the "Independent Nets" section. Why wouldn't it work, in a limited way, for the growth of NTS?

WANTED — REPEATER CALL SIGNS

When sending in reports for the Public Service Diary, Amateur Radio Emergency Service, Repeater Log, or the like, please indicate the *call sign* of the repeater that was used. Many reports come with indication that "the local repeater" was used during the flood, etc. That doesn't give credit to anybody. Please, include the appropriate call or calls. Public Service events can be easily reported on form CD-157, available from Headquarters.

COMING SOON

QST will chronicle the Hurricane David and Frederic emergencies in feature format next issue. There are as-yet-untold stories out there, though. Please send reports of significant involvement in the emergencies promptly to the Communications Department so that our feature will be comprehensive and representative.

HELP FOR SPELUNKERS

In a recent issue of the *NSS Bulletin*, published by the National Speleological Society, there was an article concerning a cave rescue in Mexico that was hampered by a lack of adequate radio communications. As an active caver and ham, I am writing the ARRL in hopes of preventing future occurrences of this sort.

There is a need for adequate communications at any rescue and especially at cave rescues because of the usual remoteness of the location of the situation. As hams, we all know the limitations of CB radio and unfortunately this service is one of the most commonly used forms of radio communications during cave rescues.

At present, I am compiling a list of all cavers who are hams and would like to be a part of a cave rescue group. I am soliciting such information as name, address and phone number, equipment available and portability of station. Once I have a completed list, I will forward it to the NSS for distribution to the various cave rescue groups around the country. My address is 1711 Fremont, Casper, WY 82601.

I urge my non-caving hams to contact the caving club nearest them and offer their services. The location of the nearest club (or grotto, as cavers call it) can be obtained from the National Speleological Society, Cave Avenue, Huntsville, AL 35810.

As more and more people begin caving each day, the occurrence of cave rescues is increasing. It is imperative, from a resource and human life standpoint, that adequate communications be maintained throughout a rescue. I hope that my fellow hams will help in this endeavor. Good caving and 73. — *Mike Craig, WA4ZVS*

PUBLIC SERVICE DIARY

☐ Cornwall, England — December 30 (1978). When severe winter storms hit this area for a period of

*Asst. Communications Manager, ARRL

several days, RAYNET went into operation, handling communications for the County Emergency Control. G8DZE was the coordinator, assisted by G5VGO, G3XC and others in the area. These stations were scattered throughout the county and were able to provide a county-wide assessment of weather and road conditions. (G3XC)

☐ West Germany — December 31 (1978). The final hours of 1978 saw Schleswig-Holstein's radio amateurs and the DARC repeater network in the northernmost part of the Federal Republic of Germany involved in an improvised but effective disaster operation in the wake of the country's worst snowstorms in memory. Snow and gales flooded the province's eastern coastline, brought snowdrifts of up to 4 meters to roads and railways, interrupted power supplies to wide areas and led to a breakdown in public utilities, flood supplies and, as telephone exchange backup batteries ran down, communications.

In this chaotic situation, DARC's regional representative for Schleswig-Holstein contacted the provincial government's disaster committee and placed amateur operators and the repeater network at its disposal. Primary communications and emergency traffic coordination were passed through DBØZA and DBØXN as well as through DBØXB where local amateurs were called upon to assist the public electric utility to localize and repair downed supply lines. Amateurs with hand-helds were placed at the command center and accompanied helicopters and army tanks.

The Flensburg repeater, DBØSH, near the Danish border, bore the brunt of much of the traffic during the two days of nonstop operations. Two-meter traffic was coordinated through the Kiel 70-cm repeater, DBØUK.

From the early hours of December 31, when the first emergency call went out on the Flensburg repeater, to nightfall on January 1, amateurs could be found in or on snowplows, tanks, rescue vehicles, helicopters, electric company substations, community centers and essentially everywhere that rescue and repair operations were underway. The amateur operation continued into January 2.

Discipline over the repeaters and simplex was exemplary, with nonparticipating stations maintaining radio silence to permit the unhindered passing of emergency traffic. (DL1FL — translated by HB9AJU)

☐ Harrison, AR — January 16. When an explosion occurred at the Allied Telephone Company building, the North Arkansas Radio Emergency Net was activated. Communications were supplied for the police, fire department and hospitals. (W5MYZ)

☐ Port Townsend, WA — February 13. All power was lost when a 7131-foot-long concrete floating bridge sank, bringing down power and telephone lines with it. The Northwest Amateur Monitoring Service assisted as needed. (W7UU)

☐ Powhatan, VA — April 5. WA4ZAJ was asked by a deputy sheriff of the county to contact the family of a destitute woman. W5REC was contacted on the Interstate Net (3985 kHz) and received the priority message to Oklahoma. Within five minutes after the traffic was passed, the woman received a telephone call from her son. (WA4ZAJ)

☐ Barbados — April 13. With the help of 24 amateurs in Barbados and an assist by three U.S. Coast Guard cutters, residents of St. Vincent were evacuated following the eruption of the volcano Soufriere. During a two-week period, the amateurs passed many emergency and welfare-type messages. (W4KFC)

☐ Ottawa, ON — May 28. VE3AUM alerted the U.S. Coast Guard to the position of a sinking sailboat, about 150 miles off the coast of St. Martin. He acted as the go-between, relaying traffic to and from the stricken boat. Through his efforts, a rescue was effected. (VE3BCZ)

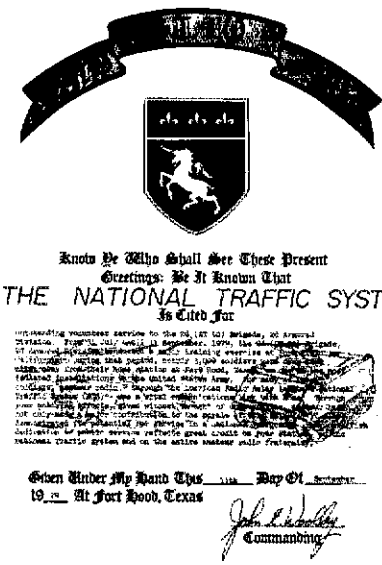
☐ Battle Creek, MI — June 21. Amateur Radio operators in seven states and two countries worked into the early morning to trace the whereabouts of the mother of a hospital patient in this Michigan city. This individual was stricken with phlebitis symptoms, but his mother, who was en route to a retirement home in Florida, was the only one who knew which drugs he was allergic to. The local REACT group in New Port Richey, FL, also pitched in and within four hours of the initial inquiry, the woman was located. (W8CNL)

☐ Lancaster, SC — August 6. Upon receiving a call from W4RSC about an explosion of a chlorine tank at a private pool, WD4BLW and K4PFC activated the Lancaster County RACES group. Communications were handled at the scene (where residents were evacuated) and at the local hospital. (WD4BLW)

☐ West Branch, MI — August 11. WA3SWD came upon an individual unconscious beside his car on I-75. WA3SWD broke into MIDCARS and reported the situation while his wife attempted to revive the victim. The Michigan State Police were on the scene in less than 10 minutes. (WB8GFJ)

☐ El Paso, TX — August 17. A race to get a critically ill infant to the hospital was slowed by severe thunderstorms. Although WA5VXH was a licensed pilot, these conditions forced him to go by car, a distance of 120 miles. He broke into W5YV/R (07/67) and requested escort through the city of El Paso. Through the help of hams monitoring the repeater, he received a police escort and hospital specialists were notified to stand by in the emergency room. The baby was saved. (W5DKD)

☐ Windsor Locks, CT — October 3. When a freak tornado devastated the area, including Bradley International Airport, local amateurs provided communications involving local hospitals, search parties, weather information and health and welfare traffic. The bulk of the communications was handled on WR1ADJ, 19/79; other repeaters were active as well. The Connecticut Weather System (CARWRS), featured in October *QST*, was functioning during the emergency, as was the Connecticut Phone Net on 3965 kHz. WA1UNE, the state Red Cross headquarters station, was active on all frequencies. (W1XX)



Traffic handlers who helped out with the traffic from Fort Irwin, CA, received this handsome certificate from the U.S. Army. See "Communications Service of the Month," this page.

AMATEUR RADIO EMERGENCY SERVICE REPORTS

☐ Northwestern AL — April 11. Members of the Muscle Shoals ARC, notably WB4WRO and WD4HCM, were activated from e.d. headquarters after tornado warnings were issued. Other members traversed the roads, relaying weather conditions, storm damage, locations of downed trees and power lines and related emergency conditions. Contact was also maintained with the Alabama Emergency Network. (WA4JYU, SCM AL)

☐ Brownsville, TX — May 31. A power outage affected the entire city after an explosion at the main power plant. WD5CLI put his 2-meter rig into operation at the Brownsville police station. His son, WD5CLD, made his mobile unit available at the Public Utilities Board grounds. (W5KR, SCM NTex)

☐ Cheyenne, WY — July 16. A tornado touched down on Cheyenne, causing widespread havoc. Members of the Northern Colorado ARC, using the Fort Collins repeater, relayed health and welfare traffic and arranged for portable generators and other needed equipment. A communications link was established by WØGOW with the Red Cross. (WØGUG, Asst. Director, Rocky Mountain Division)

☐ Southwestern IN — July 26. Torrential rains fell, with floodwaters in some areas over six feet. WC9AAP, the State of Indiana EOC, was activated and placed on 24-hour duty. Flood-emergency traffic was handled for three days. Several 2-meter nets were also activated in order to gather damage information for the state. (W9NBQ)

☐ Lakeland, FL — August. A call was received by the Florida Mid-day Traffic Net from WB4BFT/MM2, asking for assistance for a 98-foot schooner with four people aboard that had run aground in the Bahamas. WB4AID patched in the Coast Guard and help was sent. (WB4FVV, EC Polk County).

☐ Regina, SK — August 8. A severe storm, with winds up to 117 km/h and at least two tornadoes, left a path of destruction across Regina, from the northwest suburbs through the downtown area and into the industrial and suburban area. Local amateurs were involved in providing 2-meter fm communications and assisting with traffic control and surveillance of downed power lines. (VE5WM, SEC SK)

☐ Whatcom, WA — August 26/27. Two emergencies necessitated the Whatcom Co. Emergency Services to request help from the Whatcom ARES. In the first, communications were needed in a search for a lost mountain climber on Mt. Baker. In the second, the ARES mobilized after a plane crash. Communications were delivered in a smooth and efficient manner. (WA7QQN)

☐ ARRL Section Emergency Coordinator Reports. For August, 34 SEC reports were received, denoting a total ARES membership of 15,957. This is a 13 percent decrease as compared with reports received last August (39) and a 1-percent decrease in ARES membership (16,131). Sections reporting were Alta, Ariz, Del, EBay, EMass, Ind, Kans, KY, Mar/NF, Mich, Mo, Mont, NFla, NTex, Ohio, Okla, Ont, Orange, Org, Que, SV, SDgo, SF, SJV, SBar, Sask, SFla, SNJ, STex, Va, Wash, WVa, WPa, Wisc.

COMMUNICATIONS SERVICE OF THE MONTH

From July 31 until September 11, the 2d (ST LO) Brigade, 2d Armored Division, conducted a major training exercise at Fort Irwin, CA. During that period, nearly 3000 soldiers were over 1200 miles away from the home base, Fort Hood, TX, on one of the most isolated installations in the United States Army. For many of these soldiers, Amateur Radio — specifically MARS and NTS — was a vital communications link with home.

Nearly 300 messages were handled by MARS and NTS over a five-week period. The volume was heavy but operators volunteered their time freely and enthusiastically. Amateur Radio not only made a major contribution to the morale of this Brigade, it also demonstrated its potential for service in a national emergency.

On behalf of the soldiers of the Brigade, I would like to thank the volunteer operators in both systems for their dedication to public service and especially those stations in Southern California and Texas who handled the bulk of the traffic. It is not possible for me to recognize all of the hundreds of operators who relayed messages for us, or even for me to know who they all were, but the few we did get to know typify the amateur fraternity's dedication to public service. We thank them all. — *Colonel John E. Wooley, Commander*

REPEATER LOG

According to reports received between August 20 and September 20, the following repeaters and simplex frequencies were involved in the delineated public service events.

	Weather Emergency	Criminal Activity	Medical Emergency	Vehicular Emergency	Search and Rescue	Fire	Miscellaneous	Total
VE1CBC						1		1
WR3AKJ				1				1
WR4ACY		2	1	29	1		5	38
WR5ABA				1				1
WR5ABY		3		22				25
WR5ADP				1				1
N5DD				5				5
WR6BAQ			1					1
KH6IAA						1		1
WR7AFJ		1						1
W7WGW			2	7	2			11
W8KW					1			1
W8WUX			1					1
K8ZIS			1		1			2
WB9DFD			1					1
WR9AQM				1				1
WRØAFT	1							1
WRØAOO		1						1
WBØSBH	1							1
Simplex						2		2
TOTAL	2	7	7	67	5	4	5	97

NATIONAL TRAFFIC SYSTEM

The most important matter before the house is the National Traffic System interface with the Hurricane Traffic Net on 14,303 kHz, which is documented in the lead to this column. NTS expansion is paramount, whether it involves satellite communication, cooperative efforts with independents or the use of specialized modes of communication.

August Reports

Area Nets

1	2	3	4	5	6	7
EAN	93	3634	39.1	.901	95.0	
CAN	93	1803	19.4	.511	97.4	
PAN	62	1834	29.6	.711	99.6	
Region Nets						
1RN	119	882	7.4	.415	90.1	95.7
2RN	155	1015	6.5	.619	89.9	100.0
3RN*	31	193	6.2	.466	100.0	96.8
4RN	124	1355	10.9	.430	73.8	98.9
RN5*	31	474	15.3	.435	96.8	99.2
RN6	93	1432	15.4	.420	91.0	100.0
RN7	124	735	5.9	.579	99.1	100.0
8RN	122	1180	9.7	.410	89.7	100.0
9RN	93	897	9.6	.484	93.0	99.2
TEN*	60	441	7.4	.323	73.1	98.4
ECN	62	154	2.5	.276	69.9	84.9
TWN						98.9
TCC						
TCC Eastern	177[1]	1006				
TCC Central	209[1]	1021				
TCC Pacific	119[1]	810				
Sections[2]	6038	27,589	4.6			
Summary	7300	46,455	6.4			
Record	6290	39,017	16.4			

*Incomplete report

[1]TCC functions not counted as net sessions.
[2]Section and local nets reporting (202): ASN (AK), AENB AEND AENJ AENK AENM AENS (AL), ARN SCARC (AR), ATEN HARC SWN (AZ), NCN NCN/VHF NCTN SBARESN SCN SCN/RTTY SCN/VHF (CA), CN CWN HNN (CO), CN CPN NVTN WESCON (CT), DEPN DTN (DE), AFPN DEN FMTN FPON FPTN GN MEN NFPN PEN QFN QFNS SBEN SCARES SERC PARC SWFTN TPTN (FL), CGAVHFN GCN GTN WGARES (GA), I75MN IACN TLCN (IA), IMN MTN (ID/MT), ILN (IL), ICN ITN QIN (IN), KPN KSBN KWN QKS QKS-SS (KS), 2STN 4DARES 5DARES KNTN KTN KYN MKPN SEKEN (KY), LAN LRN LSN LTN (LA), EM2MN EMRI EMRI/SS EMRIPN HHTN NEEMN RIEMTN WMN WMPN (MA/RI), MEPN MTN MMN WRIN (MB), MDD MEPN (MDC), AEN MPSN PTN SGN SPSN (ME), MACS MITN MNN QMN UPN (MI), MSN MSPN MSSN RARES (MN), ACE MEOW MON NEMOE (MO), APN (MR/NFLD), MSN MTN (MS), NCSSBN (NC), WNN (NE), GSFM NHN (NH), MCN NJN NJPN NJSN NJVN OBTTN SPARTN UCETN (NJ), NMRRN SWN (NM), BAVTN NYPON NYS OCTEN WDN (NY), BN BNR BRTN EOTN ONN OSN OSSBN TSRAC (OH), NOKSN OAN OLZ ONON OPEN OTWN STN (OK), CMN LN ODN OLN OPN OSN (ON), 16/76N ARESTN BSN JCARES PDXAARES (OR), EPA EPAEPTN PFN PTTN WPA WPA2MTN WPAPTN (PA), WQV/UHF (PQ), CMN CN CNN SCSSBN (SC), NJQ SDMN SDN SDSSBN TN TSEWN (SD), SATN SPN (SK), MCRN RCARESN TNN WTVHFN (TN), DFW TEX TTN (TX), BUN UCN (UT), SVEN VN VNTN VSBN VSN (VA), WARTS WSN (WA), BEN BWN WIN WNN WSBN (WI), HBN WVMDN WVN WVNN WVPN (WV).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP.
7 — % REP. TO AREA NET

Transcontinental Corps

Welcome W6SX and K7MC back to the TCC ranks. TCC-C(E) certificates were awarded to WN4KKN N4MD W4ZJY K5GM K5MC N5TC N5TS W5RB W5KLV WA5RKU N9TN W9CXY W9DND W9NXG KØCW WØAM WØHI and WAØTNM.

1	2	3	4	5
TCC Eastern	192	92.2	2617	1006
TCC Central	217	96.3	1992	1021
TCC Pacific	124	96.0	1614	810
Summary	533	94.8	6223	2837

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (August); Eastern Area (N2YL/K3KW, Directors) — W1s KX NJM, WA1ZAZ, K1s BA EIR GN SSH XA, W2s CS CQB FR GKZ MTA RQ, K2NY, WA2s ICB SPL, W3s FAF PQ, WA3WQP, K3s KW NGN, W4s JK MEE SQQ UQ, WA4CCK, WB4PNY, K4s BKX KNP, N4s KB NK, W8PMJ, WB8WTS, K8KMQ, VE3s GOL SB. Central Area (W5GHP/W9JUJ, Directors) — W4ZJY, WD4HIF, WN4KKN, N4MD, W5s KLV RB, WA5s BHF INJ IQU RKU, WB5s MVR OXE SDD YDD, WD5HHK, K5s GM MC, N5s TC TS, W9s CXY DND HOT JIJ JUJ NXG, N9TN, WØs AM HI, WAØTNM, KØCW, AFØO. Pacific Area (W5KH, Director) — N8s MR NG, W5KH, N6s GW PZ WP, W6s EOT OA SX VZT, WA6UAZ, W7s AK DZX EP GHT LYA VSE, K7s HLR MC, ADØA, KØs BN DJ TER, VE7ZK.

Independent Nets (August 1979)

1	2	3	4
Amateur Radio Telegraph Society	30	1473	373
Central Gulf Coast Hurricane	31	340	2305
Clearing House	30	271	514
Empire Slow Speed	29	80	315
Hit and Bounce	31	303	531
Hit and Bounce Slow	17	29	137
IMRA	27	332	831
Mission Trail	31	248	1299
New England Novice	30	91	237
North American SSB	26	314	278
Washington Region PON	17	19	309
West Coast Slow Speed	31	130	297
20-Meter ISSB	27	404	560
75-Meter ISSB	30	724	1014
7290 Traffic	50	1199	2875

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Public Service Honor Roll August 1979

This listing is available to amateurs whose public service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SCM). Please note maximum points for each category: (1) Checking into cw nets, 1 point each, max. 30; (2) Checking into phone/RTTY nets, 1 point each, max. 30; (3) NCS cw nets, 3 points each, max. 12; (4) NCS phone/RTTY nets, 3 points each, max. 12; (5) Performing assigned NTS liaison, 3 points each, max. 12; (6) Delivering a formal message to a third party, 1 point each, no max.; (7) Handling an emergency message, 5 points each, no max.; (8) Serving as emergency coordinator or net manager for the entire month, 5 points, max. 5; (9) Participating in a public service event, 5 points, max. 5. This listing is available to Novices and Technicians who achieve a total of 40 or more points.

257 WB5MVR
206 K4TH
191 WD4COL
166 WB5LBR
144 W7VSE
143 WB5YDD
137 WD8KZX
135 KB6FR
134 WB1DXR
127 N4CCT WD4HIF WB5NKC
123 WA3PXA W5KLV
121 WA2SPL
118 N2APB K2GCE
WA2MFV 115 WA3WQP 113 KB2KW AF2L N4NK 112 W2MTA WA4PFK 111 W2RQ W7GHT 110 AA2H W9JUJ 109 WB2RMI WA2UWA WB8YDZ AFØO 108 KA1BMJ VE3GT WA3NAZ WA4VKD WA8HGH WD8LRT 107 W6NTN WD8NKA
106 WB2TOM K8AAZ 105 WA6UAZ K8DL WB8YRY 104 W4OGG KB4OZ K4SCL WA5RVT 103 WA4YIU 102 W2SQ W2ZOJ N8ABA W8VPW 101 WB1CPF WA1TBY 100 VE3JIR WB6PVH AF8V 99 W2UEZ K4DZM WD5AHH 98 KA1BJY
WA4JDH WA8GMT 97 WB3JYZ KK4M KB4N K5OWK 96 VE1WF VE3GOL VE3KK K5TL 95 AA3S 94 WB5LAT WAØTNM 93 WD4LUG W5HMR N5TC 92 WB2PJU K7GXZ 91 W4NWM KØPIZ 90 WA2MVQ WA4CCK 89 KA1CC
KA4BGX WB5NKD N6AWH 88 WB1BYR N3AKC 87 W4CKS KB8GC 86 WB2IDP N5EK WD5EUE AA5J W6DXL 85 N4WA AK5N W8GGX 84 WA4LGT W5DTR W5VMP KL7HSF W9NXG 83 WD4AWN K6YD 82 VE3DPO K3ORW 81 WA2ZJP KM4G W7EP 80 K4BKX W4FMN
W4ZJY WB5MMI N6GW KØEZ 79 N2CR W4ANK WD4EPO W4JK WB8OMC 78 WB5CIT 77 K3JL W4NQL 76 AD2X K4JGW K4XE WD8KBW 75 K1BSO KB2GT WD5HHK WA7IHS 74 VE5AE WD5KBK W6OA WB6QBZ W7LNE WBØZBJ 73 WB4FVV WA5QFD N5RB 72 WB2HDU W5RB
71 WA1LOU N3AQV WA4EYU WA4NBE WB8SIQ 70 W1RWG WA2EQW VE5WM WB7OEX 69 AF1L K2VX WBØHOX 68 W2XD WB4ZOJ 67 WA4AAV K4VHT WD5JYI W9HOT 66 VE3JRT K4EV WD4LYV WD4PDK WD5IVD KA5Q WA8QAF 65 W2PZL KB4OW W9IEM 64 K5ARH WB5SDD WB8WTS W9XD
63 WB1FZX WA1MJE AJ5F W7LYA W9JIJ 62 K1EIC WD4CNQ WA4CNY W6JXK NØAHA KAØAIT WØOPX 61 W1TM KA2BGX/N N8CW WB8MTD WØFT WØOTF 60 WB1EMU N3EE WB8SYR WDØBMR 54 WD4CFZ/T 48 WB2KTR/T 45 KA2DBN/T WB2RMJ/T 44 KA2CNN/T 42 WB2SQW/T 41 KA9BSF/N

Brass Pounders League August 1979

BPL Medallions (see April 1979 *QST*, page 77) have been awarded to the following amateurs since last month's listing: WA3NAZ, WD4HIF, K9PNG, VE3KK.

The BPL is open to all amateurs in the United States, Canada and U.S. possessions who report to their SCM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL form.

1	2	3	4	5	6
W3CUL/4	840	1086	1691	29	3646
WØWYX	58	1383	398	985	2824
WB5MVR	926	322	1259	215	2722
WA2SPL	237	437	648	25	1347
WAØHJZ	0	599	321	412	1332
K5OWK	428	184	520	11	1143
W9JUJ	3	530	517	4	1054
WA3WQP	3	506	506	26	1041
KA9CPA	7	701	71	253	1032
WA4JDH	1	473	449	2	925
W4MEE	7	442	417	36	902
W3VR/4	291	179	327	5	802
W5KLV	16	408	316	45	785
W7VSE	12	364	308	43	727
K8AAZ	0	372	323	17	712
WB4PNY	1	377	305	8	691
KB6FR/3	181	178	245	65	669
WD4HIF	6	320	271	53	650
WAØAUX	19	233	393	2	647
WA6UAZ	9	325	303	4	641
W8VPW	17	293	304	21	635
WB5NKC	96	158	334	31	619
WA4VKD	0	333	243	19	595
W7DZX	26	258	279	2	565
W4JK	0	292	254	1	547
WA2MFV	16	259	247	24	546
K8DL	25	220	245	40	530
WB2TOM	10	237	269	10	526
WA4CNY	4	210	257	46	517
W5TI	4	296	200	14	514
WA4CCK	2	270	239	1	512
K4TH	16	230	145	117	508
K1BCS	116	107	270	13	506
WA3ATQ	272	120	108	1	501
WØBMA	90	163	193	55	501
WA2MFV (April)	87	200	259	47	593
Multioperator stations:					
K3NSN	488	2200	488	335	3511
K8DDG	1287	72	1295	4	2658
K8KRG	475	32	492	15	1014

BPL for 100 or more originations plus deliveries:

W1TN	180	WD4COL	114
WB4MMK	136	WAØLLQ	114
WD4EPO	130	N3AQV	109
K5OUK	127	WA2MFV	103
WB5YDD	124	W3BBN	101
WA2MVQ	116	WB5NKD	101

1 — CALL
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DEL.
6 — TOTAL

Operating News

Conducted By John F. Lindholm,* W1XX

Where Have All the Control Operators Gone?

"Joe?"

"Yeah."

"Do you still need CR9?"

"Yeah."

"14,240 . . . CR9AJ . . . he's working districts . . . right now he's on the 5s . . . good luck."

"Thanks."

The above was a complete QSO from beginning to end. Nothing edited. Where? On the local DX information repeater, of course.

Now for the $64,000 question. What's missing? Signal reports? Nope, not required. Ah ha . . . location? Naw, both stations know each other. Oh, I know. Contact wasn't long enough to qualify for Rag Chewers Club. Sorry, guess again.

Let's stop kidding around. We all know what's missing . . . It's call signs. You know, those funny combinations of letters and a number issued by FCC (or DOC[1]) that identify who you are. The FCC regs call for their use at the beginning and end of each single transmission or exchange of transmissions, and a minimum i-d at least once every 10 minutes.

[1]Canadians see DOC General Radio Regulations, Part II, par. 51 (1).

Where have all the control operators gone? The above contact should have been scrubbed. When a control op monitors contacts as above, does it make him a fink to request the stations to properly identify? How about official observers? When offending stations are known, send them an OO report. Anyone can tactfully remind other stations of their i-d obligations. How about editors of repeater, DX or contest clubs producing more editorial comment on proper i-d-ing. Why? Because it's the regs, that's why. Our very operating privileges may rely upon our compliance.

Dialing up the autopatch also raises some questions of proper identification. When the autopatch is brought up, the repeater becomes, in the eyes of the FCC, just another amateur station conducting third-party traffic. Proper i-d would require signing your call sign at the beginning of the contact, and both calls (the repeater's and yours) at the end of the autopatch. For example, "WA3NLO repeater from W1XX."

Not only are we subject to proper identification, but also, of course, to third-party logging requirements. As a convenience to the repeater control operator, it is a good idea to sign both calls during the time that the autopatch is on, so that any automatic tape logging will pick it up; this helps satisfy some of the repeater logging requirements.

Historically, amateurs have taken great pride in following the regs religiously. We sometimes go to almost ridiculous lengths to follow them. The alternative is chaos. The slightest deviation, e.g., the above QSO, points us in that direction. With self-discipline, the assistance of concerned friends, diligence of control operators, and cooperative notices of OOs, we *can* supervise ourselves. With amateurs such a tightly knit group, peer pressure can work for the freedom of all. Violations such as improper i-d-ing must not go unnoticed. We are our brother's keeper.

The alternative to shaping our own destiny is to have it done by the great monitoring station up in the sky. No doubt, the big stick of the FCC is a necessary deterrent. People *are* losing their licenses. Just because a violation may occur on 2 meters does not mean the FCC monitoring station is out of range. The issuance of citations is not always made public, but the penalties can be severe. Let us not comply because of some great fear, but rather let's follow the rules of the spectrum road to preserve the service for the enjoyment of all.

SCM ELECTION NOTICE

To all ARRL members in the Eastern New York, Eastern Pennsylvania, San Diego, South Dakota, Louisiana, North Carolina, Virginia, Pacific and Maritime-Newfoundland sections: You are hereby solicited for nominating petitions pursuant to an election for section communications manager. A petition, to be valid, must contain the signatures of five or more full ARRL members residing in the section concerned. Photocopied signatures are not acceptable. No petition is valid without at least five signatures *on that petition.* No member may sign more than one petition. It is advisable to have a few more than five signatures on each petition.

Petition forms (CD-129) are available on request from ARRL headquarters but are not required. The following form is suggested:

(Place and date)

Communications Manager, ARRL
225 Main Street, Newington, CT 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. (Signature . . . Call . . . City . . . ZIP/PC . . .)

SCM candidates must have been a member of the League for a continuous term of at least two years and

*Communications Manager, ARRL

5-Band WAS

Awards issued February-September 1979

505 W1JR
506 WØSI
507 WA4NUR
508 WD4HVZ
509 N6JM

510

510 WB6SRU
511 WB7FDE
512 AE7P
513 W2HG
514 W2DEC
515 WA1WRI
516 YS9RVE
517 WA5GDC
518 KB9BG
519 WB4YBF

520

520 WB7RKE
521 WA4OBO
522 W7ULC
523 CT2AK
524 N7US
525 WD5HGN
526 K5EJC
527 W2JVU
528 W8CBA
529 WA7ZZY

530

530 WA6OTV
531 WA4DKH
532 WA5KQD
533 W3MDJ
534 WDØCHO
535 K9GBN
536 N4OW
537 WD8NBD
538 WA7WLT
539 AE5H

540

540 W9JR
541 WA7LQQ
542 K5CM
543 WD4PVT
544 N7AET
545 WA2WCW
546 WA4EBN
547 N8AG
548 W7QMU
549 WB3JUK

550

550 W5FGO
551 WA1TMN
552 W4RAL
553 JA9BE
554 W9NGA
555 W1LJ
556 WB8TXG
557 K8GG
558 WD8KKF
559 WD4HLK

560

560 WB6RIU
561 K9VTD
562 W4KHW
563 WB3DUG
564 AA4D
565 W6TDO
566 K3ICP
567 G3TJW
568 LU1BR
569 KØSE

570

570 AB5J
571 D4CBS
572 VE4SW
573 W1CHA
574 6W8DY
575 K6HNS
576 K4JYS
577 WBØTUJ
578 W1VH
579 WBØRSC

580

580 K8TV
581 K4ONF
582 W7CUJ
583 WØWP
584 I3MAU
585 WA6OUA
586 W7BG
587 KB5DQ
588 K8UQ
589 I6FLD

590

590 K3SWZ
591 W1BIH/PJ2
592 AF7S
593 WA4YWR
594 W7QK
595 WA4NUL
596 W4CEB
597 WA5ZOZ
598 WBØKIG
599 KL7AF

600

600 WB3CIW
601 K3CQY
602 WD8CZA
603 W6MFC
604 KB5DZ
605 WDØCQI
606 WD5CCM
607 ON4UN
608 WB5WFQ
609 W5VD

610

610 KE4I
611 WB7QID
612 WA2UUK
613 WA2CIO
614 K4UEE
615 WBØUKB
616 TI2BEV
617 AA4RP
618 W5OHF
619 K5QQ

620

620 W4PTW
621 W6TGI

a licensed amateur of General class or higher (Canadian Advanced Amateur Certificate) immediately prior to receipt of petition at Headquarters.

Petitions must be received at Headquarters on or before 5:30 P.M. Eastern Local Time, December 7, 1979.

Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on January 2, 1980, returns counted February 19, 1980, and SCMs elected as a result of the above procedures will take office April 1, 1980.

If only one valid petition is received for a section, that nominee shall be declared elected without opposition, for a two-year term beginning April 1, 1980.

If no petitions are received for a section by the specified closing date, such section will be resolicited in April *QST*, and an SCM elected through the resolicitation process will serve a term of 18 months.

Vacancies in any SCM office between elections are filled by appointment by the communications manager.

You are urged to take the initiative and file a nominating petition immediately.

John F. Lindholm, W1XX
Communications Manager

REPEAT SCM NOMINATING SOLICITATION

Since no petitions were received for the Colorado section as a result of notices in April and May *QST*, nominating petitions for this section are herewith resolicited. See the above notice for details on how to nominate.

SCM ELECTION RESULTS

The following were elected for two-year terms of office beginning January 1, 1980.

Uncontested:

Alaska	Fred S. Wegmer, KL7HFM
KS	Robert M. Summers, KØBXF
NM	Joe T. Knight, W5PDY
WMA	Arthur Zavarella, W1KK
DE	Roger E. Cole, W3DKX

W1AW NOTE

The complete W1AW winter operating schedule appears in October *QST*, page 111. A W1AW schedule also is available on request from ARRL headquarters. Please enclose an s.a.s.e. See the "Contest Corral" section of *QST* for times and dates of W1AW Code Proficiency Runs.

MEET YOUR SCM

How to follow the 38-year SCM record of Frank Baker, W1ALP, ain't easy, but Eastern Massachusetts folks got a good one in Richard "Rick" Beebe, K1PAD, who took office in January. Originally from New London, CT, Rick resides in Billerica. An engineering project manager for Hewlett-Packard, Rick holds double-E degrees from Northeastern and Southern Methodist. Formerly an EC and net manager, Rick holds DXCC, WAS and WAC, and enjoys contests and handling traffic. Rick is veep of the Billerica ARS. An avid follower of the perennial second-place Boston Red Sox, Rick has been known to hit a few for the Heavy Hitters Traffic Net softball crew. First licensed in 1960, K1PAD holds an Extra Class license and is a Life Member of ARRL. QST

	OSCAR 7			OSCAR 8			SOVIET RS		
DATE (UTC)	*Ref. Orbit*	*Time (UTC)*	*Long. W.*	*Ref. Orbit*	*Time (UTC)*	*Long. W.*	*Ref. Orbit*	*Time (UTC)*	*Long. W.*
1 Nov.	22692	0029:35	73.1	8444A	0040:15	55.7	4436	0126:15	103.7
2 Nov.	22705	0023:52	86.7	8858AJ	0045:19	56.2	4448	0130:57	106.4
3 Nov.	22717	0023:12	71.6	8872J	0050:22	57.4	4460	0135:40	109.1
4 Nov.	22730	0117:29	85.1	8886J	0055:26	58.7	4472	0140:22	111.8
5 Nov.	22742	0016:49	70.0	8900A	0100:29	59.9	4484	0145:05	114.6
6 Nov.	22755	0111:06	83.6	8914AJ	0105:33	61.2	4496	0149:48	117.3
7 Nov.	22767	0010:27	68.4	8928X	0110:36	62.4	4508	0154:30	120.5
8 Nov.	22780	0104:44	82.0	8942A	0115:40	63.7	4520	0159:13	122.7
9 Nov.	22792	0004:04	66.9	8956AJ	0120:43	64.9	4531	0003:32	95.2
10 Nov.	22805	0059:21	81.5	8970J	0125:47	66.2	4543	0008:14	97.9
11 Nov.	22818	0152:38	94.1	8984J	0130:50	67.4	4555	0012:57	100.7
12 Nov.	22830	0051:58	78.9	8998A	0135:54	68.7	4567	0017:40	103.4
13 Nov.	22843	0146:15	92.5	9012AJ	0140:57	69.9	4579	0022:22	106.1
14 Nov.	22855	0045:35	77.4	9025X	0002:48	45.4	4591	0027:05	108.8
15 Nov.	22868	0139:52	91.0	9039A	0007:51	46.6	4603	0031:47	111.6
16 Nov.	22880	0039:12	75.8	9053AJ	0012:55	47.9	4615	0036:30	114.3
17 Nov.	22893	0133:29	89.4	9067J	0017:58	49.1	4627	0041:13	117.6
18 Nov.	22905	0032:49	74.3	9081J	0023:02	50.3	4639	0045:55	119.7
19 Nov.	22918	0127:06	87.8	9095A	0028:05	51.6	4651	0050:38	122.5
20 Nov.	22930	0026:27	72.7	9109AJ	0033:09	52.8	4663	0055:20	125.2
21 Nov.	22943	0120:43	87.3	9123X	0038:12	54.1	4675	0100:03	127.9
22 Nov.	22955	0020:04	71.1	9137A	0043:16	55.3	4687	0104:46	130.6
23 Nov.	22968	0114:21	84.7	9151AJ	0048:19	56.6	4699	0109:28	133.4
24 Nov.	22980	0013:41	69.6	9165J	0053:23	57.8	4711	0114:11	136.1
25 Nov.	22993	0107:58	83.2	9179J	0058:27	59.1	4723	0118:53	138.8
26 Nov.	23005	0007:18	68.0	9193A	0103:30	60.3	4735	0123:36	141.5
27 Nov.	23018	0101:35	81.6	9207AJ	0108:34	61.6	4747	0128:19	144.3
28 Nov.	23030	0000:55	67.5	9221X	0113:37	62.8	4759	0133:01	147.3
29 Nov.	23043	0055:12	81.1	9235A	0118:41	64.1	4771	0137:44	149.7
30 Nov.	23056	0151:29	94.7	9249AJ	0123:44	65.3	4783	0142:26	152.4
1 Dec.	23068	0048:49	78.5	9263J	0128:48	66.6	4795	0147:09	155.2
2 Dec.	23081	0143:06	92.1	9277J	0133:51	67.8	4807	0151:52	157.9
3 Dec.	23093	0042:26	77.0	9291A	0138:55	69.1	4819	0156:34	160.6
4 Dec.	23106	0136:43	90.5	9304AJ	0000:45	44.5	4830	0000:53	133.1
5 Dec.	23118	0036:04	75.4	9318X	0005:49	45.7	4842	0005:36	135.8
6 Dec.	23131	0130:20	89.0	9332A	0010:52	47.4	4854	0010:18	138.5
7 Dec.	23143	0029:41	73.8	9346AJ	0015:56	48.2	4866	0015:01	141.3

Have you listened to OSCAR 8 yet? It is available to anyone with a good-quality, 10-meter or 70-cm receiver. To track it, you'll need an OSCARLOCATOR and the above reference-orbit information (also available on W1AW bulletins). It orbits the earth every 103 minutes; the morning and evening passes occur at approximately the same times each day. Decoding the telemetry from the beacon is a simple matter using the ARRL OSCAR telemetry forms, available from Hq. for an s.a.s.e. When you return it, we'll send you a colorful OSCAR 8 QSL card.

To keep abreast of the latest developments, tune in to the regular phone and cw bulletins over W1AW, AMSAT bulletins transmitted around 29.490 MHz on Mode A, 145.960 MHz on Mode B, and 435.160 Mode J, during O 7 and O 8 reference orbits, and AMSAT nets (East Coast at 0100 UTC Wednesdays; Mid States at 0200 UTC; West Coast at 0300 UTC, all on 3850 kHz lsb); (international net at 1800 UTC Sundays on 14,280 kHz usb).

Notes

1) The times and longitudes are for the satellites' first equator crossing each day, which is called the reference orbit.
2) Due to spacecraft problems, OSCAR 7 will not be maintained in any specific mode.
3) All Monday orbits are reserved for QRP use only. Use a maximum of 10 watts erp. Wednesdays are reserved for special experiments. Schedule O 7 experiments through AMSAT, O 8 experiments through ARRL. At no time exceed 10 W erp using Soviet RS.
4) The OSCAR 7 Mode B and OSCAR 8 Mode J transponders invert signals. Upper sideband into the uplink becomes lower sideband on the downlink.
5) O 7 progresses an average of 28.737760° W. per orbit in a period of 114.944773 minutes. O 8 progresses an average of 25.803378° W. in a period of 103.218492 minutes. RS period is 120.3894 minutes. RS progresses 30.227° W.
6) O 8 modes of operation are Mondays and Thursdays — Mode A. Tuesday and Friday — Mode AJ. Saturdays and Sundays — Mode J. Wednesdays are for experimental use on Mode A or J or recharge Mode D.

Spacecraft Frequencies

Spacecraft	*Uplink*	*Downlink*	*Beacon*
O 7			
Mode A	145.850-145.950 MHz	29.400-29.500 MHz	29.502 MHz
Mode B	432.125-432.175 MHz	145.975-145.925 MHz	145.972 MHz
O 8			
Mode A	145.850-145.950 MHz	29.400-29.500 MHz	29.402 MHz
Mode J	145.900-146.000 MHz	435.100-435.200 MHz	435.095 MHz
RS			
Mode A	145.880-145.920 MHz	29.360-29.400 MHz	29.401 MHz

Further information on the radio amateur satellite program can be obtained free of charge from ARRL hq.

Further information on the radio amateur satellite program can be obtained free of charge from ARRL hq. OSCAR locators for O 7, O 8 and Soviet RS are available in the new *Satellite Communications* package at your dealer or direct from ARRL; $4.75 U.S., $5.50 elsewhere.

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By Tom Frenaye,* K1KI

NOVEMBER

1-2

YL Anniversary Party, October *QST*, page 113.

1-7

HA-QRP Contest, October *QST*, page 113.

2

ARRL Frequency Measuring Test, (0300 and 0600 UTC, November 3), October *QST*, page 113.

3-4

ARRL November Sweepstakes, October *QST*, page 96.

6

West Coast Qualifying Run (W6OWP prime, W6ZRJ alternate), 10-35 wpm at 0500Z, November 7. The run takes place at 9 P.M. PST on November 6. Frequencies are approximately 3590/7090 kHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid, and send to ARRL for grading. Please enclose your full name, call (if any), and complete mailing address. A large self-addressed envelope will help expedite your award/endorsements.

7

W1AW Qualifying Run, 10-35 wpm at 0300Z, November 8 (10 P.M. EST, November 7). Transmitted simultaneously on 1.835 3.58 7.08 14.08 21.08 28.08 50.08 147.555 MHz. The complete W1AW schedule of code practice and bulletins appears on page 111 of October *QST*, or send an s.a.s.e. to ARRL for a copy. Other details are the same as in the November 6 listing.

10-11

OK-DX Contest, October *QST*, page 113.

International Police Association Contest, October *QST*, page 113.

Delaware QSO Party, sponsored by the Delaware ARC, from 1700Z November 10 until 2300Z November 11. DE stations send serial number, signal report and county. Others send serial number, signal report and ARRL section or country. DE stations score one point per QSO, multiply by total number of ARRL sections and DX countries for final score. Others work DE stations only, count five points per QSO, multiply by total sum of counties worked per band, per mode. Suggested frequencies: Phone — 1815 3900 7275 14,325 21,425 28,650; cw — 60 kHz from the low end of each band and 1805; Novices — 3710 7120 21,120 28,120. If you work all three counties and want WDEL Award, send two 15¢ stamps and address label. Send s.a.s.e. for results. Mail logs by December 15 to Stephen J. Momot, K3HBP, 14 Balsam Rd., Wilmington, DE 19804.

17-18

ARRL November Sweepstakes, phone, October *QST*, page 96.

24-25

CQ World-Wide DX Contest, cw, October *QST*, page 113.

26

W1AW Qualifying Run, 10-35 wpm at 2100Z (4 P.M. EST). See November 7 for more details.

DECEMBER

1-2

ARRL 160 Meter Contest, this issue page 91.

EA-DX Contest, phone from 2000Z Saturday through 2000Z Sunday (cw Dec. 8-9). Non-EA stations will try to contact the most EA stations in every zone and with as many EA districts as possible. Only single-operator category: 80-10 meters. Transmit signal report plus serial number starting with 001, N.A. to EA QSOs are worth 2 points. Only one QSO with each station per band valid. A minimum of 100 points for score consideration. Multipliers are each EA district, per band. Call CQ EA. Log QSOs, date/time(Z), bands/stations, control numbers, QSO points and note new multipliers. Usual summary with call, name, address and declaration. Postmark no later than Feb. 15 and sent to the URE International Contest, Box 220, Madrid, Spain.

Alexander Volta RTTY DX Contest, sponsored by the SSB & RTTY Club of Como and the Associazione Radioamatori Italiani, from 1200Z December 1, until 1200Z December 2. Use 80-10 meters. Contacts with your own zone (RTTY Exchange Points Table available for s.a.e. and IRC) count two points each, except those with your own country do not count. Otherwise use EPT to figure point value. Forty-meter QSOs count double; eighty-meters triple. Multiply by sum of countries worked on all bands for final score. Add 1000 bonus points for each I/IS/IT contact. W/VE/VK call districts count as separate countries. Exchange serial number, signal report and EPT zone. Separate log for each band. Awards. Logs must be received by January 20. Mail to A. V. RTTY DX Contest Committee, c/o SSB & RTTY Club, P. O. Box 144, 22100 Como, Italy.

North Carolina QSO Party, sponsored by the Alamance ARC, from 1900Z December 1 until 0100Z December 3. Suggested frequencies: Phone — 3900 7270 14,290 21,390 28,590; cw — 3560 7060 14,060 21,060 28,060; Novice — 3720 7120 21,120 28,120. NC stations send signal report and county. Others send signal report and state, province or country. NC stations multiply total QSOs by total of states, provinces and countries for final score. Others multiply QSOs by number of NC counties worked. NC mobiles multiply final score by number of counties operated *from* for additional points. Logs must show signal report, band, mode, time (UTC), exchange. Multiops list all operators. Awards. Mail by January 10, 1980 to: Alamance ARC, Inc., 2822 Westchester Dr., Burlington NC 27215.

Connecticut QSO Party, sponsored by the Candlewood Amateur Radio Assn., CARA. The time will be from 2000Z December 1 to 0200Z December 3 with a rest period from 0500Z to 1200Z December 2. Phone and cw are considered to be the same contest. Send QSO number, RS(T), ARRL section for out-of-state stations or CT county for CT stations. Stations may be worked once on each band and on each mode. To score, out-of-state stations multiply total QSOs by the number of CT counties worked (maximum of eight), CT stations multiply total QSOs by the sum of ARRL sections and provinces. Additional DX contacts count for QSO points but only one DX multiplier overall is allowed. W1QI, the club station, will be operating cw on the odd hours and ssb on the even hours and counts as 5 points (each band, each mode). Novice contacts count 2 points each and OSCAR contacts count 3 points each. Suggested frequencies are cw, 40 kHz up from the bottom of each band; ssb, 3927 7250 14,295 21,370 28,540; Novice, 3725 7125 21,125 28,125. Out-of-state portables and mobiles operating in CT are requested to identify themselves as such, as are CT mobiles operating in other counties. Awards (minimum of 5 QSO points). A Worked All Connecticut Counties Certificate will be awarded to each station working all CT counties. Logs must show category, date/time (Z), stations, numbers, bands, QSO points and claimed scores. Enclose a large s.a.s.e. for results. Logs must be postmarked by Jan. 2 and sent to CARA, c/o Skip Paulsen, W1PV, 19 Westview Dr., Danbury, CT 06810.

5

West Coast Qualifying Run, 10-35 wpm at 0500Z, December 6 (9 P.M. PST December 5). See November 6 for more details.

8-9

ARRL 10-Meter Contest, this issue, page 91.

EA-DX Contest, cw, see December 1-2 listing.

HA-DX Contest, sponsored by the Hungarian Radioamateur Society from 1600Z December 8 to 1600Z December 9. Classifications: single op, single band; single op, multiband; multioperator, multiband (club stations classify for this category). All bands 80 through 10 meters, cw only. Call TEST HA (HAs will call TEST WW). Exchange RST and serial starting with 001. After their signal report HA stations will transmit a two-letter code corresponding to their location (county) as follows: BA BP BE BN BO CS FE GY HA HE KO NO PE SA SO SZ TO VA VE ZA. Each HA contact counts a point. The same station may be worked just once on the same band. Each different HA county worked counts as a multiplier on each band. Usual logs/summary plus declaration. Awards. Report promptly to the Radio Amateur League of Budapest, H-1553 Budapest, Box 2, Hungary.

VU2-DX Contest, sponsored by the Bangalore ARC and VIT Museum, from 1200Z December 8, until 1159Z December 9. Single operator only, 40- and 20-meter cw. VU stations work anyone; others work VUs only. Exchange signal report and serial number. North and South American stations multiply by three for final score. Europe, Africa and Australia multiply by two. Mail by December 31 to The Convenor, Garden City Contest 1979, Visvesvaraya Industrial and Technological Museum, Kasurba Road, Bangalore 560001, INDIA.

13

W1AW Qualifying Run, 10-40 wpm, at 0300Z December 14 (10 P.M. EST December 13). See November 7 listing for more details.

22-23

Teenage Amateur Radio Contest

HA5 DX Contest

27

W1AW Qualifying Run

29-30

ARRL Midnight Special

JANUARY

1

Straight Key Night

12-13

ARRL VHF Sweepstakes
ARRL CD Parties
3.5 MHz YU-DX Contest
International Island DX Contest

26-27

REF Contest, cw
CQ 160M Contest

FEBRUARY

1-10

ARRL Novice Roundup

16-17

ARRL DX Competition, cw

MARCH

1-2

ARRL DX Competition, phone

*Assistant Communications Manager, ARRL.

Station Activities

A-1 OPR ✕ EC ✕ DXCC ✕ RCC ✕ WAS ✕ STM ✕ OES ✕ OTS ✕ NM
SCM ✕ ARES ✕ OVS ✕ SEC ✕ OBS ✕ TCC ✕ OO ✕ NTS ✕ WAC ✕ CP ✕

CANADIAN DIVISION

ALBERTA: SCM, S. T. Jones, VE6MJ — SEC: VE6XC. Net manager (APSN): VE6AFO. Net manager (ACWN): VE6BBL. VE6BLV has moved to Comox BC. VE6PA is reported to be in hospital and we wish him a speedy recovery. VE6RM was heard on the air from Jasper, but apparently was having trouble with the antenna. VE4IM and VE7AQC were Edmonton visitors this month. VE6DD and VE6MJ are taking off on vacation on Labour Day weekend. Traffic: VE6BBL 37, VE6CHK 20, VE6ABC 17, VE6QN 8, VE6XD 6, VE6EO 5, VE6MJ 4, VE6CMN 2, VE6WV 2.

BRITISH COLUMBIA: SCM, H. E. Savage, VE7FB — Well, sorry about missing a couple of months. Closed the shack up 27 June for Vernon and the Dogwood annual meeting of QCWA. Vernon gang sure did a bang up job to entertain us all. End of July found us at the Okanagan International Hamfest at Gallagher Lake some 175 amateurs signed in with their families. In the meantime, our Asst. Vice Director, VE7ZK, held down the traffic and also put into service his giant home brew final using 450 TH's. Much larger then solid state devices. VE7COA took over as Asst. Manager BCEN and reports good summer net. VE7YG, Net Manager, had thousands of forest fires to attend to this dry summer. VE7ARB worked OA4ARB on 15 meters and later had an eyeball QSO with him in Vancouver. The local group had a successful exhibit at our annual fair PNE, but as usual short of operators. Traffic: (August) VE7ZK 208, VE7COA 62, VE7FB 13, VE7BLO 3, (July) VE7ZK 155, VE7COA 44, VE7FB 20, VE7DFY 11. (June) VE7ZK 107, VE7COA 46, VE7FB 25.

MANITOBA: SCM, Peter Guenther, VE4PG — Asst. SCM: VE4JP. SEC: VE4TR. STM: VE4RO. NMs VEs 4TE NM VJ IZ AGB. By October, all nets will be back on a full schedule again. MTN operating 4 days a week in summer did fill the bill, and is now on at a daily basis, with new net controls. The Manitoba Morning Net very seldom missed a day all year and has been a welcome addition to all those that required an outlet in the morning. The evening phone net has of course proven to be a must for years, and it as well is serving a useful purpose. The cw slow net will again be on a regular schedule, and dispite its low QNI in the summer and last spring, it will be there if needed. Hats off to all that kept it all going. VE4TT is now home from a successful operation and doing well. VE4MG is between moving, as well as your SCM. MEPN: QNI 829, QTC 32, Sess 31. MMN: QNI 437, QTC 30, Sess 30. WRIN: QNI 103, QTC nil, 4 Sess. MTN QNI 87, QTC 35, Sess. 18. Traffic: VE4PG 36, VE4TE 27, VE4AEJ 15, VE4QJ 15, VE4JA 14, VE4LB 12, VE4ID 11, VE4NE 8, VE4ACX 7, VE4AED 6, VE4NM 6, VE4HA 4, VE4AAD 3, VE4FK 3, VE4GB 3, VE4DE 2, VE4DP 1, VE4HK 1.

MARITIME-NFLD: SCM, Aaron D. Solomon, VE1OC — A/SCM: VO1FG. STM: VE1WF. SEC: VE1ASW, NMs: VO1JN VE1WF. Silent Key: VE1FT. Hospital VE1ASW VO1BT VO1EF VE4CF/1 Sable Is. made 8500 cont. in 120 hrs. Ops. WB2RLK/1 worked VE4CF/1 on 7 bands. QSL info. 30 Mackie Bay, Winnipeg, Man R2Y 1V7. Congrats. VE7BTV St. Paul's Is. DXpedition 15 Sept. VE1CR/1, 75 OMs & YLs attended Mini-Hamfest Sackville Aug. 4/5. All enjoyed same. Congrats VE1s NZ JU SH. 50 Moncton Amateurs part. in Lobster Car Rally. K1BCS rpts. VE1BIO, VE1BIP enjoyed tour of Maine. SONRA manned Signal Hill Station for Tourist PR. NCS. Nfld Net for summer incl. VO1AE VO1FN VO1FG. Recent visitors Hfx. Incl. VO1JN and VO1FG. "Ham Ceilidh '80 — The Gathering of the Hams" Sydney, Cape Breton, N.S. Labour Day week-end 1980. Net traffic: APN Sessions 31, QNI 112, QTC 36. Traffic: VE1WF 220, VE1LCR/RO 36, VE1RI 31, VE1OC 12, VE1XF 8, VE1AUL 5, VE1BSE 4, VE1KR 2, VE1YO 1.

QUEBEC: SCM, Harold Moreau, VE2BP — SEC: VE2DEA. In great number, Hams from the Montreal area turned up for the following: The VE2TA picnic, the Burlington Hamfest and the RAQI convention. New amateur VE2GBF, will join the Happy Gang soon. VE2TD is back on VE2BG repeater with the code practice. Also doing a fine job with his newsletter. Felicitations aux nouvelles stations entendues depuis quelque temps. Traffic: VE2FJ 24, VE2EKC 22.

ONTARIO: SCM, Larry Thivierge, VE3GT — SEC: VE3APK. STM: VE3GOL. Recently I had the pleasure of visiting and operating the Bancroft Centennial, XJ3TBC and it was fun. The station was located in an old house in the center of town and had been renovated by the Club for use during Centennial week. The station, open to all, drew many visitors and there was always a member of the Club on hand to explain the many interesting facets of Amateur Radio. The station worked over 1300 contacts and many very attractive certificates were issued. The Bancroft ARC with a total membership of ten, under the direction of president VE3KFA, are to be congratulated for the excellent job they did in promoting Amateur Radio. It shows just what a Club can do, regardless of size, when everyone works together. In order to raise funds for a two-meter rig for white-caner and friend VE3GCS, VE3JPL pedalled his bike from Toronto to Peterboro, a distance of 100 miles, all uphill. The trip, dubbed, "Ride for Friendship" took eleven hours to complete. VE3KDT using auto-patch, provided progress reports. Anyone wishing to sponsor VE3JPL are requested to contact him. OVMRC Inc. provided communications for the RA Yacht Club Regatta held on the Ottawa River. Participating were VE3s FN FSN LAR KLX GYP and FHC. Regretfully I announce that VE3TL has become a Silent Key. Our SEC reports that Red Cross officials favourably impressed with Amateur Radio communications between Canada and Dominica during Hurricane David. VE3KK came in first for the section in the New York and Zero district QSO parties. VE3JIR has been appointed Assistant Manager for OSN. VE3EWD, longtime NM of the OPN has been appointed OES. Any clubs wishing information on emergency communications or the role they can provide in the Amateur Radio Emergency Service (ARES) are urged to contact the SEC, VE3APK. Traffic: (Aug.) VE3GOL/3 414, VE3JIR 228, VE3KK 163, VE3GT 141, VE3ISW 125, VE3DPO 114, VE3EWD 80, VE3SB 62, VE3GFN 51, VE3HGJ 45, VE3HCS 37, VE3JRT 37, VE3GJG 35, VE3EHL 34, VE3GNW 27, VE3BVG 22, VE3EBC 22, VE3JRO 20, VE3APK 17, VE3IMR 16, VE3CYR 14, VE3DVE 14, VE3IFP 14, VE3DUK 12, VE3EST 11, VE3GCE 11, VE3ANJ 9, VE3JHE 6, VE3FHZ 5. (July) VE3JRT 87, VE3AWE 24, VE3CYR 12, VE3GFV 6.

SASKATCHEWAN: SCM, Norm Waltho, VE5AE — SEC: VE5WM. NMs: VE5HG VE5DC. The Saskatoon ARC were very successful doing the communications for the Summer Games. The Regina ARA did communications on the recent tornado that went through the city. With winter upon us now, the amateurs in the province are keeping their ears close to the repeaters for anyone that needs any help. The RARA 2-meter net at 0330Z daily has been in full swing with a fair representation from the south part of Sask. The VE5ESK repeater was hit by tightning in Aug. and is now back in service again. SPN for Aug: 640 QNI 40 QTC; SATN for Aug: 355 QNI, 29 QTC. Traffic: VE5AE 19, VE5HG 16, VE5WM 9, VE5QI 8, VE5OL 4, VE5NJ 1, VE5TT 1.

ATLANTIC DIVISION

DELAWARE: SCM, Roger E. Cole, W3DKX — SEC: W3PQ. STM: W3QQ W3WD. PSHR: N3AKC 88, K3JL 77. PSHR: N3AKC 85. I was glad to eyeball as many Hams as the wheelchair permitted at the Delmarva Hamfest, and to make Field Day Awards as follows: John Thompson Memorial Trophy (Single xmitter) 1st State ARC 1352 pts., W4JG Memorial Trophy (multiple xmitter) Del. ARC 6034 pts., VHF trophy DARC 195 pts. XYL of W3FEG won the 1st prize, a 220 mtr xcvr at the Hamfest. Welcome to KL7JEQ, retired Air Force Recruiter, to the New Castle area. WA3RTX is improving at Memorial Div. in Wilmington. Aug. Traffic: DEPN: QNI 51, QTC 1. DTN: QNI 351, Tfc 60. Traffic: W3PQ 237, N3AKC 104, W3QQ 67, W3DKX 47, WB3DUG 35, WA3WIY 35, W3WD 20, K3JL 14, WB3GOI 10, WA3DUM 2.

EASTERN PENNSYLVANIA: SCM, G.S. Van Dyke, W3HK — SEC: WA3PZO. STM: K3NGN. NMs W3VA K3KW W3IAZ WA3WQP. Net Reports: PFN QNI 244, QTC 496; EPAEP&TN QNI 337, QTC 115; AREC (2) QNI 17. BPL: K3NSN WA3WQP & WA3ATQ. PSHR: KB6FR/3 WA3WQP WB3JYZ WB3CAI WB3GDE. OO repts K3NSN. OVS repts W3GOA WA3BJO W3CL N3CP. OBS repts WB3JYZ W3VA W3ID W3CL K3EBZ WB3JZA. NOTE PSHR rules have changed read em. WA3ATQ says an early winter. No reports from some nets! WB3JYZ finding it hard to find time for ham radio. AA3B won home brew nite at PWA! WB3JZA has new 2-m rig and likes how it works in emergencies. N3CP's YF is a sister of KA3ALW, he's hoping for a conversion! WB3GDE temp QRT awaiting new ant. W3ADE now using TenTec OMNI and doing fine. WA3CKA finished WAC & DXCC after 17 years! W3WRE needs some help on her rig, she says she will keep murphy busy while they work! W3EU going to have a yard sale to get renewal money! If you've got any extra bucks send em to HQ for the WRAC, it's gonna cost lots to just save what we got. PFN issued new net cert to KB6FR/3 WB3DXW WB3JYZ WB3FEH & WB3JZA. Recvd many messages from members on vacation, too many to list, TNX. Carbon ARC put on a display at local Hospital Fair. Ops were WB3EPI KA3DGR WB3JYZ WB3JZE & WB3JYY. W3CUL reports finally set up in Fla. Trying to talk XYL into working so I can afford all the nice Hamfests, Flea Markets etc! Net, Repeater and Club papers are still coming in and are excellent! Keep up the good work. Traffic: (Aug) K3NSN 3511, WA3WQP 1041, KB6FR/3 669, WA3ATQ 501, K3KW 411, WB3JYZ 215, W3IPX 211, W3FAF 188, WB3FEH 171, W3VA 102, K3NGN 98, AG3R 85, AA3B 69, WB3JZA 53, N3CP 51, N3CD 41, W3ID 38, W3PD 28, WA3YOE 26, WB3CAI 23, K3EIP 21, WB3GDE 17, W3ADE 10, W3CL 10, WB3GUR 10, WA3VIL 8, K3EBZ 4, W3HK 4, WA3BJQ 3, WA3CKA 2, K3AI 1, W3EU 1, W3GMK 1, W3GOA 1, W3WRE 1. (July) N3CP 6. (June) N3CP 13.

MARYLAND — DISTRICT OF COLUMBIA: SCM, Karl R. Medrow, W3FA — N3AQV made August BPL congrats. WB3GZU continues with a high count. KB3AP tists vacation as a major activity! WA3EOP is currently hiding on two-meters. W3CDQ is getting ready for the QCWA convention in Chicago. WB3JRW did his thing on the outer banks, but kept in touch thru the MEPN. W3ECN made DXCC last July, congrats, and he is having a ball on 3RND Sundays. K1BCS keeps his eye on WA3VPL vacationing in N. Hamp. W3FZV is about set for the new season. N3SJ has been heard on a number of different nets. K3ORW was a busy fellow this month. WB3KDQ is getting into all sorts of things. N3QA says wow to his traffic total of one. Seems like AA3S is subbing for all NCS who are vacationing! W3CDG gets his reports relayed in. WB3CES gets 'em on hf and relays 'em on vhf. WØVJD/3 has been making lotsa deliveries. W3ZNW is regular as clockwork with ARES reports. The tail slate of the PVRC is W3XE, pres.; WB3DNL, vice pres.; N3GB, secy.; W3MR, treas.; W3GRF joins W3FA and W4YE, directors. The AARC ARES group were monitoring flooded roads during David. They have their own clubhouse — purty nifty! Washington's FAR has W2GHK, pres. W3WZN is chairman of the scholarship committee. Six scholarships were awarded this year. W4URL heads up the Widow Assistance Program and does a real good job. With the nets: Net Manager/Time/Frequency Sessions/Traffic/QNI Average. MEPN, AA3S, 6 P.M. local, 3920 kHz, 31/104/18.5. No Toppers. Others were W3ADQ N3AMA WB3BFK and WA2YFM. WR PON: W3DFW, 5:15 P.M. 3905 kHz except Sun. 17/19/18.2. MDC-PON: W3CYY meets Thurs. Hagerstown 2-Mtr Net: WB3GEJ 5/4/15. MDD: W3PQ, 7 and 10 P.M. local, July 62/212/7.2. Top Brass: N3AKC W3QQ and WØVJD/3. August 62/291/9.0. Top Brass N3AKC N3AQV and W3QQ. Traffic: WB3GZU 418, N3AQV 360, W3FA 88, WØVJD/3 86, K3ORW 76, AA3S 64, WB3KDO 45, N3SJ 42, WB3JRW 29, W3FZV 15, W3ECN 14, WB3CES 10, KB3AP 6, W3CDG 5, N3QA 1.

SOUTHERN NEW JERSEY: SCM, Bill Luebkemann, WB2LCC — SEC: W2HOB. STM: WB2LCC. The possibility of a section-wide or state-wide 2-meter net continues to improve as the 145.27 repeater nears it's completion date. For those who haven't heard, this repeater will be put approximately 950 feet high on Channel 29's TV tower in Roxborough, Philadelphia, for a total height above sea level of about 1200 feet. Put together by the folks at Drexel University (including me), with some help from area hams, the repeater should have coverage throughout the section. Remote inputs will be strategically located, if necessary, to improve the coverage in outlying areas. If you have an idea for a remote input site, please let us know. We'll also need local people to maintain the remote inputs, so let us know if you can help. As to the possibility of running a net, the biggest question seems to be when to hold it in the already overpacked evening NTS cycle. The possibility of eliminating late NJN has been discussed, with mixed reactions. The possibility of placing it somewhere else in the evening still exists, at least in the beginning while we are building up the participation. Why not let your suggestions and comments be heard, so the right choice can be made. Traffic: AA2H 174, KB2EV 74, WA2CUW 66, WB2LCC 55, WB2HUV 48, WA4JRP 39, WB2GTW 38, WA3YGZ 36, W4NLC 35, WA2ONW 33, WA2HEB 24, K2UL 23, WA2GTJ 22, N2AXL 18, WA2GXU 18, AA2C 16, WA2OLS 8, WB2AIQ 4.

WESTERN NEW YORK: SCM, Lonnie J. Keller, WA2AOG — SEC: WB2FTX. STM: W2MTA. Congratulations to new OTS appointees WB2RWW and N2ALB. BPL this month to WA2MFV (magic no. 31) and WA2MFU. PSHR to N2APB WA2MFV W2MTA W2ZOJ WA2ZJP KB2GT W2PZL and KA2BGX. Looks like the new format is catching on well! ARATS officers for 1979-80 are WB2JQK, pres.; WB2WUB, vp-treas.; K2QB, secy. WA2ZJP now on low band RTTY. KB2GT has a new Tempo S1T HT. W2ZOJ has updated to a Ten-Tec OMNI-B. W2WSS reports ESS activity quite good for mid-summer, averaging over 10 QNI per session. OCTEN, managed by WA2MFV, is now an official NTS net. N2AYR now Ø in Denver with business. Auburn ARA license classes last winter produced new Novices KA2FFG KA2GMZ KA2FEP KA2FEU KA2FHG KA2FES KA2EPS KA2GCS KA2GGO KA2FEP KA2FET and General N2AYR. Traffic: (Aug) WA2MFV 546, WA2ELD 366, N2APB 309, W2MTA 280, WA2MFU 231, W2ZOJ 189, WA2HSB 136, W2RUF 106, W2PZL 88, WA2ZJP 66, KA2BGX 52, AF2K 51, WB2OMZ 51, W2TZ 42, W2ROF 39, KB2GT 23, WB2OTC 19, WB2NAO 14, WA2AIV 10, K2VR 8. (July) WB2VSJ 30, KB2GT 26, WA2MFU 20.

WESTERN PENNSYLVANIA: SCM, Otto L. Schuler, K3SMB — ASCM: N3FM. STM: W3YQ. SEC: WA3VUP. Ass't SECs WA3LJW & WA3JBQ. NMs: W3NEM W3KUN W3MML & WA3PXA.

Net	Sess.	QNI	QTC	kHz	Time/Day
WPACW	31	340	144	3585	7:00P Dy
WPAPTN	31	436	161	3983	6:30P Dy
WPA2MTN	31	574	121	146.28/88	8:00P Dy
PTTN				3610kHz	6:30 Dy
WPARACES				3990.5	9:00 ASu

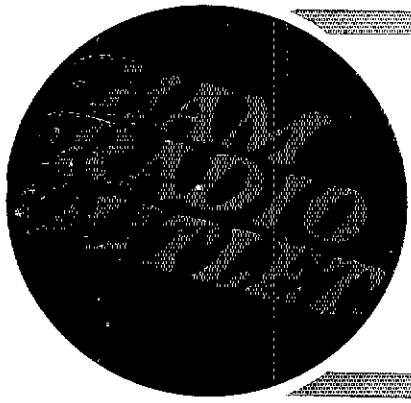
Now that summer season is about over I hope that more operators will participate in ARES and RACES planning and forming local nets in their respective counties. Some county officials must be convinced that the amateur can do the communicating that will be an asset to them in an emergency. This is the only way they can have outside aid if all other means of communication are cut off. All stations having ARRL appointments must report regularly or have their appointment cancelled. A great many in the WPA section do not. The ATA of WPA new officers for 1979-80 are: WA3ZPL, pres.; W3OKK, vice-pres.; W3DHL, treas.; W3NJI, secy ; W3VF W3OJW and WA3WYV, directors. WA3PMI is now a 1st Lt. in the 15th Corps of Eng. at Fort Lewis. He commands the Commun. and Electronics section there. He is a graduate of the Indiana U. of PA. KA3BCX and WB3ITS have advanced to General. N3ANB is Advanced not Extra as reported last month. Traffic: W3EGJ 409, WA3PXA 343, N3FM 157, W3SMV 122, N3EE 118, N3WS 54, W3YQ 51, K3SMB 50, WA3UNX 49, W3MML 35, AC3N 34, WB3JDI 30, W3EXC 26, K3HCT 26, WB3IAB 19, W3RUL 19, WB3GWJ 13, W3TDW 12, W3EXG 11, AF3B 10, W3KUN 10, K3VOV 8, W3SN 8, WB3KAF 4, WB3SKC 4, WB3BOB 3, W3LOD 1.

CENTRAL DIVISION

ILLINOIS: SCM, Edmond A. Metzger, W9PRN — Asst SCM: W9RYU. SEC: W9AES. NMs: WA9KFK, WB9JSR. Cook County EC: W9HPG.

Net	Freq.	Times/Days	Tfc	Sess.
ILN	3690	2330/0300 Dy	307	62
ILL phone	3915	2130 Dy		
NCPN	3915	1200/1700	136	54
IEN	3940	1400 Su	10	4
W9VEY		2-meter	10	4
Mem Stn				

W9ZA is the new QSL bureau Manager for the Ninth Call Area. W9EBO has resigned after 6 years of service. He and his NIDXA helpers made the Ninth Call Area QSL bureau one of the most efficient in the US. The Central Illinois Chapter of QCWA will meet October 27th at the Village Inn at Tonica. AA9R is the new EC for Starved Rock Radio Club area. His assistants are KA9DKF WB9ZFO and K9QOB. KA9ACV WD9HXG and WD9FJF are new General class licensees. WA9FBC is on two fm with an ICOM 230 and Ringo Ranger. WA9UMA is back on the air regularly with an ICOM 230 mobile and fixed. W9HOT reports that the Ninth Region Net had 249 messages during 58 sessions in August. Illinois participation was 100% with W9YCE W9JIJ W9NXG W9LTU and W9HOT checking in. Members of the Sangamon Valley Radio Club (Springfield) established radio link between the Chapter House and the Illinois State Fair



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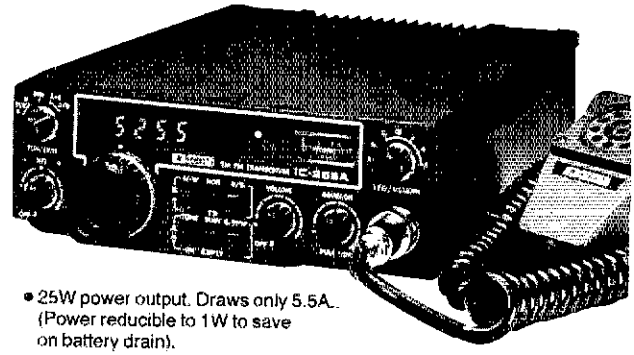

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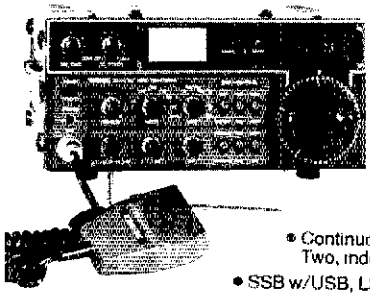

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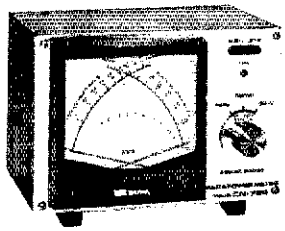

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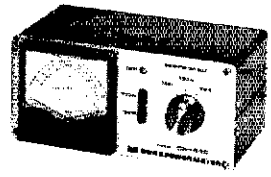
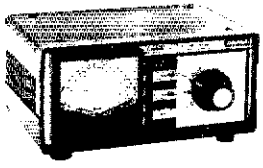
CN-620





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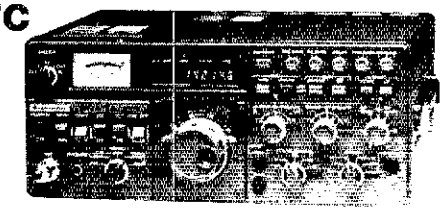

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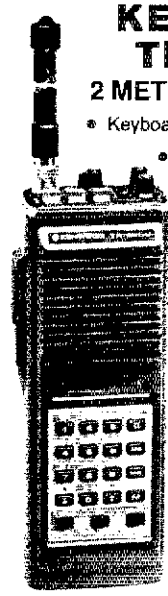

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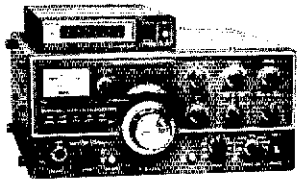

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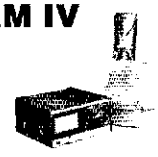

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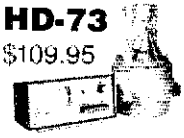

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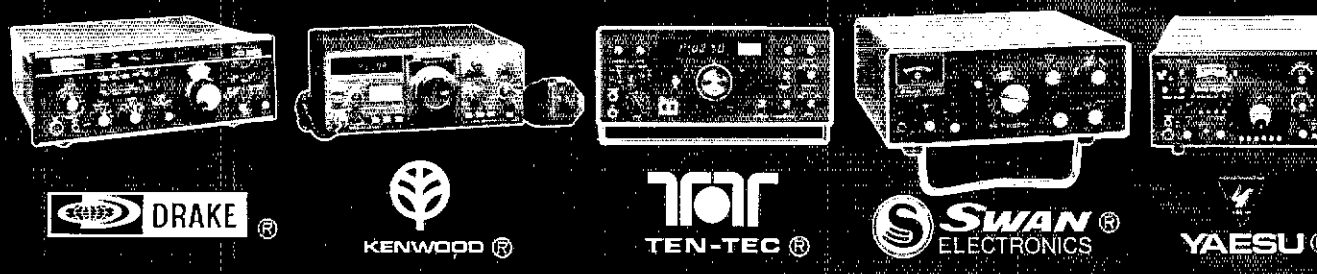

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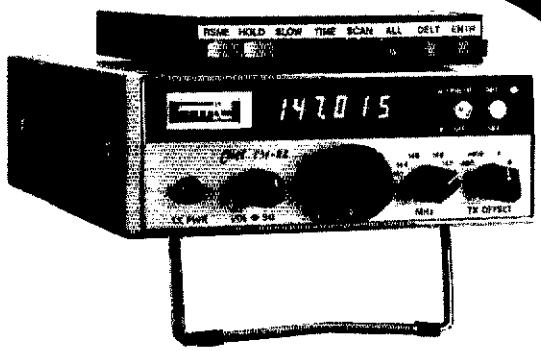

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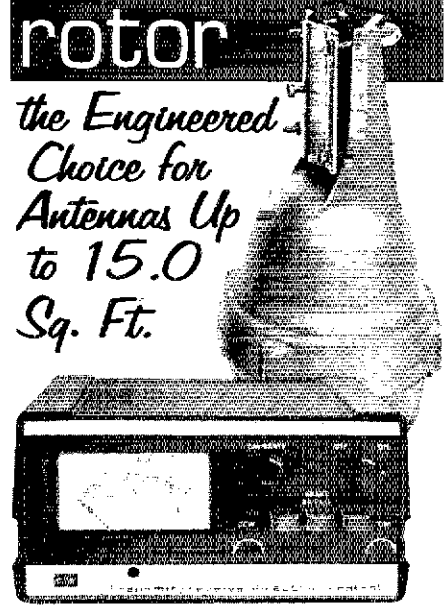

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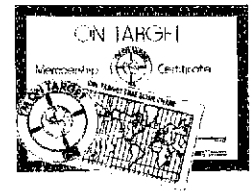

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Grounds First Aid shelters during fair week. W9RLI is now at 1818 Hemlock, Garland TX 75041. He spearheaded the Chicago FM Club for a couple of years. Illinois amateurs were active on the bands during the recent hurricanes and some FB inquiries were passed back to those outside of the bad weather. The CAND report for August states that 847 messages in 62 sessions were scored and W9WMP WA9NHT W9JIJ W9NXG W9HOT and W9YCE participated. WD9DPN was not included in the list of officers of the York Radio in the July issue of QST. We are sorry for this error. W9FKC gave a talk on Morse operation at the August meeting of the Metro Amateur Radio Club. KB9HB has upgraded to Advanced. Our sympathy to the family and friends of WB9DTM who recently passed away and joined the ranks of the Silent Keys. W9LMT worked number 3075 and has now worked all counties in the United States. Traffic: W9JIJ 415, W9HOT 293, W9NXG 288, K9PNG 238, W9KR 204, K9EEA 146, K9BVE 133, N9TN 132, W9KR 108, WB9JSR 97, K9SW 83, K9UN 63, WD9BEX 60, W9YCE 58, W9LNQ 43, W9OBS 42, N9MX 36, KA9ALR 27, W9OYL 27, W9PRN 20, W9HBI 17, WD9EVV 13, W9SXL 1.

INDIANA: SCM, J. M. Kell, W9LTU — SEC: W9UMH. STM: W9JUJ. NMs: OIN WB9UYU, ICN N9AEI. August net reports, time in UTC and Freq. in kHz.

Net	Freq.	Time		QTC	Sess.
ITN	3910	1330/2230 Dy	1901	176	62
QIN	3656	1430/0100/0400 Dy	818	488	93
ICN	3708	0015 Dy	132	44	31
IPN	3910	2130 Dy	1055	82	31

VHF Nets QNI 2950, QTC 54 from 3 reporting nets. Those of you that want to do some long range planning will be interested to know the 1980 ARRL National Convention will be in Seattle, WA July 25 thru the 27th. Nov. and Dec. are the peak of the traffic handling season, so check in and help pick up the traffic for your area. Its terrific training for that emergency that just might happen some day. The term of the present SCM expires in July of 1980. As I, W9LTU, do not intend to run or serve for a second term it is time to consider the selection of a new SCM. Nominations must be in by the first of the year in order to have an election over by the first of July. Nomination forms, CD 129, are available from Headquarters. As the sun spot cycle nears its peak, 6M has come alive again. WA9PKL reported working CO2CI during July. SE Ind Net now meeting at 2330Z on 146.25/85. August Silent Keys were K9IYK and K9FVV. Ind was 100 percent on D9RN again in Aug. Traffic: W9JUJ 1054, WB9UYU 293, W9FC 193, WD9CIS 172, W9QLW 140, WA9QCF 117, W9EI 100, W9XD 63, K9FZX 54, K9WWJ 54, N9AEI 47, W9DLF 36, W9HUF 36, WD9GXW 24, W9PS 20, W9RTH 14, WA9GJZ 13, WA9OHX 11, K9CGS 8, K9DIY 8, W9PMT 8, K9TKE 7, W9WEI 5, W9BDP 1.

WISCONSIN: SCM, Roy A. Pedersen, K9FHI — SEC: W9OAK. NMs: W9AYK WB9ICH WD9EAQ W9DM K9LGU K9EN W9IEM. STM: K9UTQ. Nets, freq, time mgr: BWN, 3985, 1145Z, M-Sa, W9AYK; BEN, 3985, 1700Z, Dy W9IEM; WSBN, 3985, 2230Z, Dy, WB9ICH; WNN, 3725, 2300Z, Dy, WD9EAQ; WIN-E, 0000Z Dy W9DM; WIN-L, 0300Z, Dy K9LGU; Wi exPO, 3925, 1701Z, M-F, WA9NIX. KA9BPF has Tech. Are your antennas in good working order? Winter is coming, no fun to freeze fingers. Are your ARRL appointments up to date? WD9EAQ is Net Manager of Wisconsin Novice Net. Please give her your full support, note the time as 6:00 P.M. local. K9FF/8RI is now in Guyana. KA9EAC has General. WB9JXT has Advanced. KA9CBN has Tech. K4GKD exK9OPF tied the knot, congratulations. BPL to KA9CPA. NTN had 540 stations and handled 32 messages. New from Rhinelander General N9AZI, Tech. N9AZH WD9IMZ. Yours truly wishes to thank all those who sent good wishes and thoughts while being hospitalized for a few days. It was greatly appreciated. Traffic: (Aug.) KA9CPA 1032, W9CXY 238, W9IEM 234, AE9H 195, WB9YPY 123, K9FHI 117, AD9X 109, W9DND 95, W9YCV 93, K9AKG 77, WD9BCM 67, W9DM 65, W9FDY 62, WD9ESZ 54, W9OT 48, K9LGU 47, W9UCL 47, WD9EAQ 43, WB9ICH 43, WD9DHF 44, WB9RRU 41, K9AQ 36, W9AYK 36, WB9WHQ 35, W9UW 33, K9CPM 30, WB9ESM 27, K9VSY 27, W9GKO 26, KB9FA 25, K9HDF 25, AG9G 20, KB9FM 19, N9CP 16, K9UU 14, WB9YPZ 11, WD9AJA 9, K9ANV 9, KA9CYG 9, WA9WYI 6, K9UTQ 5, N9AZI 4. (July) AF9T 43, AG9G 12, WD9BCM 8.

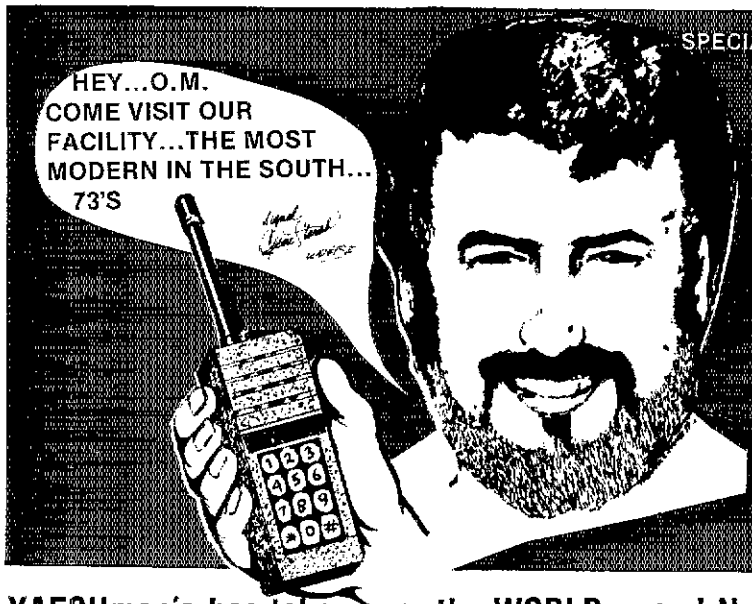
DAKOTA DIVISION

MINNESOTA: SCM, Helen Hayes, WBØHOX —

Net	CDST	MHz	NM	Sess.	QNI	QTC
MSPN-N	12:05 PM	3945	WØOPX	28	503	68
MSPN-E	5:45 PM	3929	KAØAIT	31	582	120
MSSN	5:30 PM	3710	WBØZBJ	25	75	6
MSN-1	6:30 PM	3685	AFØO	31	192	97
MSN-2	10:00 PM	3689	KØPIZ	31	151	59
RARESN	7:30 PM	146.22/82	KØTS	5	119	9

As this is being written, fall is in the air. And I, like everyone else, wonders where the summer has gone. My hearty congrats go to AFØO. For the last 12 months she has had over 60 PSHR points. That's diligence! My question to WDØFFE is this. With two NCS spots on MSN-2, 14 check-ins on TTV/E, 29 check-ins on MSN-2, why did you miss the other two nights? HI! HI! Seriously congrats. NEWS FLASH! WØRUE will be in England in Oct. operating OSCAR. The call will be G5DBD. Minnesota has a new SEC. Due to the resignation of KØHJC, WAØQIT has been appointed Minnesota SEC. His address is 123 South 65 Av. West, Duluth, MN 55807. His telephone number is 281-624-2758. Why not help him by volunteering for EC of your county if there isn't already one? Ohio's loss is Minnesota's gain. Lets welcome K8PE, who at present is moving to the Twin Cities. The new repeaters have begun operation in Minnesota. One, WDØBZU/RPT on 147.72/12 MHz, is in Marshall, and the other, WBØSBH/RPT on 146.625/025 MHz, is in Rochester. Both repeaters are carrier accessed. HB9MQM from Switzerland, was a guest in my home this August, and what fun we had. Thanks to him, I am the proud posessor of the most beautiful medalion anyone could have. The medalion commemorates the 50 birthday of the Switzerland Amateur Radio Union and will be featured on Swiss postage stamps. Also, I would like to receive net reports from all Minnesota ARES nets. Please? Traffic: AFØO 249, WAØTFC 221, KØPIZ 112, WBØHOX 92, KAØAIT 84, WØRIO 48, WDØFFE 65, WAØYVT 64, WØOPX 56, WBØNZB 37, WBØZBJ 35, WDØFRX 23, WØRQJ 23, WDØGPX 20, KØTS 14, KØRMX 8, WBØUKI 5, NØJP 4, KØCSE 2.

NORTH DAKOTA: SCM, Lois A. Jorgensen, WAØRWM — SEC: WBØTEE. OBS: WØDM. OO: WØSRH. NM: WAØCRH. Congrats to the Novices in Park River: WDØERF and KAØFDR son of WBØITD. General, WDØHBU, Cooperstown. WBØWIB call now is KBØIP. WAØWBU is leaving for Wentzville Mo. to Corporate Network Service



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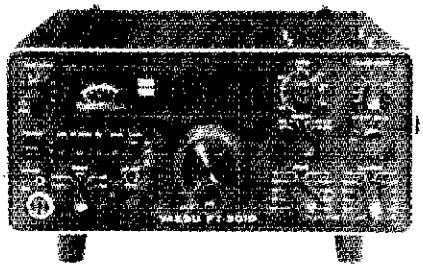

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	List	Special Price
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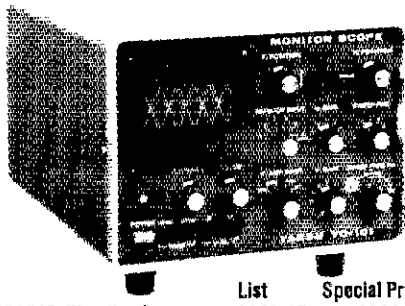

	List	Special Pr
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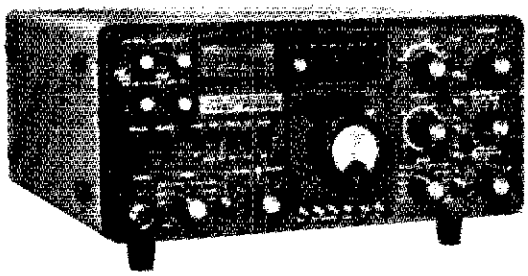

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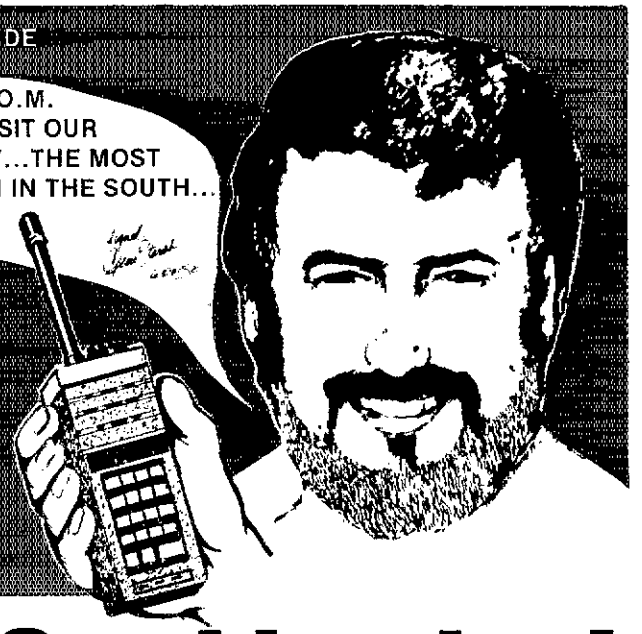

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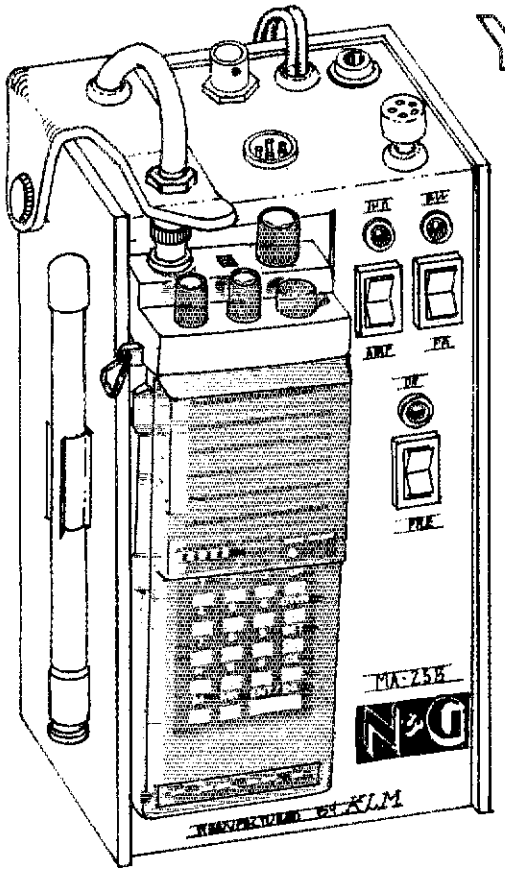

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Dear Santa,

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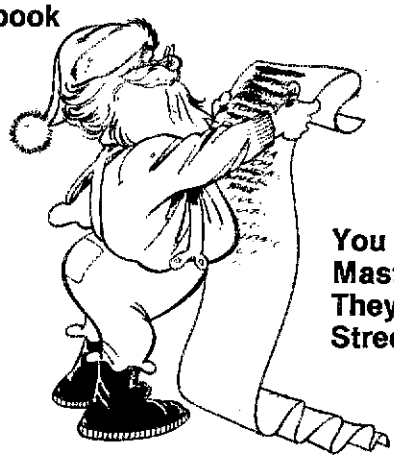
an ARRL 1980 Radio Amateur's Handbook
an ARRL Satellite communications kit
an ARRL Code kit

If you're working on a tight budget this year you could get me:

an ARRL Call Area Map
an ARRL World Map
an ARRL Antenna Anthology book
a NEW Weekend Projects book
a spiral bound Log Book
an L/F/C Calculator

Have a prosperous New Year and

tnx,
Joe Ham, WKØJH



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A full list of publications and prices appear on page 138 of this issue.

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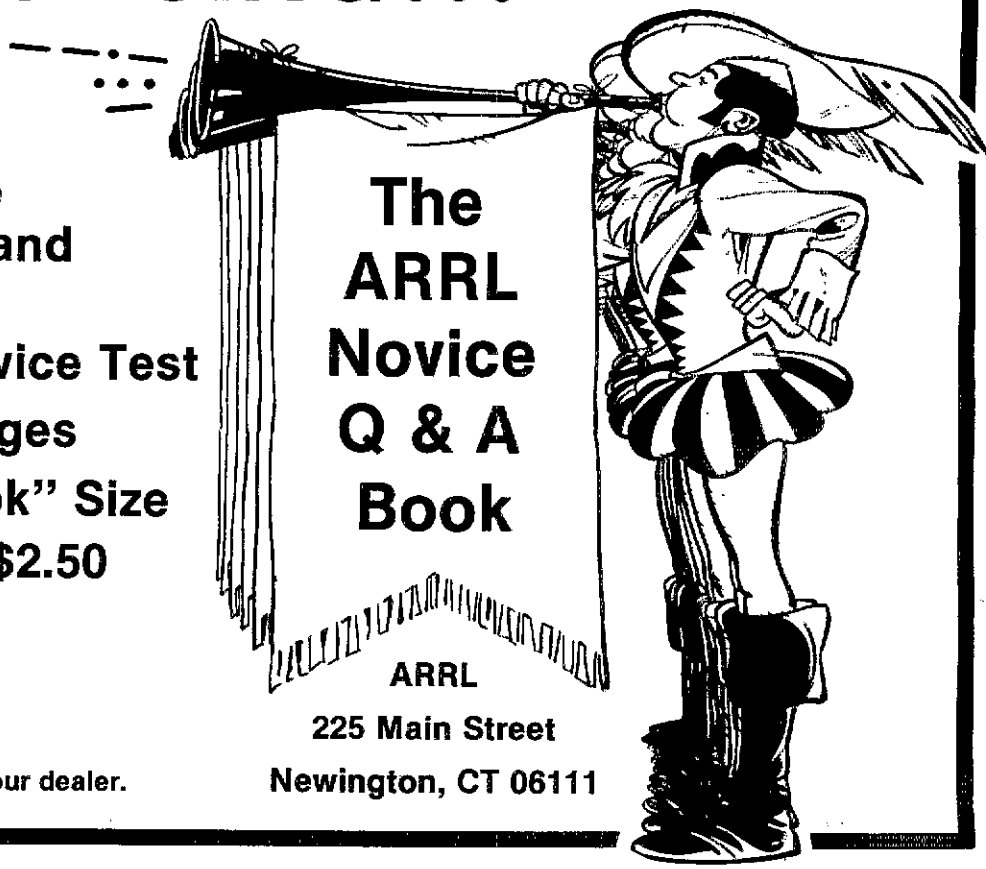

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Supervisor for Continental Telephone Computerservices division. Congrats and Good Luck. WA@WLP is moving to Elgin, YL WX Net will start again this year on Nov. 1 at 1330 UTC on 3996.5 kHz. The NWS will send out info, if you didn't get one let WA@RWM know. K@PYZ Memorial Corn Hamfest was a success with the Meteorologist of Fargo NWS and Chief of 4th region Navy MARS of Great Lakes, IL attending.

Net/ Manager	Freq.	CDT/Time/Dy	Sess.	QNI/QTC
Goose River W@CDO	1990 kHz	0900/Su	4	37/0

Traffic: WA@RWM 50.

SOUTH DAKOTA: SCM, Lydia S. Johnson, W@KJZ — Ass't SCM: W@DVB. SEC: WA@TNM. NMs: W@s HOJ MZI NEO WE, WA@s TNM VRE WD@BMR. Regret to report that W@OXC joined the Silent Keys. Info received from W@NEO Aug. 20th. YL WB@MRL now XYL. KA@BMT upgraded is N@BAO. EC WB@OMF renewed appointment. K@JV by his request cancelled EC and OBS. New EC Lawrence Co. is WA@BWF. N@ACL new trustee for S.F. repeater. WD@BMR made PSHR with 60 points, and WA@TNM 94. Nets: SDN: QNI 72, QTC 57, in 31 sessions; NJQ QNI 636, OTC 30, in 31 Sessions; Morning QNI 572, QTC 88, in 27 sessions; Evening QNI 800, QTC 28, in 31 sessions; TRI-State QNI 52, OTC 4, in 4 sessions. Traffic: WA@TNM 151, WA@VRE 99, K@FRE 97, WD@BMR 88, W@DVB 76, W@HOJ 68, W@KJZ 40, W@MZI 23, W@IG 18.

DELTA DIVISION

ARKANSAS: SCM, S. M. Pokorny, W5UAU — SEC: WD5IRB. NMs: AD5D W5MYZ W5POH WA5ZWZ. Nets freq time/day QNI QTC Mgr: ARN: 3.995, 0030 Dy 1061, 80, AD5D; OZK: 3.760, 0100 Dy, W5MYZ; ASN: 3.745, 0130 TTHSa; SCARC: 28.765, 0230 Su, 0130 M, 83, 4, WD5HJC; APN: 3.937, 1200 M-Sa, 885, 43, W5POH; M-Bird: 3.928, 2230 M-F, 811, 35, WA5ZWZ. End EC WB5SUQ. W5KL newly elected member BofD QCWA. Razorback Chapter QCWA semi-annual meeting Oct. 6th at Harrison. Your SCM attended the Jonesboro and Little Rock hamfests. Would like to hear from some of the clubs in Southern part of State with their meeting dates and places so as to plan visit with them. OBS WA5WWA 1 W5UAU 1 AD5D 2. Traffic: K5AO 96, W5BLP 45, AD5D 35, W5UAU 14, WB5WWA 10, W5KL 4, WB5GQH 3.

LOUISIANA: SCM, S.T. "Tom" Losey Jr., K5TL — Asst. SCM: K5DPG. SEC: WB5IYH. Net Mgrs: N5RB K5ARH WB5LBR WB5IYH. W5YZL and N5EK active on DRN5. The section dropped from 26th in traffic handling to 33rd in 1978. It makes me sad to see such a fine bunch of traffic men and women have to loose grace because the others can't seem to send in an activity report each month. Our section is second to none in expertise and know how and hard work — PLEASE won't you send me a station activity report each month, so I can report it in this column? LARC to begin Novice class in Oct. WB5IOE named Regional Coordinator for RACES. The SELARC is presenting good programs to its members, this month is "Printed Circuit Boards." New time and frequency for RACES and LEN NETS, RACES now at 7:30 A.M. on 3993.5 followed by LEN at 8:30 A.M. Join in these, they are worthwhile and educational. Whatever became of WA5IQU?

Net	Freq.	Time	QNI	QTC	Mgr.
LAN	3615 kHz	7 & 10 P.M. Dy	428	171	N5RB
LTN	3910 kHz	6:30 P.M. Dy	505	156	K5ARH
LSN	3703 kHz	7:30 P.M. M-F	73	25	WB5LBR
LRN	3587.5 kHz	6:30 P.M. Sun	10	10	N5RB
RACES	3993.5 kHz	7:30 A.M. Sun			WB5IYH
LEN	3993.5 kHz	8:30 A.M. Sun			WB5IYH

Traffic: W5GHP 207, WB5LBR 151, K5TL 139, N5RB 126, N5EK 54, N5ES 54, K5ARH 49, W5YN 6, WD5GJB 4, N5BFV 2, WB5IKT 1.

MISSISSIPPI: SCM, E. Ed Robinson, W5XT — SEC: WB5FXA. Appears fall or late summer doldrums are here as reports are minimal this month. My personal apologies to all for my being off the air with antenna problems and I may have missed some reports. DX still flourishing with good band openings. Congrats to K5MK on his receiving 5 Band DXCC. Congrats also to WD5JXT now Advanced. Still need a VHF Freq. Coordinator?? Volunteer?? CGCHN (K5UPN) sess. 31, QNI 2305, QTC 340. MSBN (K5MK(sess. 31, QNI 2019, QTC 204. MTN (K5OAF) sess. 31, QNI 103, QTC 49. MSN (WD5GNR) sess. 10, QNI 31, QTC 6. MN (WA5OPT) sess. 31, QNI 502, QTC 16. Traffic: N5AMK 406, K5OAF 112, W5EDT 92, WB5SNB 29, WA5OPT 22, WB5TRZ 20, KA5AGD 19, K5MK 19, W5XT 14, KA5AFT 8, WB5UPN 6, N5XA 5

TENNESSEE: SCM, O.D. Keaton, WA4GLS — Asst. SCM: WB4PRF. SEC: WB4DYJ. STM: W4ZJY.

Net	Freq.(MHz)	Time(UTC)/Days	Mgr.
TPN		1140 M-F	WA4EWW
		1245 M-F	W4PFP
		0030 T-Su	WB4YPO
		1400 S-Su-H	
TN	3.635	0010 Dy	AF4T
		0400	
TNN	3.710	0000 T-W-F	WA4CNY
TSN	3.635	0000 Dy	
		1330 S-Su	
ETTMN	28.7	0200 W&F	WB4NFI
MTTMN	28.8	0200 T & F	WB4CHS
ETVHFN	50.4	0000 T,Th,F	WA4SXM
	145.2	0200 W & F	WB4DZG
TCDWN	146.16/76	0200 W	WA4BOG
	146.31/91	W	
W = VHFN	146.37/97	0030 Dy	WA4VVX
MCRN	147.72/12	0130 Dy	WB4VXW
RCARESN	147.72/12	0130 Th	W4EBTn

Section Net Certificates have been given to K4AMC WA4BTK WA4CGK WA4CNY W4DDK K4EOH W4FLW KB4G K4JGW K4ON W4OGG W4PIM W4PTI AJ4T N4UC K4VM K4WOP K4XE WB4ZSZ N4ZZ. N4UC is moving to AL, good luck and come back when you can. Many thanks for your services while in our Section. July & August net reports are: cw net reports 116 sessions, 757 QNI, 359 QTC. Phone nets reports 372 sessions, 12927 QNI, 1330 QTC. TLC report functions 17 @ 20%, traffic 23. This year's hamfests are now over so lets start planning for 1980, make them even more successful. W4ZJY says more cw net participation is needed, pick one or more of the section's cw nets and get in there. W4NJR in Spet. QST should have been WD4NJR. Traffic: WA4CNY 517, W4OGG 315, W4ZJY 224, WA4NIF 176, WB4BKF 135, AF4T 101, WB4PRF 72, WA4FMR 70, WB4ZSZ 61, K4JGW 54, WA4GKT 35, K4XE 32, N4UC 29, WA4GLS 22, K4VM 20, W4TYV 17, K4WOP 15, K5FSK 12, W4EBT 11, WB4DYJ 11, WA4WWW 10, W4EWR 6, W4PSN 6, WD4NJR 4, W4VJW 4.

GREAT LAKES DIVISION

KENTUCKY: SCM, Joe Miller, K4DZM — STM: K4HRF.

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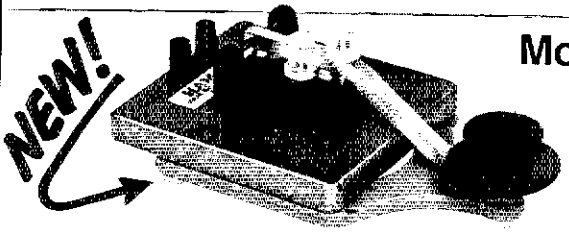

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Model HK-3M

With anti-tip bracket even a heavy-handed key pounder cannot tip. All the features of the HK-3.

$19.95

- Deluxe straight key
- Heavy base — no need to attach to desk
- Navy type knob

CC-3 shielded cable w/plug for HK-3M $3.95

Model HK-1

- Dual-level squeeze paddle

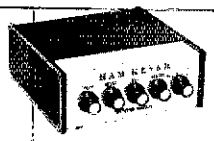
$29.95

CC-1 shielded cable w/plug for HK-1 $4.49

Model HK-2

- Same as HK-1, less base for incorporation in own keyer

$19.95



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- Self-completing dots and dashes
- Curtis 8044 I.C. Keyer Chip

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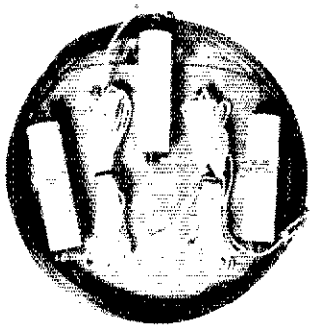
BASSETT HELIUM MOBILE ANTENNAS

The result of nearly two years of continuous development and nearly fifty years of amateur and commercial antenna design and manufacture Bassett helium filled antennas are for the amateur who demands the very best in American made automatic bandchange systems and mobile antennas that are compatible with all transceivers including the new "no tune"units. Trap systems are fundamental dipoles on each band and do not require antenna tuners.



- Helium filled traps impervious to all weather
- Maintains precise resonance and efficiency
- Systems easily handle legal amateur power
- Multiband amateur and MARS with one coax
- Fully compatible with"no tune" transceivers
- Short enough to fit on a small 50'by 100' lot
- Rugged white traps only 1"diameter, 5" long
- Uses your RG-8 or RG-58 coax in any length
- Center"isolator" equipped to accept a PL-259
- Solid Copperweld, stainless, nylon end lines

Multiband Broadside Dipoles

VAC-40/75--$54.50
VAC-20/40--$54.50
VAC-15/20--$54.50
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VAC-15/20/40--$74.50
VAC-10/15/20--$74.50
VAC-10/15/20/40-----$104.50
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- Helium filled for a lifetime of high efficiency
- Completely adjustable to precise resonance
- Power handling capability to 750 watts PEP
- Beautiful white 32" Fiberglass lower section
- Stainless 38" 17-7 tapered top whip section
- Very low weight. VAC-20 weighs 6.5 ounces
- Low wind drag. Holds vertical at high speed
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- Models for all bands with a 2 meter collinear
- Mates with any standard 3/8-24 mobil mount

Single-Band Mobiles

VAC-2 collinear for 2 meter mobile---$29.50
VAC-6, VAC-10, VAC-15, VAC-20---$29.50
VAC-40, VAC-75 (40 and 75 meters)--$34.50

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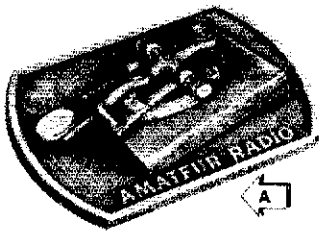
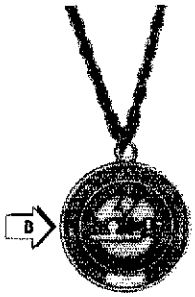


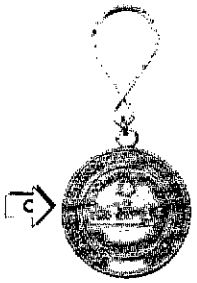
(A) Belt Buckle — Brass key motif in 3-dimensional bronze finish. Size 2¼" x 3½".

Order No.	Each
510	$10.00



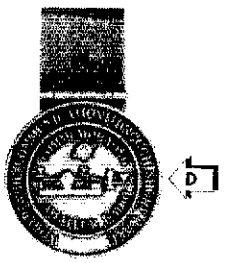
(B) Pendant — Straight key design in 3-dimensional bronze. 1½" diameter.

Order No.	Each
505	$ 9.95



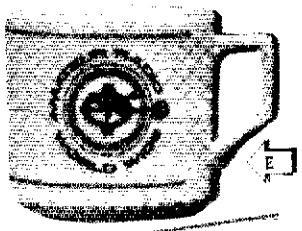
(C) Key Ring — Straight key design in 3-dimensional bronze. 1½" diameter.

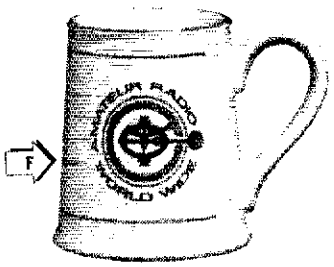
Order No.	Each
507	$ 5.95

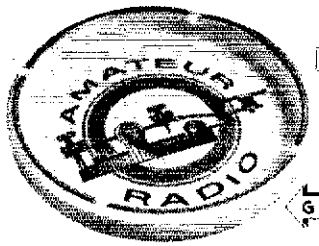


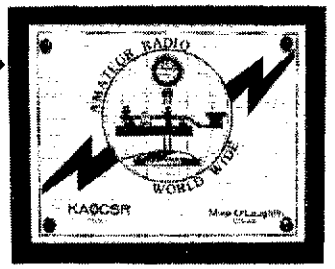
(D) Money Clip — Straight key design in 3-dimensional bronze. 1½" diameter.

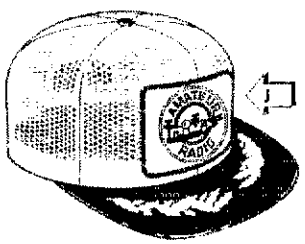
Order No.	Each
511	$ 6.95

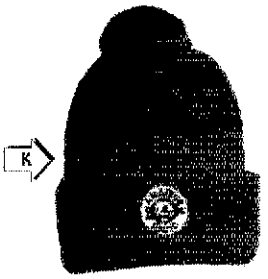


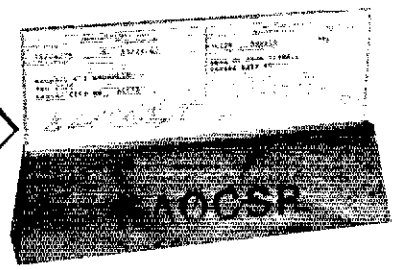












(E) Coffee Cup — Fine white porcelain. Gold and black brass key design. 11 oz. size.

Order No.	Each
501	$ 9.95
501 w/call imprint	$14.95

Allow 30 days for delivery with imprint.

(F) Stein — Gold and black brass key design. Big 20-oz. capacity.

Order No.	Each
502	$ 9.95
502 w/call imprint	$14.95

Allow 30 days for delivery with imprint.

(G) Ashtray — Big 7" diameter tray of white ceramic with black and red straight key design. 14K gold trim on edge.

Order No.	Each
503	$10.95

(H) Plaque — 8" x 10" solid walnut base with hanger. Name and call printed on parchment which is mounted under plexiglass. Blue and brown design with black imprint.

Order No.	Each
506	$19.95

(I) 1st QSL Card Holder — Card visible from both sides. Bronze commemorative medallion and words *"1st QSO"* embedded in solid walnut base.

Order No.	Each
812	$12.95

(J) Cap — White mesh cap is adjustable to fit all head sizes. Distinctive gold braid on black bill with gold, red and black amateur radio emblem.

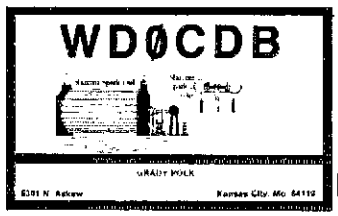
Order No.	Each
601	$ 9.95

(K) Stocking Cap — Bright red cap with colorful red and black emblem on the front.

Order No.	Each
604	$ 6.95

(L) A/R License Holder — Solid walnut base with call letters imprinted. License is held between plexiglass.

Order No.	Each
814	$ 9.95



(M) QSL Cards — Bright and colorful card featuring the "Marconi Spark Coil" design. Name, address and call printed in black ink.

Order No.	Per 100
407	$14.00
Add'l. 100	$ 5.00

(N) X-Mas Card — Bright and colorful, full-color Christmas card.

Order No.	
905	(25 Cards) $ 6.95
905	(100 Cards) $19.95

Add **$10.00** for call and name imprint.

Call _____ Name _____

Address _____

City & State _____ Zip _____

☐ Master Charge
☐ Visa # _____ Expiration Date _____

Qty.	No.	Item	Price
____	501	Cup	$ 9.95
____	501	Cup w/call	14.95
____	502	Stein	9.95
____	502	Stein w/call	14.95
____	503	Ash Tray	10.05
____	505	Pendant	9.95
____	506	Plaque	19.95
____	812	1st QSL Card Holder	12.95
____	407	QSL Card (100)	14.00
		Additional 100	5.00

Qty.	No.	Item	Price
____	507	Key Ring	$ 5.95
____	510	Belt Buckle	10.00
____	511	Money Clip	6.95
____	601	Cap	9.95
____	604	Stocking Cap	6.95
____	814	License Holder	9.95
____	905	X-Mas Card (25)	6.95
____	905	X-Mas Card (100)	19.95

Add $10.00 for call and name imprint.

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SEC: WB4ZML. NMs KB4OZ WA4WSM WB4NP WA4AVV WA4JTE W4BEJ. Nets reporting:

Net	QNI	QTC	Net	QNI	QTC
KYN	299	280	PAWN	320	25
KTN	1098	232	CARN	193	23
KNTN	378	151	KPON	48	3
MKPN	905	109	4-D ARES	38	3
KSN	171	52	5-D ARES	51	3
KRN	420	43	SEKEN	34	1
9RN-D	100 %	249	2STN	9	1

PSHR: KB4OZ 3 K4DZM. New Appts: OTS WA4NO OVS WD4NEH WD4NIU. First month as NM WA4SM ha KYN as top QTC net. Traffic on the upswing now a Xmas season approaches Appalachian Radio Club ne affiliated club in Pikeville. Hope all are making plans f OSCAR. Traffic: KB4OZ 239, WA4AVV 213, WB4APC 17 K4DZM 111, WA4EBN 110, WA4WSM 104, WB4NPD 8 WB4UOI 73, KA4AZT 53, WA4GAL 50, WB4KDP 5 K4JLX 48, K4HOE 44, WD4KDG 44, WD4COF 4 WD4RNI 37, WA4JTE 31, WA4SWF 28, W4OJN 25, Al 24, K4HRF 22, WA4FAF 21, WB4HIT 20, WA4YPQ 2 W4CDA 16, WA4RCD 15, WB4ABE 14, W4BAZ 1 W4PKX 12, WB4AUN 11, WA4JAV 9, K4AML 9, W4HKT KA4IKH 8, WA4NOG 7, K4AVX 6, WA4OMH 6, KA4EN 6, KA4GFU 6, WA4AGH 5, WD4NYC 1.

MICHIGAN: SCM, Stanley J. Briggs, W8MPI/K8SB Asst. SCMs: WA8DHB W8SOP. SEC: WA8EFK. ST WB8MTD. NMs: K8LNE K8KMQ WB8YDZ WA8DH WD8BHE WD8LSV N8ABA. ECs at Large: K8RI W8VWY.

Net	Freq.	UTC/Day	QNI	QTC	Sess
OMN*	3663	2300/0300 Dy	1008	336	62
MITN*	3953	0000 Dy	694	319	31
MACS*	3953	1600 Dy	726	202	31
GLETN	3932	0200 Dy	1054	184	31
MNN*	3722	2230 Dy	343	102	
UPN*	3922	2200 Dy	690	84	35
BR	3930	2230 M/S	333	40	26
WSSBN	3935	0000 Dy	662	36	31
ARES	3932	2230 Su	92	5	4
MEN	3930	1400 Su	135	2	4
VHF Local Nets: 7 reports			591	18	36

*NTS Section Nets. Hurricane David pressed a las number of radio amateurs in this part of the world in emergency service. We should all be very proud of t thousands of man-hours (and woman) of emergen communications provided by fellow radio amateurs. T record of activity is far from complete at this da WD8KPB of Flint provided communications between t Governor of Michigan's office and officials in San Domingo to arrange for the shipment of food, medic and building supplies from Michigan. I wish I cou recognize and thank the thousands of amateurs w monitored emergency frequencies and only transmitt when they really could be of assistance! The Macon County ARES provided communications for the No Star Sail Club Labor Day regatta. WA8OAF coordinat the activity. The UP ARES is now being conduct following the UP NET each Monday evening on 39 kHz. K8RCT is the Net Manager. I am very sorry to rep the following Silent Keys in the Michigan Secti W8DQP WA8ENA WB8ISQ WD8JER. Lots of Emergen Coordinator Appointments to report ... just in time SET! WD8IXZ for Delta County; K8GBC Shiawass County; WA8BAP Clinton-Ingham Counties; N8AYV Kent and Newaygo Counties; WD8PAK for Marque County; WB8PLK for Gogebic and Ontonagon Cou (SW part) W8NI for Schoolcraft County and K8RCT as at large for the UP. Other Field Appointments: KB8 AF8D:OBS WD8EIB AC8Y WB8ZIY:OTS. Mont reports from OOs: K8JH, W8QG, K8RCT, W8MVR/8. O reports: W8GZF, K8NKB, WB8DJS. Record vhf cor tions and NO OVS reports!! The Michigan Novice has a new manager: WD8BHE. Traffic: W8VPW 6 WD8NKA 296, WD8KZX 279, W8PDP 270, WB8YDZ 2 AF8V 203, K8KMQ 153, WB8MTD 143, WA8DHB 1 WB8YRY 106, N8BIK 102, WD8LRT 100, N8ABA W8MPD 94, WB8QYU 92, K8LNE 89, K8DTG 72, WD8C 72, WD8OSE 67, K8RV 66, WB8ZIY 64, W8SOP WB8ITT 62, W8YIO 62, WD8LSV 57, WB8AIR WA8TAQ/8 55, W8CUP 52, KB8AI 50, K8DYI 49, KB8 48, WB2LZN/8 47, WD8IBY 46, WA8WZF 46, WA8OAF K8GXV 41, W8WOJ 41, WB8MJB 37, W8HIN 28, W8I 27, K8ZJU 27, WA8UPL 26, WD8JOL 25, W8NOH WD8EIB 25, WA8PIM 24, WD8JFF 23, K8JED WB8SYA 18, KA8CPS 17, W8VIZ 16, K8UPE 16, WB8Z 15, W8AFZ 14, W8UOO 14, WB8DJS 11, KB8FK W3GOJ/8 11, WA8VVF 11, WA8AFX 10, W8LDS K8OGP 10, WA8GTG 9, WB8AFO 8, K8MJK 7, KA8GM. WB8HSN 6, W8GZF 5, WB8NCD 5, N8AOA 4, WD8IXZ WA8FJF 3, K8TIY 3, W8WVL 3, KA8APL 2, W8FZL WA8FXR 2, W8SCW 2, WB8UUJ 1, WB8VVF 1.

OHIO: SCM, Harold C. Chapman, WB8JGW — As SCMs: AF8O W8TP. SEC: K8AN. NMs: AF8A K8A WD8KBW WB8KWD WB8OMQ WB8YGW. Net reports

Net	QNI	QTC	Sess.	Time(local)	Freq.
BN	522	401	59	6:45/10 PM	3.577
BNR	67	19	26	6 PM	3.605
ONN	59	32	27	6:30 PM	3.708
OSN	224	167	31	6:10 PM	3.577
OSSBN	2922	1986	93	10:30AM/4:15 & 6:45 PM	3.9725
O6mN	335	55	31	9 PM	50.160

Eleven ECs participated directly, others indirectly observers, in a test involving Civilian Aviation of Ol (CAO) and State Disaster Services. The purpose was demonstrate Amateur Radio communications capabil between the two organizations following a somewh pre-set plan but to be used during a real emerger where CAO could be utilized. Communications wis was a success. As it was the first of its kind, everyth was not as smooth as it might have been. Future te should reflect an improvement on CAO planning. Th may plan an exercise during SET. The Ohio State F and Lorain County Fair gave Amateur Radio lots of posure. The traffic handled from both site was ext sive. The real gems of public relations was permitting of those people the opportunity to see and hear amateur station in operation. Thanks to all for the pl ning, participation and assistance offered by vario groups to both expositions. Our Director of the Gr Lakes Division, W8ETU, has decided it is time to s down from that position. Few realize the time and eff he has put into the position the past 6 years. Likewi few realize what he had previously offered as EC a SCM. From the Ohio Section and ARRL members ent a hearty thanks for a job well done and welcome bac traffic circles W8ETU. W8IM received WAS and W QRPP — congrats! Cleveland area amateurs combi efforts to provide successful communications for

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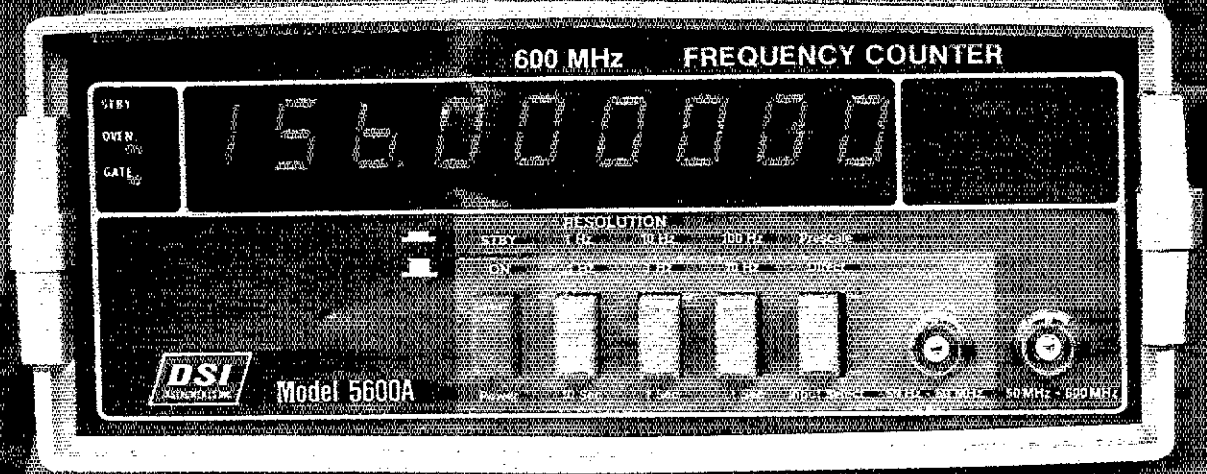

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5600A-W	$179.95											
3550	99.95	50Hz-450MHz	TCXO 1 PPM 17°-40°C	25MV	25MV	75MV	8	.5 Inch	*115 VAC or 9.2-14.5 VDC	2½"	x 6"	x 5"
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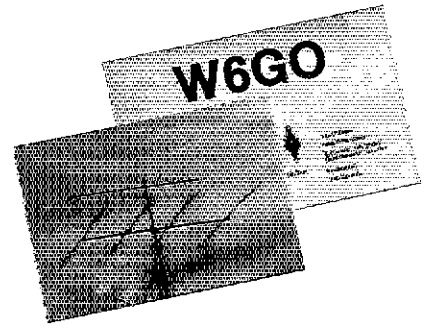

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Cleveland National Air Show — participating were 55 amateurs from CARS BRTN LEARA MARS WRRA and SEARA. Medina County two-meter repeater group stood at the ready for several hours when local telephone switching unit left about 45,000 residents without phones. They were assisted by stations from five adjacent counties and provided back-up support for local law enforcement and other groups. Queen City Emergency Net provided communications for Cincinnati Red Cross during flooding Aug. 1 and 2, assisting with communications to Hamilton Ohio and Lawrenceburg Ind. Appointments: OBS WD8DIP; OES N8AJD; OTS N8AJD; EC, WB8TFC/Morrow. Overheard at a recent hamfest: "Yeh, I'm starting a class for the new sidebanders". Traffic (Aug.) K8DDG 2658, K8KRG 1014, K8AAZ 712, K8DL 530, W8FU 483, W8PMJ 397, WA8GMT 323, WB8OMO 320, WA8HGH 311, WB8SIQ 274, WB8WTS 246, K8OZ 241, W8LNI 234, W8JMD 180, N8VT 172, W8TP 166, W8QZK 163, WB8KWD 154, WB8UBR 153, WD8OZM 149, WD8DTG 143, WB8GGx 130, WA8SSI 128, W8QEM 118, WD8KBW 112, WD8PEI 107, N8AJD 104, WB8MEK 101, WD8OYK 97, W8MOK 93, WD8QMP 93, WB8CJU 79, WD8JTT 68, WD8PPQ 68, K8AN 64, W8TH 61, WB8SRC 60, W8MGA 51, WD8DIP 48, N8CW 46, K8PE 46, N8AFD 45, W8LZE 42, WD8OYD 41, K8SVP 40, WD8LPP 38, WB8QHU 38, WB8QHV 38, AF8A 36, WB8HMI 36, WD8KFN 35, WB8YGW 34, N8AKS 33, WD8DLP 33, N8JR 32, WB8MRU 32, WD8INK 28, WB8PIY 28, K3RC 28, W8RG 28, KB8KV 26, WU8PUH 26, WB8WNH 22, WB8YTD 22, K8CKY 21, WB8MRL 21, KA8CVW 20, WB8NHV 19, AB8P 19, WB8TRK 19, WB8YUS 18, N8AIB 17, WB8VLR 16, WD8BIX 12, WB8JGW 12, WA8MAZ 11, W8IM 10, WD8JIK 10, K8RRQ 10, WB8TYQ 10, W8QCU 9, WB8WHF 9, WB8KKI 8, WD8MKC 8, WD8QAC 8, N8AUH 7, WA8ISX 7, W8WEG 7, WD8CTX 6, K8CYX 6, KB8FU 6, N8FU 4, K8HLJ 4, K8JOS 4, WD8OOQ 4, WA8RQQ 4, WB8INY 3, W8DYF 2, KB8LQ 2, WB8RUW 2, WB8TCZ 2, W8BHL 1, WD8EKI 1, WD8OTO 1, WB8YIJ 1. (July) K8OZ 32, N8JR 11, W8QCU 7, WA8RQQ 6. (June) K8OZ 27.

HUDSON DIVISION

EASTERN NEW YORK: SCM, Guy L. Olinger, K2AV — SEC: WB2VUK. STM: WA2SPL. ASCM: WB2VUK WB2COY W2IT WB2KDC. NMs: W2CS KB2JG WB2UOH WB2ZCM W2WSS WB2EAG. Nets: NYPON 5 P.M. 3913; ESS (slow) 6 P.M. 3590; NYSPTEN 6 P.M. 3925; NYS 7 & 10 P.M. 3677; NETN (slow) 8 P.M. M/W/F 3732; CDN (Troy) 6:30 P.M. 34/94; HVN (Beacon) 7:30 P.M. M-F 37/97; SDN (W. Plains) 9:30 P.M. S/T/T 66/06 M/W/F 615/015. NOTICE TO OBS: By the time you read this you will have recvd a letter from me. OBS not reporting schedule will be cancelled. Congrats to new OTS WB2MCO. WA2OTC has Extra & 122 on DXCC. Sez college & work limit air time. W1IQK reports equip. probs. & much overtime. KB2KW worked 41 1/2 hrs straight fixing mess Hur. David made. He works for power co. Urs truly bombed with work and blew away SB400 running RTTY without reducing power (Think I'd learn, woodencha). One contrasting note in this weird epidemic, WB2EAG FIXED his HW101 and is back on the air. Enjoyed K2GCE's recital of pet peeves in ESS bulletin. Funny how some things never change. AD2X tells that now that brother got ticket, there are four hams in family. PSHR: WA2EOW AD2X WA2SPL KB2KW WB2HDU. BPL: WA2SPL. Traffic: WA2SPL 1347, W2EFU 241, W2YJR 159, KB2KW 144, W2ACO 110, N3EF 88, WA2EQW 84, AD2X 76, WB2HDU 57, WB2EAG 46, AA2Y 35, K2AV 32, WA2OTC 21, WA2MZJ 20, WB2SPK 18, WB2SON 14, WB2MCO 6, W2IQK 5.

NEW YORK — LONG ISLAND: SCM, Paul A. Lindgern, WA2UWA — Asst. SCM: Stephen Bloom, WB2IDP. STM: WB2BNY. NM: WB2HIQ KA2CNN. NM/ASCM: WB2EUF. The following are traffic nets in and around the section. Join one!

Net	Time/Day	Freq.	Mgr.
NLI*	1900 Dy	3710	WB2EUF
NLI*	2200 Dy	3630	WB2EUF
NLIPN*	1815 Dy	3928	WB2HIQ
ESS	1800 Dy	3590	W2WSS
BAVTN*	2030 M-F	146.40/00	KA2CNN
NETN	2000 MWF	3732	WB2EAG
Clearinghouse	1100 Dy	3925	WB2EAG
Mike Farad	1300 M-S	3925	WA1LAD
NYSTPTEN	1800 Dy	3925	W2GLH

*Denotes section nets, all times local. Several changes in the nets this month. NLIPN now meets at 1815 local time with WB2HIQ as manager. WB2LIG had to resign from this spot due to other commitments. Thanks to him for his fine work. BAVTN is now a section net and now meets at 2030 local. New up and coming traffic team in NYC with XYL KA2DBW beating out OM KA2CNN for family traffic leader. In this particular battle of the sexes, the real winner is public service! New appointments: OO K@CVD/2, OTS N2AJV, NM WB2HIQ KA2CNN. Congratulations to all. WB2JKJ upgraded to General after 17 years on 6 and 2. He has a new Icom 701 and Alpha 374 linear. W2DBQ has new twist beam and Yausey and can now operate on all modes on 2-meters. Larkfield ARC held their annual picnic in spite of bad weather and a good time was had by all. N2LI has been busy again with over 100 QO cards sent. Lots of activity heard from NLI in September VHF QSO party. Stations heard were WA2SLY WA2TWO KA2DTE WB2IDP WA2PMW and WA2DKB among others. K2RIW has 16, count 'em, 16 yagis on 432. He is going to experiment with propagation on this band. By the time you read this, the SET will be history. Hope everyone participated and contributed to this effort. Former NLI stalwart, WB2LZN, now spending a year in Muskegon MI. Sez it has to be more interesting than Philadelphia. WB2IDP now active on 2-meter ssb and having a ball. Those who have never tried ssb on 2-M ought to try it. There are lots of nice people there. Appointees remember, three months of no reporting and you will be cancelled. Following stations made PSHR for August: K2GCE WA2UWA WB2IDP KA2CNN and KA2BDW. DBW made it in her first month as a Technician. Congratulations. Hope everybody stays warm over the winter! Traffic: W2MLC 118, K2GCE 114, WA2UWA 110, WB2IDP 84, WB2HIQ 52, KA2DBW 41, KA2CNN 36, WB2BNA 28, K2CMV 12, W2DBQ 7, K2LIE 6, WA2KXE 5.

NORTHERN NEW JERSEY: SCM, Robert E. Neukomm, WA2MVO — SEC: WB2VUF. STM: W2XD. NM: AF2L K2VX WA2OPY W2PSU WB2RMI W2TCA and W2UEZ.

Net	Mgr.	Freq.	Time/Days	Sess	QNI	QSP
NJN	AF2L	3695	7 PM Dy	31	549	231
NJN	AF2L	3695	10 PM Dy	33	391	198
NJPN	K2VX	3950	6 PM Dy 9 AM Su	35	554	314
UCEN	WB2RMI	146.085/ 685	Dy	31	281	80

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FREQUENCY COUNTER CONSUMER DATA COMPARISON CHART

MANUFACTURER	MODEL	SUG'STD. LIST PRICE	FREQUENCY RANGE	TYPE OF TIME BASE	ACCURACY OVER TEMPERATURE 17° - 40°C	ACCURACY OVER TEMPERATURE 0° - 40°C	SENSITIVITY 100 Hz - 25 MHz	SENSITIVITY 50 MHz - 250 MHz	SENSITIVITY 250 MHz - 450 MHz	DIGITS No.	DIGITS SIZE IN INCHES	PRE-SCALE INPUT RESOLUTION 1 SEC	PRE-SCALE INPUT RESOLUTION .1 SEC
DSI INSTRUMENTS	100 HH	$ 99.95	50Hz-100MHz	TCXO	1 PPM	2 PPM	25 MV	NA	NA	8	.4	100 Hz	10 Hz
DSI INSTRUMENTS	500 HH	$149.95	50Hz-550MHz	TCXO	1 PPM	2 PPM	25 MV	20 MV	30 MV	8	.4	100 Hz	10 Hz
CSC‡	MAX-550	$149.95	1kHz-550MHz	Non-Compensated	3 PPM @ 25°C	8 PPM	500 MV*	250 MV	250 MV	6	.1	NA	1 kHz
OPTOELECTRONICS	OPT-7000	$139.95	10Hz-500MHz	TCXO	1.6 PPM	5.2 PPM	NS	NS	NS	7	.4	1 kHz	100 Hz

* 1 KHz - 50 MHz ‡ Continental Specialties Corp.

The specifications and prices included in the above chart are as published in manufacturer's literature and advertisements appearing in early 1979. DSI INSTRUMENTS only assumes responsibility for their own specifications.

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The following are excerpts from unsolicited letters and registration cards received from owners of the new TEN-TEC OMNI transceiver.

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"My first QSO with OMNI-A was LA1SV on CW and second was EA8SK on SSB." —*N2CC*

"Excellent rig, just as advertised." —*WB5TMD*

"Very pleased with performance. QSK feature very slick." —*WB0ELM*

"This is my 5th TEN-TEC transceiver in less than 2 years. I loved them all and still have 3." —*WB0VCA*

"Through the years I have had complete Drake and Collins stations. I tried a 544 Digital and liked it the best so decided to purchase the 546 OMNI-D Digital." —*WA4NFM*

"Your OMNI is the best rig I have had in 20 years of haming." —*K4IHI*

"As a owner of Collins rig, your OMNI-D is the best." —*K9JJL*

"I already have an OMNI-A, 544 and a TRITON IV. You may ask why I own so many TEN-TEC rigs. In case there is a great RF famine, I want to be ready!" —*WD4HCS*

"You guys really know how to turn on an old timer!" —*K8ELS*

"Best operating & most conveniences of any transceiver I've ever used." —*W6LZI*

"I like CW. Compared OMNI against IC701 (rcvr) and OMNI won hands down. XYL WD6GSB really enjoys rig on SSB. Finds rig is very stable and digital readout accurate." —*AC6B*

"Have checked it out on both modes from "top band" (160) all the way to 29 MHz. Terrific!!!!" —*W4DN*

"Works well, parts layout and design much better for any possible servicing than other ham gear. The Japanese hybrid sets can't compare to TEN-TEC for audio. Audio reports excellent without special speech processors, etc., to distort the signal." —*AG8K*

"I have been using the S-Line over 15 yrs and never thought anything could outperform it. I got the biggest surprise and THRILLED with this OMNI-D even though I have been a ham since 1936." —*KV4GD*

"This must be the greatest. I've spent enough money on final tubes to almost pay for this." —*KA4BIH*

"This transceiver was recommended to me by old time hams (Xtras) whom I have known for 40 yrs. Has excellent break-in." —*N6AVQ*

"Best package job I've ever seen! First licensed 6AAV in 1926. Now in operation—a sweetheart!" —*W7LUP*

"From a 32V2/SX115 to an OMNI is a big step!" —*K6YD*

"Receiver prominent—transmitter likewise—working comfortable—pleasing design." —*OE1FAA*

"First new rig for me in 10 years but seems to be very good." —*W5GBY*

"The best transceiver I ever used or owned." —*W3TS*

"I wouldn't swap my OMNI for anything on the market, regardless of price." —*WD0HTE*

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All solid-state; 160-10 meters; Broadband design; Standard 8-Pole 2.4 kHz Crystal Ladder I-F Filter + Optional 1.8 kHz SSB Filter & 0.5 kHz 8-Pole CW Filter; 3-Bandwidth Active Audio Filter; Choice of readout — OMNI-A (analog dial), OMNI-D (digital); **Built-in VOX and PTT, Selectable Break-in, Dual-Range Receiver Offset Tuning, Wide Overload Capabilities, Phone Patch Interface Jacks; Adjustable ALC; Adjustable Sidetone; Exceptional Sensitivity; 200 Watts INPUT; 100% Duty Cycle, Front Panel Microphone and Key Jacks; Zero-Beat Switch; "S"/SWR Meter; Dual Speakers; Plug-In Circuit Boards; Complete Shielding; Easier-to-use size:** 5¾"h x 14¼"w x 14"d; **Full Options:** Model 645 Keyer $85; Model 243 Remote VFO $139; Model 252MO matching AC power supply $139; Model 248 Noise Blanker $49; Model 217 500 Hz 8-Pole Crystal Ladder CW Filter $55; Model 218 1.8 kHz 8-Pole Crystal Ladder SSB Filter $55.

Model 545 Series B OMNI-A . . . $949
Model 546 Series B OMNI-D . . . $1119

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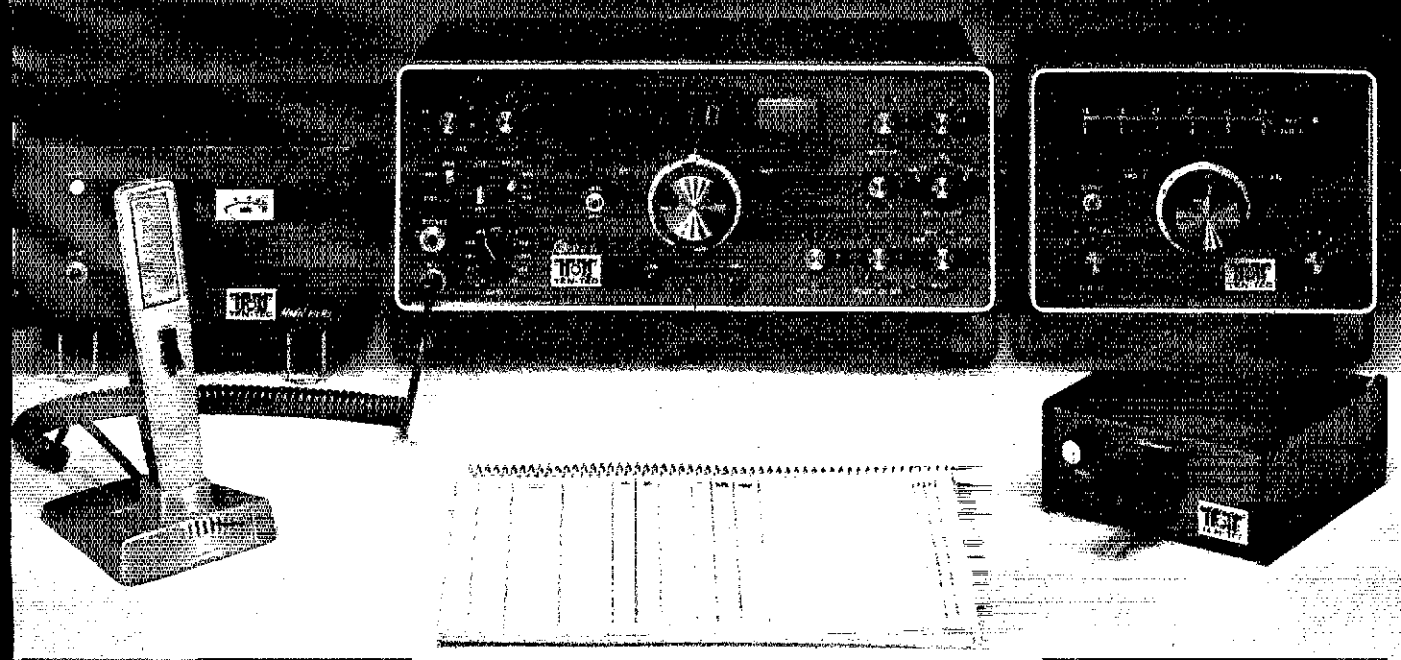

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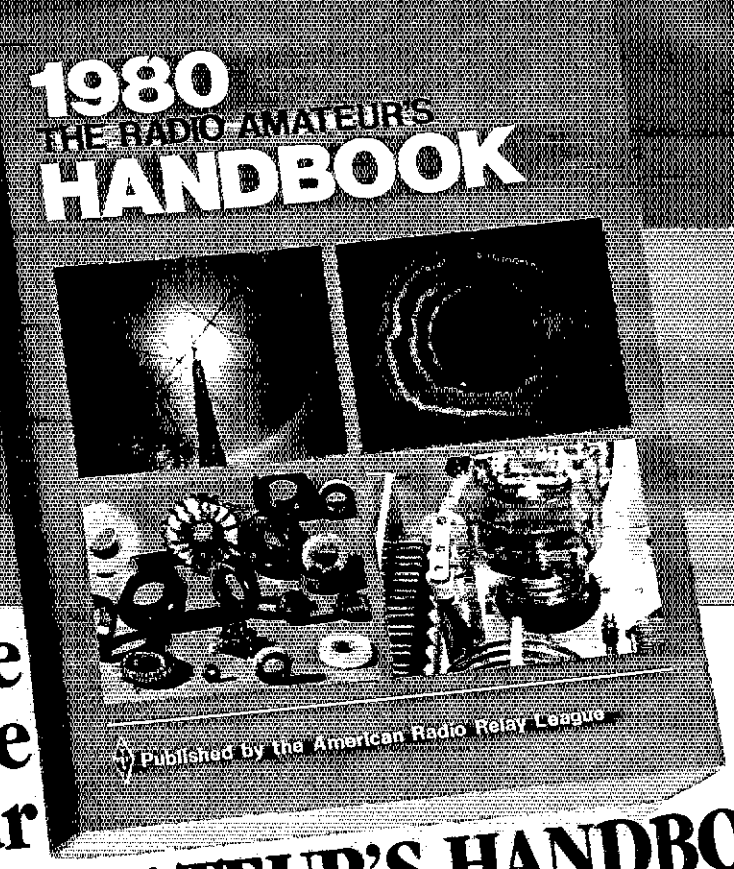

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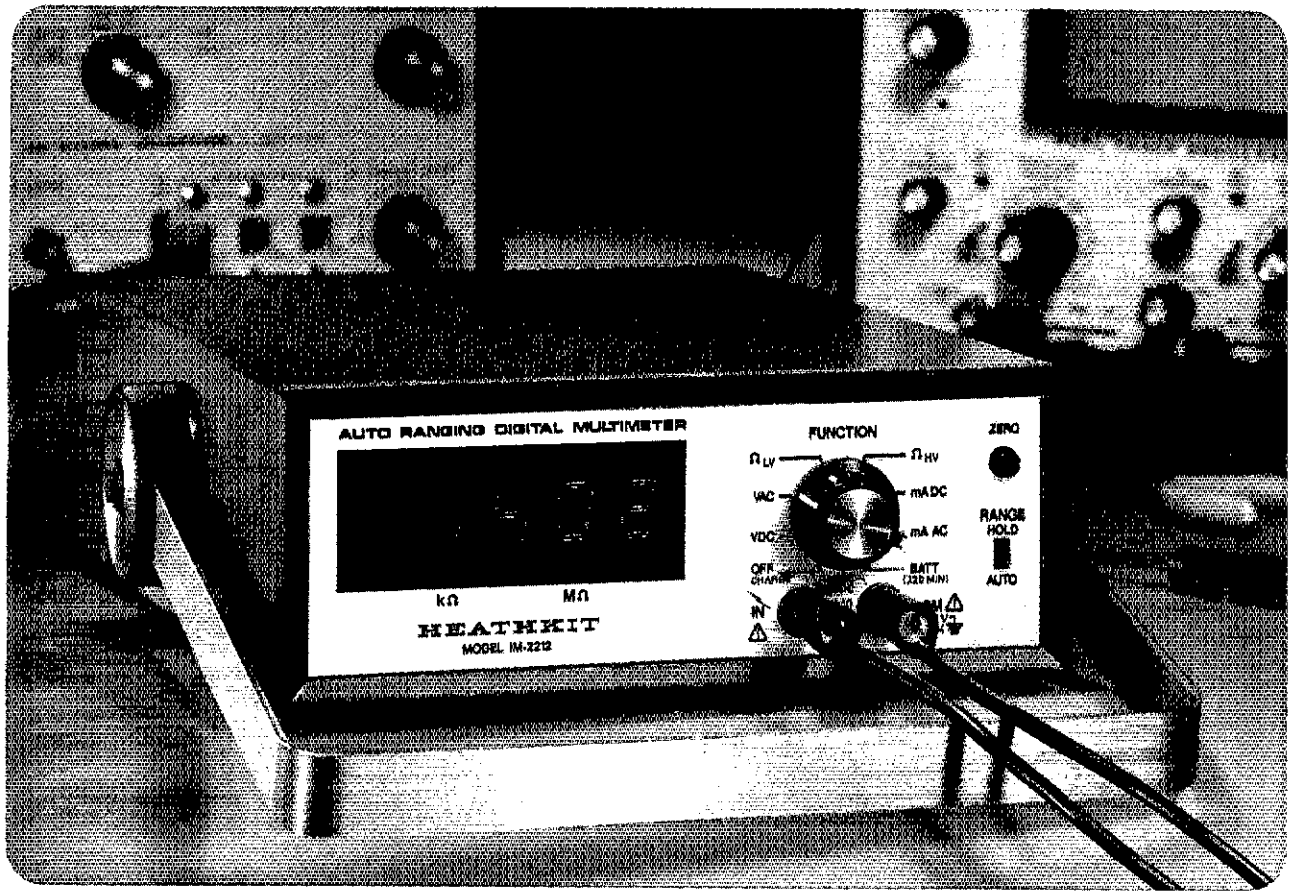

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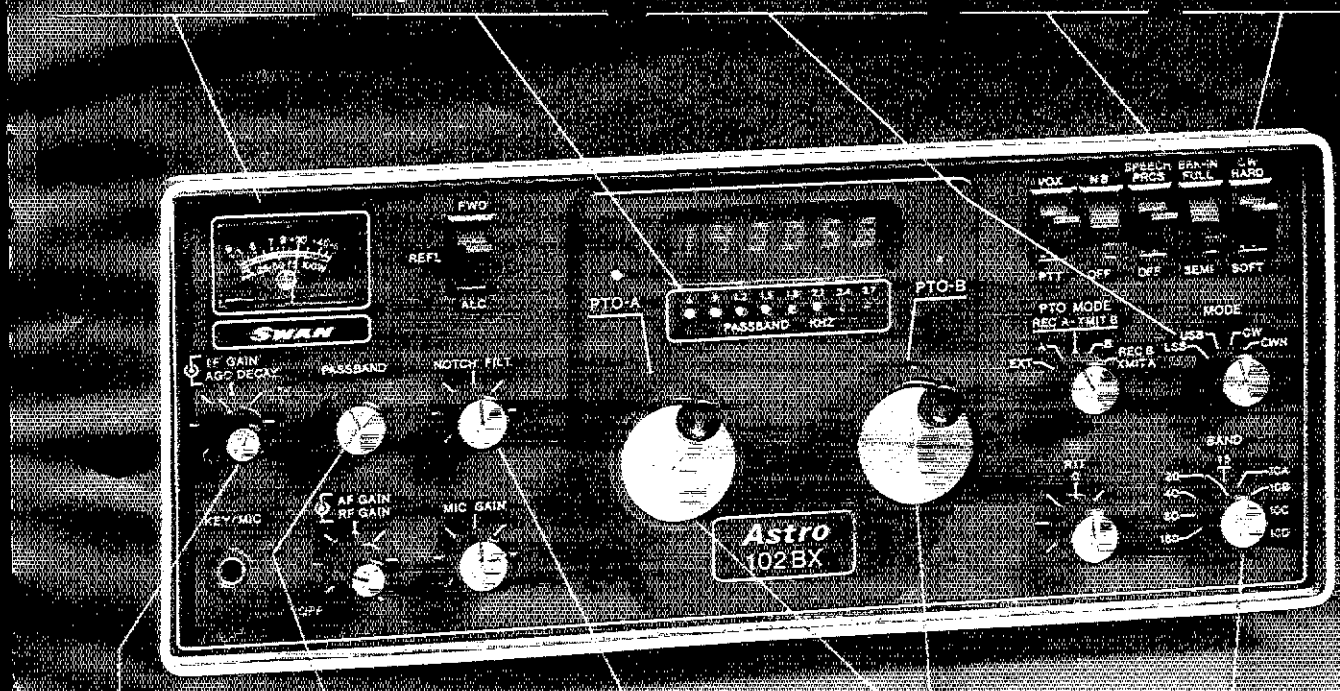

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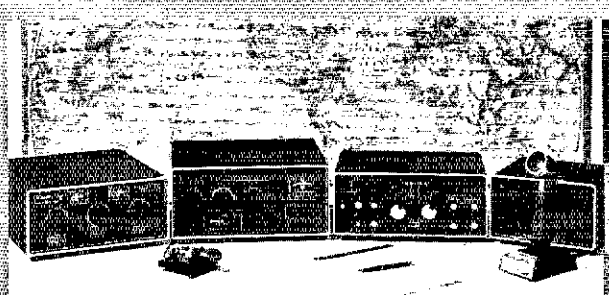

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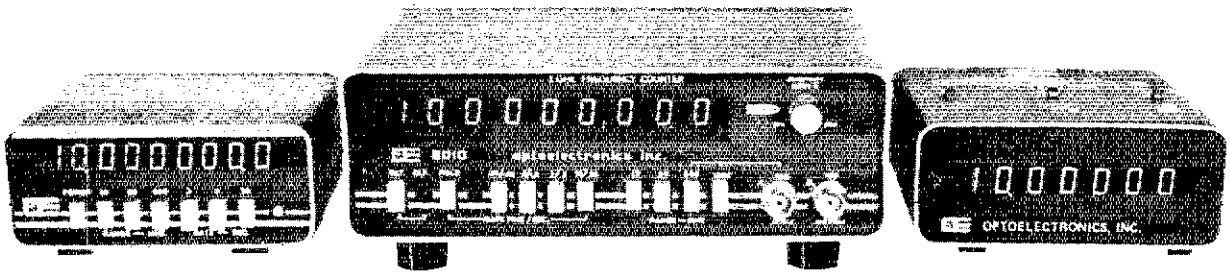

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9 DIGITS

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K-7000 kit	79.95	550 MHz	7	5-20 mV	10-30 mV	20-50 mV to 550 MHz	1-10 mV	(2).1,1 SEC	10 Hz	10 Hz	100 Hz 550 MHz	1.5 PPM	5.24288 MHz	NO	YES OPTION $15.
7010 *7010.1	145.00 225.00	600 MHz	9	5-20 mV	10-30 mV	20-40 mV to 600 MHz	1-10 mV	(3).1,1,10 SEC	.1Hz	1 Hz	10 Hz 600 MHz	1 PPM 0.1 PPM	10 MHz	YES OPTION $25.	YES OPTION $15.
8010 *8010.1	325.00 405.00	1 GHz	9	1-10 mV	5- 20mV	10-35 mV	1-10 mV	(8).01-20 SEC	.1 Hz	1 Hz	10 Hz 1 GHz	1 PPM 0.1 PPM	10 MHz	YES STD	YES OPTION $39.

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The high resolution frequency synthesizer locked to a high stability frequency reference is accurate to 10 Hz with no bandswitch. Eliminate undesired signals with independently selectable I.F. bandwidths and passband tuning. Optional I.F. filters can be selected independent of operating mode.

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Specifications†

Frequency Range: Tunable in 10 Hz steps. Receive mode — 2.0 to 30.0 MHz, 0.5 to 2.0 MHz at reduced sensitivity. Transmit mode — SSB or CW 160- thru 10-meter amateur bands.

Mode: SSB (voice and RTTY, either sideband selectable), CW, or AM (receive only).

Power requirements: 105, 115, 125, 210, 220, 230, 240, 250, ±5% V ac (Internal strapping option) 50-60 Hz, 12 V to 15 V dc (Connector strapping). 120 W input in receive max; 600 W input in transmit max.

†Subject to change without notice.

Frequency accuracy: Accurate to within ±5 Hz when the 39.6 MHz oscillator and the 455.0 MHz oscillator are set within ± 3Hz. Warm-up time is 10 min.

Frequency stability: Stability is within ±150 Hz over the temperature range of 0-50°C.

TRANSMIT PERFORMANCE

Output impedance: 50 ohms nominal.

Power output: 100 W PEP nominal from 1.6-30 MHz. In CW or RTTY, there is automatic turndown to 50 W after 10 seconds, 50% duty cycle, key down 15 minutes max.

With the optional blower kit, power is 100 W average, 50% duty cycle, key down 1 hour max at 25°C, ½ hour max. at 50°C for all modes.

Unwanted signal suppression: (minimum values below)

Carrier suppression	50 dB
Undesired sideband, 1 kHz ref	55 dB
Harmonics (all)	40 dB
Mixer products	55 dB

Third order distortion: 25 dB below each tone of a two-tone test.

Audio inputs: Microphone — low impedance type, internal strap for HI-Z. Line — 600 ohm input unbalanced impedance; level of 40 mV sufficient to produce full output.

Audio frequency response: Not more than 5 dB variation from 300 to 2400 Hz.

RECEIVER PERFORMANCE

Antenna impedance: 50 ohms

Sensitivity: Not more than 0.5 uV for 10 dB S+N/N at antenna input for SSB and CW, 2.0 to 30 MHz. Broadcast band attenuation is a nominal 30 dB.

I.F. and image rejection: Greater than 60 dB.

Selectivity: In operating modes of USB, LSB, CW, and A3E.

BW at −3 dB (min)	BW at −60 dB (max)
2.1 kHz	4.4 kHz
*1.7 kHz	3.4 kHz
*360 Hz	1.25 kHz
*140 Hz	600 Hz
*6.0 kHz	25 kHz
8 kHz	50 kHz

*optional

Audio output: Not less than 3½ W into 4 ohm load at 1 kHz, at not more than 10% total harmonic distortion. Line audio output, −10 dBm nominal into 600 ohms.

Audio frequency response: Not more than 5 dB variation from 300 to 2400 Hz.

Audio output: Not less than 3½ W into 4 ohm load at 1 kHz, at not more than 10% total harmonic distortion. Line audio output, −10 dBm nominal into 600 ohms.

Intermodulation distortion: Two signals spaced 20 kHz at a level of −30 dBm each will produce IMD down 50 dB min.

Size: 15.50" W (39.4 cm); 6.5" H (16.5 cm) (w/6 feet), 7.5" H (19.1 cm) (w/feet); 18.00" D (45.7 cm).

Weight: 50 lbs. (22.7 kg).

OBTTN	WA2OPY	147.72/12	Dy		31	355	61
NJVN	W2TVA	146.49/147.49	Dy		31	221	112
NJRTTY	W2PSU	147.51	Dy		31		

Morris County CD Director, WA2ARZ sent congratulatory messages on SKYLAB to the following repeaters: WB2ANF WR2ADB WR2AHD & WR2AGH NJVN net certificates to: WA2LHV WA2OPY WB2AIU WB2RMI WB2RMJ W2HU W2TCA and N2AAM. On August 18th the NJVN had at "Radiogram" table at the 550 ARC Flea Market with 30 messages accepted into the NTS. 15 traffic handlers attended this meeting with 3 at home on 2/10 accepting incoming/outgoing. Despite the rain, the flea market was a success. HH2JR had an "eyeball" with K2VX. It is with regret that I report the following SKs: W2IXL WA2VIN WA2LRB and W2DDZ. WA2LRB was very active in Army MARS and will be greatly missed. WA2ASC vacationing in Maine, KA2BZE vacationing in NH. WA2MVQ spent a week at Purdue University. W2MLI has moved to NH. The NJ Radio Club Information Net now has a membership of 22 stations and is looking for more club participation. WB2RMI finally got his tower up. WB2SQW is working on a Master's at Rutgers in physiology. K2EZ has the TRS80 working OK on 20 RTTY with Flesher TU with K4TUZ Bit-byter interface. WB2SZH has a 28ASH and an almost completed ST-6 with a UT-4 next. N2NS reports Union County is ready for the SET Oct. 6-7. W2CQB now has a cw keyboard working. KA2AXY a new General. JE3FPX is now N2BHY. K2ZO gave an excellent talk on antenna bridges at the recent BARA meeting. ATTENTION CLUBS: please send your dates of classes for amateur radio. Classes are presently meeting in River Dale, Fairlawn, Pompton Plains, Ridgewood and Nutley. AF2L got DXCC sticker 160 endorsement. OBRA members getting very active on low bands: WA2SLG WA2NJV KA2CHM WB2ZSI WB2JHN KB2ET WA2ONW and KA2AXY. Traffic (Aug.) WB2TOM 526, W2CQB 283, WB2RMI 283, W2RQ 277 W2SQ 275, W2UEZ 211, WA2MVQ 188, N2CR 167, AF2L 149, K2VX 141, WB2RMJ 90, WA2OVE 56, W2UH 42, W2ZEP 41, WB2KLF 37, W2XD 35, KB2HM 31, WB2KTR 27, WA7DPK 25, W5DTR 24, N2NS 23, K2WM 22, N2SU 18, WA2OWR 13, WB2SOW 12, WB2JVE 11, W2CU 9, WB7UQO 9, W2CVW 4, WA2EPK 5, W2CC 6, KP6BC 4, N2TM 4 (July) W2CVW 8, N2SU 7. (May) WB2RMJ 90.

MIDWEST DIVISION

IOWA: SCM, Max R. Otto — WØLFF — SEC: WØIYW. Mt. Pleasant ARC booth at Midwest Old Threshers Reunion had WB4KCH as a visitor. Congrats to KØKQJ who was honored by Marshall County Red Cross for his part in traffic for Algona/Manson tornado. I regret to report that we have two Silent Keys: KØGHH and KØKAO. WBØYUI has 265 for DXCC, also on RTTY now. WBØSEL helped with Hurricane David traffic. Ft. Dodge officers: WBØYWW, pres.; WDØAXF vice pres.; WBØNSS, s/t; WBØNMW rpt/chrmn.; WDØBJW, rpt/treas.; WDØBBE, rpt/secy. WØYLS WØSS KØGP WBØNSS NØSM AIØQ WBØPYD WBØUPF KØFLY/KØFO and WDØOGE active on Nts-TEN. WAØAUX WAØYGV and WØUPX active on OTRN. New equipment dept: WBØPYD 80 ft. tower; WBØYWW Yeasu FT-7; WBØYUI FTV-250 plus eleven elements up 40 ft. After 47 years of long wires and dipoles, yours truly has a TH5DX. DXCC and WAS here I come. Congrats for upgrades go to: NØBCQ KAØBBQ KAØBGP for Tech. WDØEWD for General and WDØCMB Advanced. WBØZKG worked NØAYY and WØRFX both bicycle mobile. KAØFNO is new in Grinnell. Monticello Repeater is on 147.78/18. Last call for antenna work.

Net	Freq.	Time(Z)	Days	QNI	QTC	Sess.	Mgr.
Iowa 75M	3970	1830	M-S	1278	100	27	WØWDC
Iowa 75M	3970	1830	M-S	960	85	27	WØYLS
Tall Corn	3560	0030 0400	Dy	289	81	62	WØYLS
ICN (July)	3713	0100	T-T-S	41	10	12	WBØNSS
(Aug)				26	5	8	

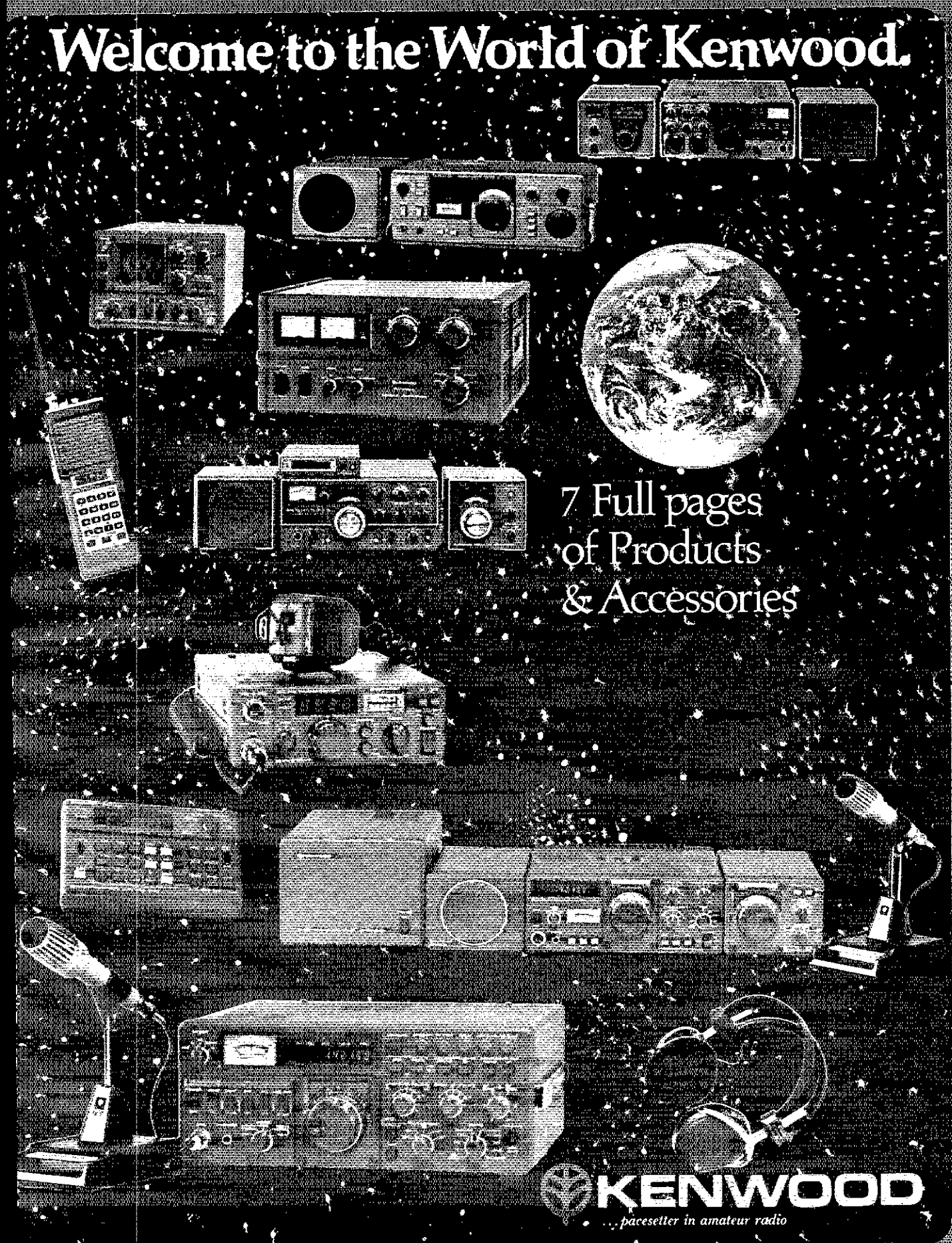
Traffic: (Aug) WAØAUX 647, WØSS 286, WØYLS 82, KØGP 57, WØLFF 27, WBØUPF 26, WBØAVW 17, KØOFI 17, KAØBYI 10, WØBW 9, WBØSEL 2. (July) WDØHND 3.

KANSAS: SCM, Robert M. Summers, KØBXF — SEC: WØKL. Net Mgr: WØOYH WØFT WDØESF WAØSZS WAØLBB. Net reports for August as follows: KPN QNI 246, QTC 10; QKS QNI 372, QTC 146; KSBN QNI 1124, QTC 161; CSTN QNI 1306, QTC 90; QKS-SS QNI 99, QTC 14; KWN QNI 718, QTC 382. Sorry to hear that there are others with rig problems besides myself. WØFT says phone rig down. WØPB was able to attend the Satellite Earth Station Seminar on a recent trip to Oklahoma. Pratt repeater now going strong on 147.93/147.33. Congratulations are in order for the Ham of the Year — Kansas wise — WØOYH was presented with RE Baker Memorial award at the Concordia Hamfest August 11. Thanks again to those who represent Kansas at the Tenth region level. WBØORH WDØACG WDØFDP KØEZ WDØESF and WØAM. Still room for others who would like to share part of the traffic load. Several recent changes in the EC line up will prompt a revised list of EC by zones in the next report. Last but not least, we are glad to hear WØGCJ back on the air after his recent ill health. KØLPE, ex-SEC, was able to be excused from the hospital long enough to attend the Concordia Hamfest banquet and the festivities that took place. Traffic: WBØOBH 157, WØOYH 122, KØBXF 118, WØHI 105, WØAM 104, WØFIR 104, KØEZ 102, WØFT 87, WAØLBB 73, WDØFDP 70, WDØACG 69, WØCHJ 27, WØKL 17, NØAOL 14, WØFDJ 14, KØFPC 7, KØKD 7, WØPB 6, WØRBO 6, NØIN 3.

MISSOURI: SCM, L. G. Wilson, KØRWL — Asst. SEC: Joe Flowers, WØOTF. SEC: WBØFKY. The Kansas City DX Club picnic was attended by about 25 amateurs and their families and a good time was had by all. It was difficult to determine which was being swapped faster, equipment or stories about the one that got away. The Heart of America Radio Club picnic was held on September 9th and drew a real nice crowd. The weather was perfect, grownups and kids had a great time and alot of prizes were given away. WØVWW, a charter member of HARC, even got back into the swing of things.

Net	QNI	QTC	Net	QNI	QTC
MON	205	190	MON 2	176	71
HBN	408	64	NEMOE	78	1
ACE	6	0	MEOW(Jun)	326	70
MEOW(Jul)	343	60	MEOW(Aug)	321	77

Maybe the gas crunch we have been living with this summer is not such a bad thing after all. Several members have bought new equipment. KAØELU has a new tower and antenna and WØDUD is sporting a newer and higher 2-meter antenna. With nobody going anywhere, antenna work and repeater work seem to be at an all-time high.


Welcome to the World of Kenwood.
7 Full pages
of Products
& Accessories
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KENWOOD *...for the discerning Amateur who demands quality.*

TS-180S *with* DFC

The TS-180S with DFC (Digital Frequency Control) is Kenwood's top-of-the-line all solid-state HF SSB/CW/FSK transceiver covering 160 through 10 meters, with outstanding performance and many advanced functions, including four tunable memories to provide more operating flexibility than any other rig!

TS-180S FEATURES:

- Digital Frequency Control (DFC), including four memories and digital up/down paddle-switch tuning. Memories are usable in transceiver or split modes, and can be tuned in 20-Hz steps up or down, slow or fast, with recall of the original stored frequency. (Also available without DFC.)
- All solid-state, 200 W PEP/160 W DC input on 160-15 meters, and 160 W PEP/140 W DC on 10 meters.
- Improved dynamic range, with improved circuit design and RF AGC ("RGC"), which activates as an automatic RF attenuator to prevent receiver overload.
- Adaptable to three new bands, and VFO covers more than 50 kHz and DFC 100 kHz above and below each band.
- Built-in microprocessor-controlled digital display. Shows actual frequency and switches to show the difference between the VFO and "M1" memory frequencies. Blinking decimal points indicate "out of band." (An analog monoscale dial is also included.)
- IF shift (passband dialing to eliminate QRM).
- Dual SSB filter system (second filter is optional) to provide very sharp receiver selectivity, improved S/N, and 30 dB compression with RF speech processor on transmit.
- Tunable noise blanker, to eliminate cross modulation from strong signals when noise blanker is on.
- Selectable wide and narrow CW bandwidth on receive (500-Hz CW filter is optional).
- SSB normal/reverse switch (proper sideband is automatically selected with band switch).
- Dual RIT (VFO and memory/fix).
- Available without DFC. Digital frequency display still included, with differential function showing difference between VFO and "digital hold" frequencies.

OPTIONAL ACCESSORIES:

- DF-180 digital frequency control (for TS-180S without DFC).
- YK-88CW 500-Hz CW filter.
- YK-88SSB second filter for dual-filter system.

MC-50 PS-30 SP-180 TS-180S VFO-180 AT-180

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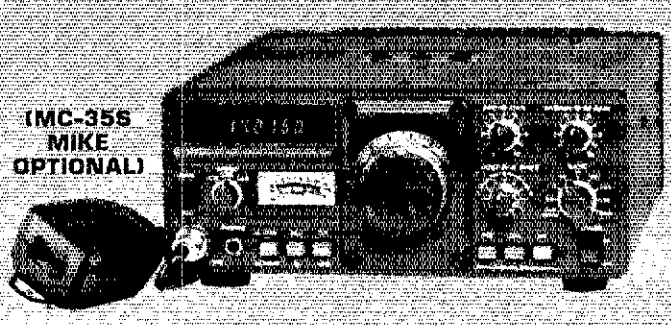
TS-120S



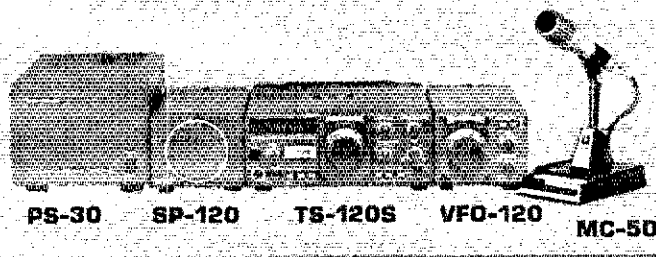
Truly a "big little rig," the TS-120S has created a new excitement in HF communications for highly versatile Amateur operation. The compact, all solid-state 80-10 meter transceiver, with up to 200 watts PEP input, requires no tuning and includes a large digital readout, making it ideal for mobile operation. IF shift and other important features make it a high-quality rig for the ham shack as well.

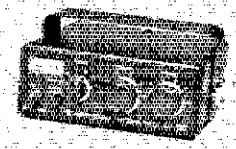
TS-120S FEATURES:

- All solid-state with wideband amplifier stages. No final dipping or loading, no transmit drive peaking, and no receive preselector tuning.
- Transceives on 80 through all of 10 meters, and receives WWV on 15 MHz.
- 200 W PEP/160 W DC input on 160-15 meters, and 160 W PEP/140 W DC on 10 meters. LSB, USB, and CW.
- Digital frequency display (standard) shows actual frequency. Backup analog subdial also included.
- IF shift (passband tuning) to eliminate QRM.
- Advanced PLL circuit, with improved stability and spurious characteristics on transmit and receive.
- Effective noise blanker.
- Built-in cooling fan, which activates automatically when final-amplifier heatsink temperature rises to 90° C.
- Protection circuit for final transistors.
- VOX.

OPTIONAL ACCESSORIES:

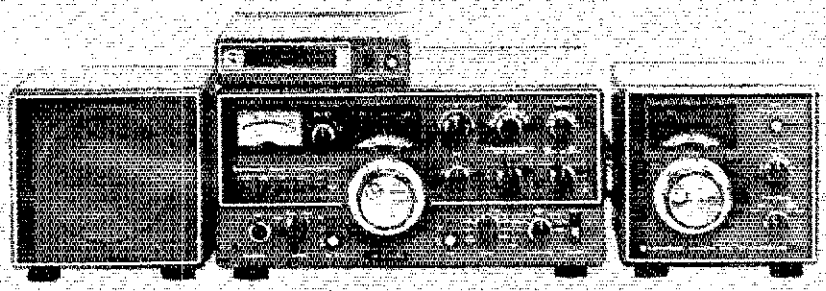
- YK-88CW 500-Hz filter.
- MB-100 mobile mount.





AT-120

AT-120 antenna tuner with mobile mounting bracket included. Features SWR meter and matches 50-ohm input to 20-300 ohms unbalanced output. Handles 150 watts (120 watts on 80 meters).



TS-520SE

The TS-520SE is an economical version of the TS-520S...the world's most popular 160-10 meter Amateur transceiver. Now, any Amateur can afford a high-quality HF transceiver for his ham shack.

TS-520SE FEATURES:

- Covers 160-10 meters and receives WWV on 15 MHz.
- 200 W PEP input on SSB and 160 W DC on CW.
- CW WIDE/NARROW bandwidth switch, for use with the optional CW-520 500-Hz CW filter.
- Digital display with optional DG-5, showing actual frequency.
- Speech processor, effective in DX pileups.
- VOX and semi-break-in CW with sidetone.
- Built-in 25-kHz calibrator.

The TS-520S is still available, with DC (mobile) operating capability (with the optional DS-1A DC-DC converter) and transverter terminals, which were eliminated from the TS-520SE.

OPTIONAL ACCESSORIES:

- CW-520 500-Hz CW filter.
- AT-200 antenna tuner.

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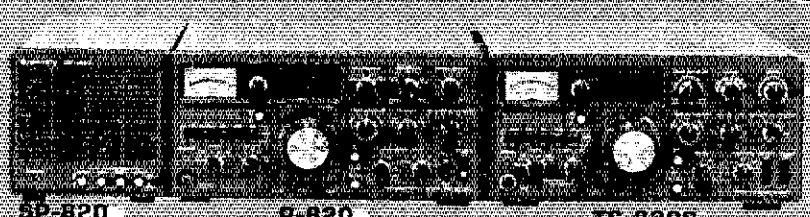
R-820/TS-820S



TS-820S

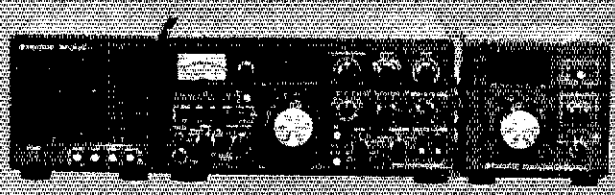
The TS-820S is a very popular 160-10 meter SSB/CW/RTTY transceiver preferred by DX operators and other particular Amateurs. It employs a single-conversion PLL circuit.

TS-820S FEATURES:

- 200 W PEP SSB/160 W DC CW/100 W DC FSK input on 160-10 meters.
- Digital frequency display, with backup monoscale analog dial.
- IF shift (receiver passband tuning) to eliminate interference.
- RF speech processor.
- Effective noise blanker.

OPTIONAL ACCESSORIES:

- CW-820 (YG-88C) 500-Hz CW filter.
- DS-1A DC-DC converter.
- AT-200 antenna tuner.



R-820

The R-820 is a highly sophisticated HF receiver for the Amateur who wants the highest quality with the most operating features. A combination of the R-820 and TS-820S provides the ultimate HF operating system.

R-820 FEATURES:

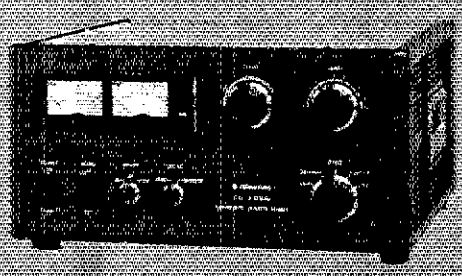
- Full transceive operation with TS-820S, providing full frequency control with either unit.
- Covers 160-10 meters, as well as WWV (15.0-15.5 MHz), and four shortwave broadcast bands (49, 31, 25, and 16 meters).
- Receives SSB, CW, AM, and RTTY modes.
- Double-tuned RF stages and improved dynamic range.
- IF shift (passband tuning).
- Variable bandwidth tuning (VBT).
- Very sharp, deep notch circuit in 50-kHz IF.
- Provisions for extra-sharp 455-kHz IF filters.
- Noise blanker with variable threshold level.
- Digital frequency display, with backup analog dial.

OPTIONAL ACCESSORIES:

- YG-88C 500-Hz CW filter, for first IF.
- YG-88A 6-kHz AM filter, for first IF.
- YG-455C 500-Hz filter, for second IF.
- YG-455CN 250-Hz filter, for second IF.

ACCESSORIES FOR TS-820 AND TS-520 SERIES

AT-200 antenna tuner handles 200 W, 160-10 meters.
TV-502S 2-meter transverter covers 144-146 MHz. (Not intended for TS-520SE.)
TV-506 6-meter transverter covers 50-54 MHz. (Not intended for TS-520SE.)

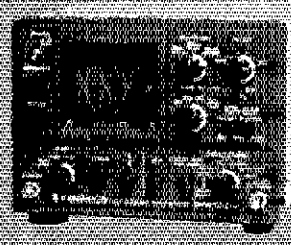


TL-922A

The TL-922A linear amplifier for all Kenwood HF equipment provides maximum legal power on the 160-15 meter Amateur bands, employing a pair of EIMAC 3-500Z high-performance transmitting tubes.

TL-922A FEATURES:

- 2000 W PEP (SSB)/1000 W DC (CW, RTTY) input power on 160-15 meters with 80 W drive.
- Excellent IMD characteristics.
- Safety protection.
- Blower with automatic delay circuit.
- Variable threshold level type ALC.



SM-220

The SM-220 Station Monitor is capable of various monitoring functions, and performs as a wideband oscilloscope, and is expandable for pan-display operation.

SM-220 FEATURES:

- Monitors transmitted SSB and CW waveforms from 1.8 to 150 MHz.
- High-sensitivity, wide-frequency-range (up to 10 MHz) oscilloscope.
- Monitors received signals in IF stage.
- Tests linearity of linear amplifiers (provides trapezoid pattern).
- Allows observation of RTTY tuning points (cross pattern).
- Built-in two-tone (1000-Hz and 1575-Hz) generator.
- Expandable to pan-display capability for observing the number and amplitude of stations within a switchable ±20 kHz/±100 kHz bandwidth.

OPTIONAL ACCESSORIES:

- BS-8 pan-display module for TS-180S and TS-820 series.
- BS-5 pan-display module for TS-520 series.

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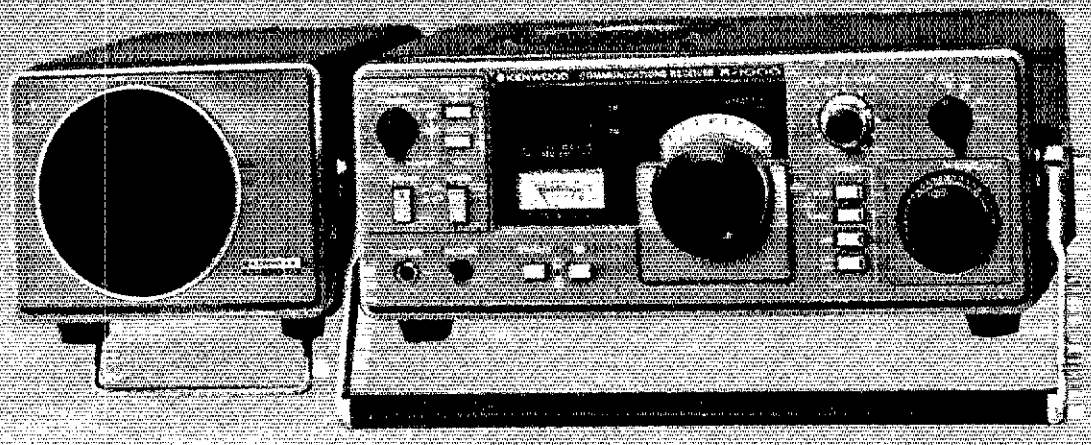
R-1000

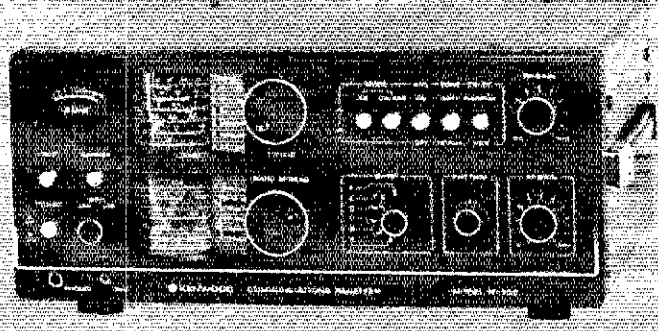


SP-100 R-1000

The R-1000 is a highly advanced communications receiver. Up-conversion, PLL circuitry and other new technology provide optimum sensitivity, selectivity, and stability from 200 kHz to 30 MHz. Featuring easy-to-operate single-knob tuning and digital frequency display, it's perfect for listening to shortwave, medium-wave, and long-wave bands. Even SSB signals are received perfectly. Included is a quartz digital clock and timer.

R-1000 FEATURES:

- Continuous frequency coverage from 200 kHz to 30 MHz.
- 30 bands, each 1 MHz wide.
- Five-digit frequency display and illuminated analog dial.
- Quartz digital clock and ON/OFF timer.
- Multi-modes ... AM (wide and narrow), SSB (USB and LSB), and CW.
- Three IF filters ... 2.7 kHz for SSB and CW, 6.0 kHz for AM narrow, and 12 kHz for AM wide.
- Effective noise blanker.
- Built-in speaker.
- Three antenna terminals.
- RF step attenuator.
- Tone control.
- Recording terminal.
- Remote terminal, for access to timer relay ON/OFF circuit and muting circuit.
- SSB sensitivity of 0.5 μV from 2 to 30 MHz.
- More than 60 dB IF image ratio.
- More than 70 dB IF rejection.



R-300

The R-300 all-band communications receiver covers 170 kHz to 30 MHz in six bands. It's ideal for listening to foreign broadcasts and other exciting transmissions throughout a wide range of the radio spectrum.

R-300 FEATURES:

- Continuous frequency coverage from 170 kHz to 30 MHz, in six bands.
- Multi-modes ... AM, SSB, and CW.
- High sensitivity, selectivity, and image ratio.
- 500-kHz marker.
- Three-way power supply (AC/batteries/external DC), with automatic switching from AC to DC in the event of AC power failure.

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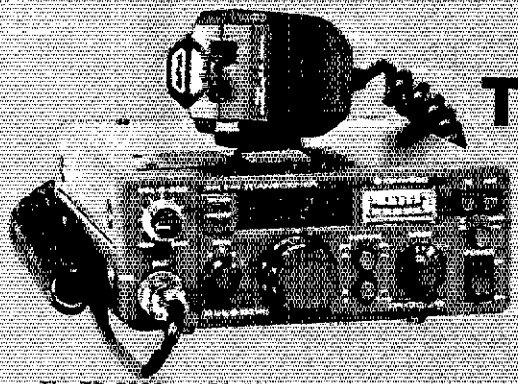
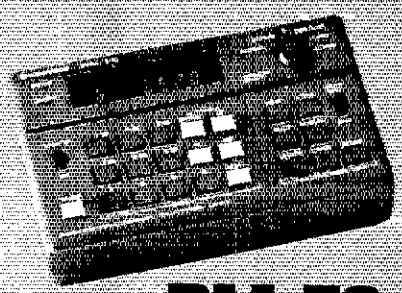


TR-7600

TR-7625

The TR-7600 and TR-7625 are Kenwood's popular synthesized 2-meter FM mobile transceivers. Combined with the RM-76 Microprocessor Control Unit, several memory and scanning capabilities are provided.



RM-76

TR-7600/TR-7625 FEATURES:

- One memory channel.
- Mode switch for simplex or repeater operation. Repeater mode shifts the transmit frequency + 600 kHz or - 600 kHz or to the memory frequency.
- Full 5-kHz coverage from 144.000 to 147.995 MHz.
- Adaptable to any one MARS simplex or repeater channel between 143.7 and 148.3 (with modification kit).

ADDED FEATURES WITH RM-76:

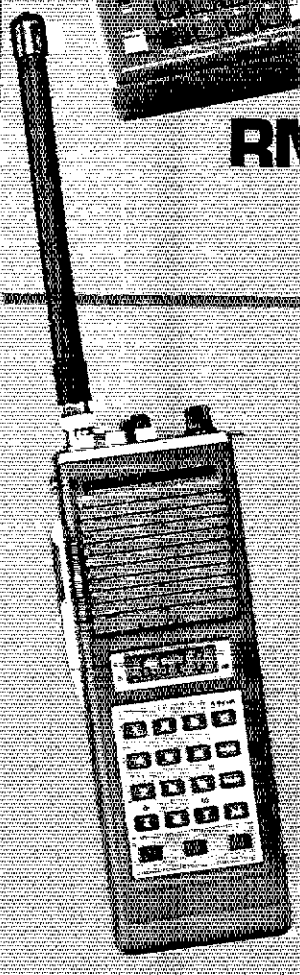
- Six memories.
- Automatic memory scan.
- Automatic scan up the band in 5-kHz steps, with selectable upper and lower frequency limits.
- Manual scan up or down the band in single or fast continuous 5-kHz steps.
- ± 1 MHz transmitter offset as well as ± 600 kHz and memory offset for repeater operation.
- MARS operation on 143.95 MHz simplex.
- Versatile digital display of transmit and receive frequencies, and operating functions.

KPS-7

The KPS-7 is a matching AC power supply for the TR-7600 and TR-7625. Output is 13.8 VDC at 7 A ICS (50% duty cycle).

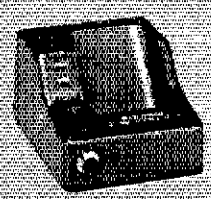
TR-2400

The TR-2400 synthesized 2-meter hand-held transceiver features a large LCD frequency readout, 10 memories, scanning, and much more.



TR-2400 FEATURES:

- Large, illuminated LCD digital frequency readout. Readable in direct sunlight, and a lamp switch makes it readable in the dark. Shows receive and transmit frequencies and memory channels, and indicates "ON AIR", memory recall, battery status, and lamp switch on.
- 10 memories, with battery backup.
  - Automatic memory scan for "busy" or "open" channels.
  - Mode switch for simplex, ± 600 kHz transmit repeater offset, and memory-frequency ("M-O") transmit repeater offset.
- REVERSE momentary switch.
- Built-in 16-button Touch-Tone generator.
- Keyboard selection of 5-kHz channels from 144.00 to 147.995 MHz.

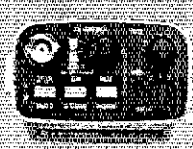


ST-1

- Up/down manual scan and repeater or simplex operation from 143.900 to 148.495 MHz in single or fast continuous 5-kHz steps.
- Two lock switches to prevent accidental frequency change and accidental transmission.
- Subtone switch (subtone module not Kenwood supplied).
- More than 1.5 W RF output.
- High-impact plastic case and zinc die-cast frame.
- BNC antenna connector.
- Standard accessories included with the TR-2400 are a flexible rubberized antenna with BNC connector, ni-cad battery pack, and AC charger.

OPTIONAL ACCESSORIES:

- Attractive leather case.
- Model ST-1 base stand, which provides 1.5-hour quick charge, trickle charge, and base-station operation with microphone connector and impedance-conversion circuit for using MC-30S microphone.
- Model BC-5 DC quick charger.



TOP CONTROLS

KENWOOD ...for the discerning Amateur who demands quality.

TS-700SP

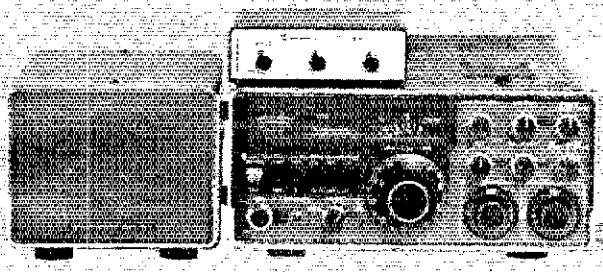
SP-70 TS-700SP VFO-700S

The TS-700SP is an all-mode (SSB, FM, CW, and AM) solid-state transceiver covering the entire 2-meter band, including repeater operation on all subbands. It's the perfect rig for the serious 2-meter Amateur.

TS-700SP FEATURES:

- All modes...SSB (USB and LSB), FM, CW, and AM.
- VFO tuning from 144 to 148 MHz in four bands.
- Seven-digit readout of receive frequency, with 100-Hz resolution. (Last digit can be eliminated automatically in the FM mode.)
- Simplex and repeater operation, including all repeater subbands. Switchable to REVERSE mode.
- Built-in receiver preamplifier.
- AC/DC capability, for fixed or mobile operation.
- 44 fixed channels with 11 crystals.
- Multifunction meter...S-meter on all receive modes, zero-center meter on FM receive, and RF transmit.
- High-low power switch (10 W/1 W).
- RIT for both VFO and fixed channels.
- Effective noise blanker.

TS-600



SP-70 TS-600 W/VOX-3

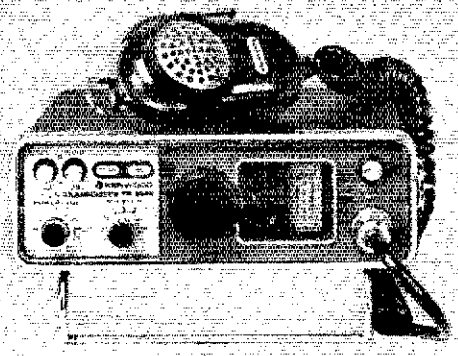
The TS-600 is an all-mode (SSB, FM, CW, and AM) solid-state transceiver covering the entire 6-meter band. It's the ideal transceiver to enjoy the many exciting propagation conditions on 6 meters.

TS-600 FEATURES:

- All modes...SSB (USB and LSB), FM, CW, and AM.
- VFO tuning from 50 to 54 MHz in four bands. Main dial graduated at 1-kHz intervals.
- AC/DC capability, for fixed or mobile operation.
- 20 fixed channels with five crystals.
- Effective noise blanker.
- 100-kHz marker.
- Multifunction meter...S-meter on all receive modes, zero-center meter on FM receive, and RF on transmit.
- RIT for both VFO and fixed channels.
- 20 W PEP input on SSB, 10 W output on CW and FM, 5 W output on AM.

OPTIONAL ACCESSORY:

- VOX-3, to provide VOX and semi-break-in CW operation.



The TR-8300 mobile FM transceiver operates in the 70-cm band, on 23 crystal-controlled channels (three supplied). Transmitter output is 10 watts, and a very sensitive and selective receiver is provided.

TR-8300

TR-8300 FEATURES:

- Covers 445.0-450.0 MHz (transmit) and 442.0-447.0 MHz (receive).
- 23 channels, three supplied (446.0 MHz simplex, 446.5 MHz simplex, and 449.10 MHz transmit/444.10 MHz receive).
- Five-section helical resonator and two-pole crystal filter in receiver IF, for improved intermodulation characteristics.
- Call channel switch, for user-desired function (such as subtone).
- High-low power switch (10 W/1 W).
- Monitor circuit, to allow listening to modulation while making frequency adjustments.

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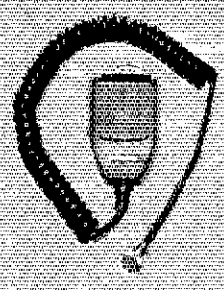
...pacesetter in amateur radio

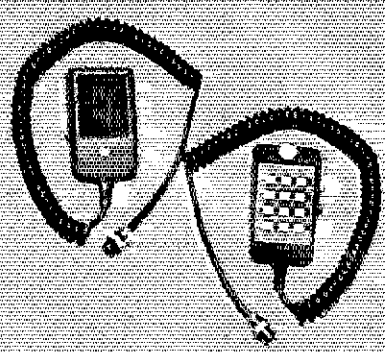
OPTIONAL ACCESSORIES

PC-1 phone patch.

MC-50 dynamic dual-impedance (50 kΩ/500Ω) desk microphone.



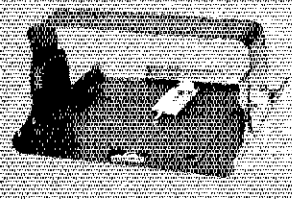
MC-30S (500Ω) dynamic noise-cancelling hand microphone. Also available, MC-35S (50 kΩ).



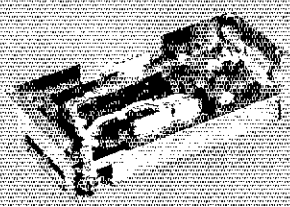
MC-45 Touch-Tone (with automatic transmit) microphone.

HS-5 deluxe 8Ω headphone set.

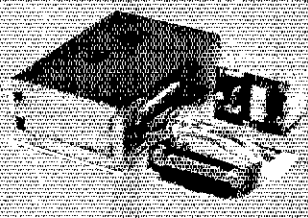
HS-4 8Ω headphone set.



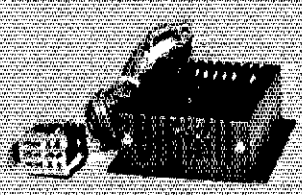
MB-100 mobile mount for TS-120S.



DF-180 digital frequency control for TS-180S without DFC.



DG-1A digital counter/display for TS-820.

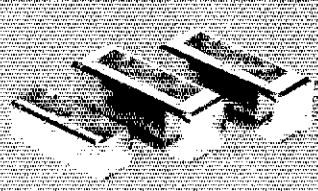


DS-1A DC-DC (mobile) converter for TS-820S/TS-520S (not for TS-520SE).

BS-8 (for TS-180S and TS-820S) and **BS-5** (for TS-520 series) SM-220 pan-display

YK-88CW 500-Hz CW filter for TS-180S/TS-120S and **YK-88SSB** IF SSB filter for TS-180S dual-filter system.

CW-820 (YG-88C) 500-Hz CW filter for TS-820S/R-820. **CW-520** 500-Hz CW filter for TS-520 series.



YG-88A 6-kHz AM filter, **YG-455C** 500-Hz CW filter and **YG-455CN** 250-Hz CW filter for R-820.

KENWOOD

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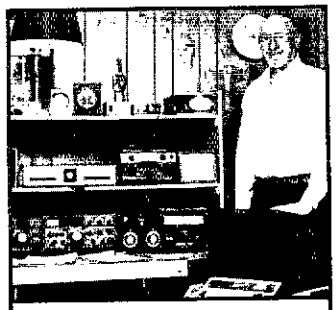
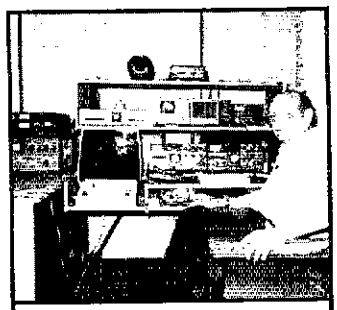
1111 WEST WALNUT COMPTON CA 90220

WHEN OUR CUSTOMERS TALK... WE LISTEN.

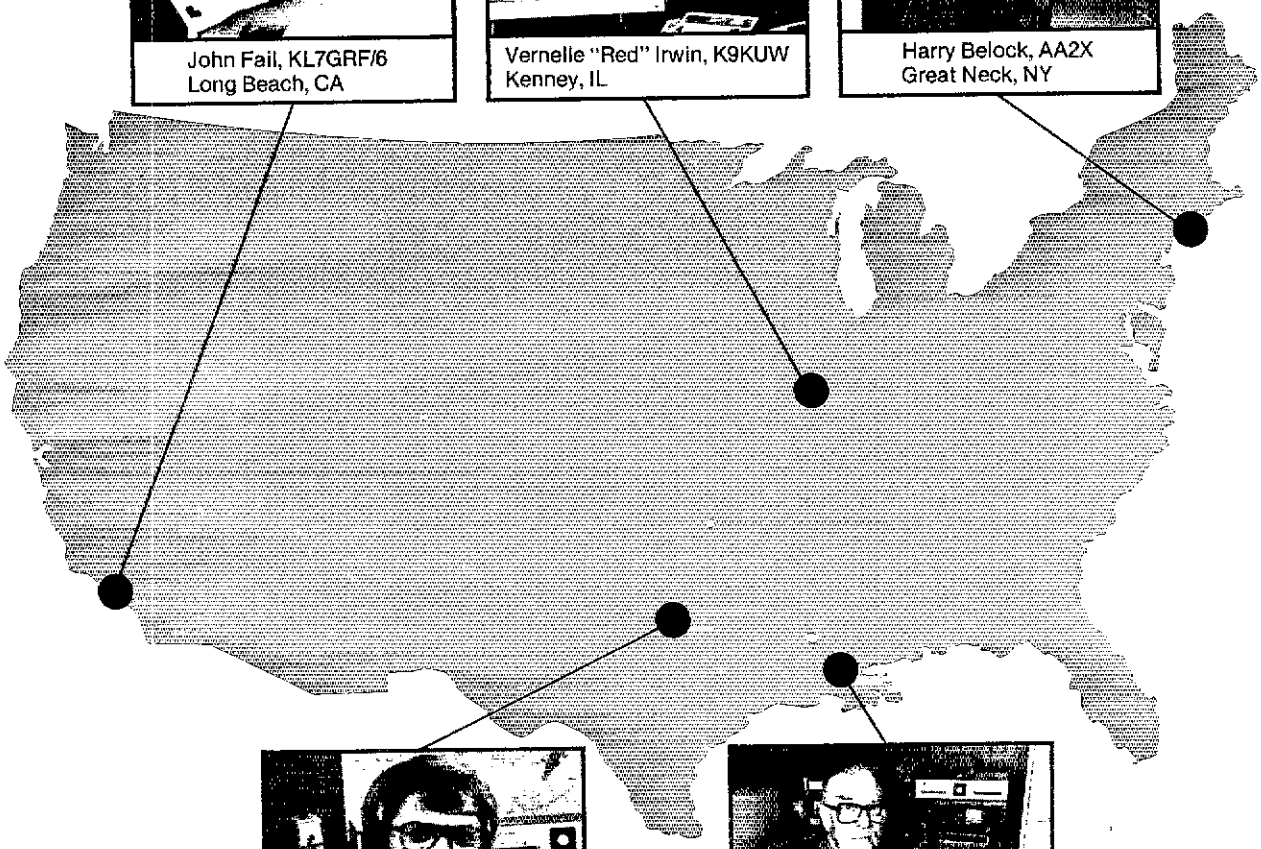
John Fail, KL7GRF/6
Long Beach, CA



Vernelle "Red" Irwin, K9KUW
Kenney, IL



Harry Belock, AA2X
Great Neck, NY



Tom Gentry, K5VOU
Dallas, TX

John Whitaker, W5HEZ
Baton Rouge, LA

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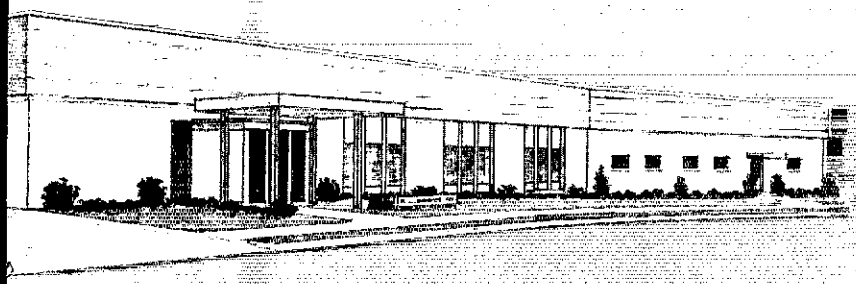
Known throughout the world for quality...

DRAKE Equipment for Radio Communications



R. L. DRAKE COMPANY
540 Richard Street, Miamisburg, Ohio 45342
Phone (513) 866-2421 • Telex 288-017

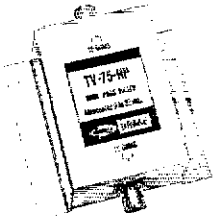
Specifications, availability and prices subject to change without notice or obligation

Drake TVI Filters

High Pass Filters for TV Sets

provide more than 40 dB attenuation at 52 MHz and lower. Protect the TV set from amateur transmitters 6-160 meters.

Model No. 1603
Drake TV-300-HP
For 300 ohm twin lead. New terminals for easy installation.

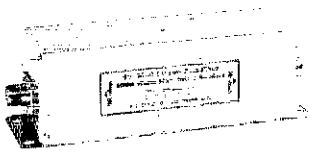


Model No. 1610
Drake TV-75-HP
For 75 ohm TV coaxial cable; TV type "F" connectors installed.

Low Pass Filters for Transmitters

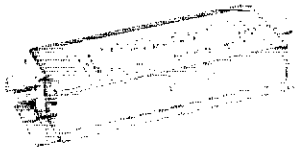
have four pi sections for sharp cut off above the hf amateur bands and to attenuate transmitter harmonics falling in any TV channel and fm band. 52 ohm. SO-239 connectors built in.

Model No. 1608 **Drake TV-3300-LP**



1000 watts max. below 30 MHz. Attenuation better than 80 dB abov 41 MHz. Helps TV i-f interference, as well as harmonic interference.

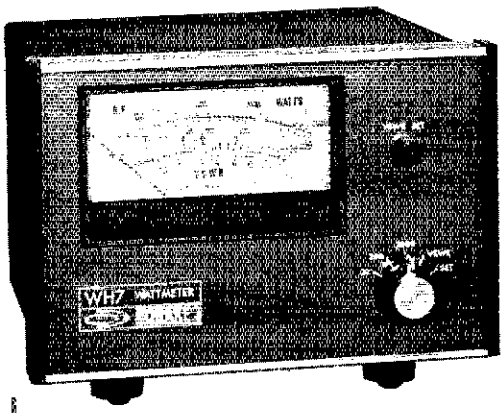
Model No. 1605 **Drake TV-42-LP**



is a four section filter designed with 43.2 MHz cut-off and extremely high attenuation in all TV channels for transmitters operating at 30 MHz and lower. Rated 100 watts input.

Drake TVI Filters help you keep peace with your neighbors

Model 1514



Drake WH-7 Directional RF Wattmeter

1.8-30 MHz

Drake directional, inline wattmeters, using printed circuits, toroids, and state of the art techniques, permit versatile performance and laboratory accuracy, yet at a lower cost.

Removable coupler provides remote metering, and allows convenient positioning of coaxial cable.

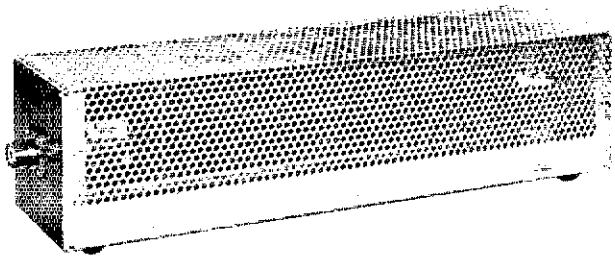
WH-7 wattmeter makes possible quick, accurate adjustments of antenna resonance and impedance match, when placed between transmitter and matching network.

Drake WH-7: Designed for user convenience and high accuracy. This instrument includes three calibrated scales for rf power to satisfy applications from QRP to high power (0-20, 0-200 and 0-2000 watts full scale). A fourth calibrated scale provides direct reading VSWR information, and is switch selected from front panel. The WH-7 is styled to match the 7-line.

Specifications

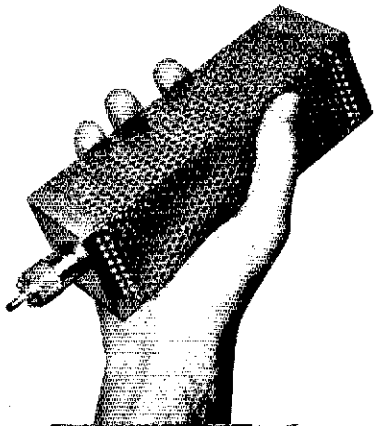
Frequency Coverage	1.8-30 MHz
Line Impedance	50 ohm resistive
Power Capability	2000 W continuous
Jacks, Removable Coupler	Two S0239 input and output connectors
Semiconductors	Two power meter rectifiers
Accuracy	± (5% of reading + 1% of full scale)
VSWR Insertion	Insertion of wattmeter in line changes VSWR no more than 1.05:1
Shipping Weight	3 lbs (1.4 kg)
Dimensions	5.3"H x 6.9"W x 7.5"D (13.5 x 17.5 x 19 cm)

Drake "Dry" Dummy Loads—no oil required



Model 1551 Drake DL-1000

- **1000 watts** for 30 seconds, with derating curve to 5 minutes. Designed to accept Drake FA-7 cooling fan for extended high power operation.
- **VSWR of 1.5:1 max.** 0-30 MHz.
- Provided with SO-239 coax connector, and rubber feet for desk or bench use.
- **Size** 14" x 3.6" (35.6 x 9.1 cm). Wt. 2 lbs (910 g)



Model 1550 Drake DL-300

- **300 watts** for 30 seconds, with derating curve to 5 minutes.
- **Built-in PL-259** coax connector for direct connection to rear of transceiver or transmitter-no jumper coax necessary.
- **VSWR of 1.1:1 max.** 0-30 MHz 1.5 max. 30-160 MHz.
- Ideal as bench test device for amateur or commercial hf and vhf gear.
- **Small size** fits conveniently in any field service tool box. 6.7" x 2.08" (17.0 x 5.3 cm). Wt. 11 oz (310 g)

A remarkable engineering breakthrough...

DRAKE TR-7

continuous coverage reception—no gaps—no range crystals required †

Amateur Band transmission, including capability for MARS, Embassy, Government, and future band expansions*

The Drake TR-7 System significantly advances the technology of world-wide radio communications and unites the new state of the art.

Models shown are Drake TR-7/DR-7 with RV-7 and MS-7

Designed and manufactured in U.S.A.

In 1963 Drake led the way by producing the first commercially available amateur transceiver that employed the now widely copied 9 MHz i-f frequency. Even today, many major competitive transceivers are still being introduced using i-f's in this range.

Now, Drake leads the way again by developing the first commercially available amateur transceiver that uses a 48 MHz i-f, through the technique of "Up-Conversion." This system greatly improves image and general coverage performance, and will be copied in the years to come. With Drake, you can join the new state of the art today!

solid state continuous coverage synthesized hf system Model 1337

DRAKE®

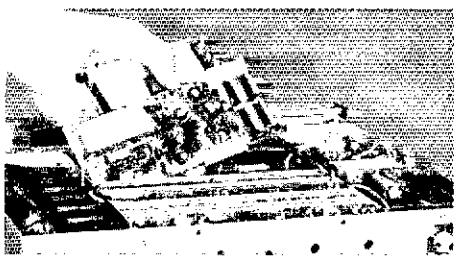
The design philosophy behind the new Drake "7 system" has created a most sophisticated system concept, extending from engineering to the visual appearance of the system and each of its parts.

The TR-7 System is the result of one of the most extensive engineering and development programs in the history of the R. L. Drake Company, and provides the user with many innovative design features.

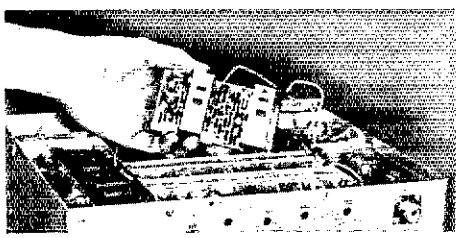
With the excellent design of its front panel and controls, the system is simple and straightforward to operate–makes state of the art performance a pleasure.

Broadband, Solid State Design—100% solid state throughout. All circuits are broadbanded so there is no need for preselection tuning or transmitter adjustments of any kind.

Synthesized/PTO Frequency Control—A Drake exclusive: Special high performance synthesizer, combined with the famous Drake PTO, provides smooth, linear tuning with 1 kHz dial and 100 Hz digital readout. 500 kHz up/down range switching is pushbutton controlled.

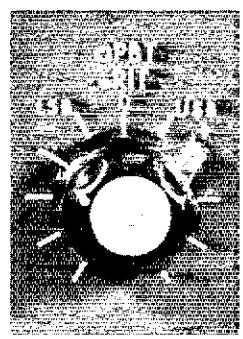


† **Continuous, Wide Range Frequency Coverage**—The TR-7/DR-7 provides reception from 1.5 thru 30 MHz—continuously, and **zero** thru **30 MHz** continuously with the optional Aux-7 Range Program Board. No gaps or range crystals required. The highly advanced Drake Synthesizer makes this possible, and is an industry first. The TR-7/DR-7 provides transmit coverage for all Amateur Bands 160 thru 10 meters. With the optional Aux-7 Range Program Board, diode-programmable out-of-band transmit coverage is available for MARS, Embassy, Government, and future band expansions in the range 1.8 thru 30 MHz.* The Aux-7 Board also provides 0 thru 1.5 MHz receive coverage and crystal-controlled fixed channel operation for Government, Amateur, or semi-commercial applications anywhere in the hf range. The TR-7 w/o DR-7 provides coverage of the Amateur Bands 160 thru 15 meters and the 28.5-29.0 MHz range of 10 meters. The Aux-7 Range Program Board is also useable in the standard TR-7 for extra range coverage as noted.



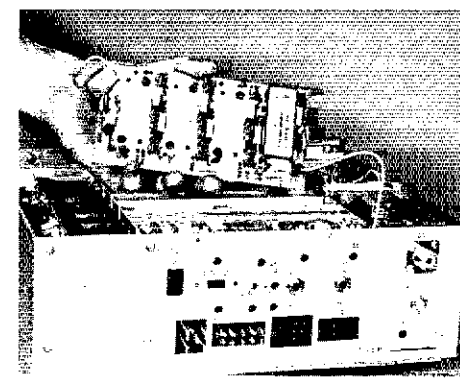
State of the Art Receiver Design—The Drake TR-7 introduces another industry first for amateur transceivers: "Up-Conversion," in combination with a special high level double balanced mixer for superior strong signal handling, spurious and image response performance. The first i-f of 48.05 MHz places images well outside the receiver passband, and provides for true general coverage operation without i-f gaps.

True Passband Tuning—The TR-7 employs the famous Drake Full Passband Tuning instead of the limited range "i-f shift" found in some other units. The Drake System tunes from the top edge of one sideband, through center, to the bottom edge of the other sideband. In fact, the range is even wider to accommodate RTTY. Full passband tuning greatly improves receiving performance in heavy QRM.



Unique Independent Receive Selectivity—Optional receiving selectivity filters can be installed internally and pushbutton-selected from the front panel. These may be selected independently of transmit mode and provide optimum response for various conditions of ssb, cw, RTTY, and a-m. You may also transmit cw while receiving ssb, or vice versa, or even transmit one sideband while receiving the other. The standard filter is 2.3 kHz for ssb. You may choose from optional 300 Hz, 500 Hz, a special 1.8 kHz for crowded ssb, or 6 kHz filter for a-m. Any three may be installed in addition to the ssb filter.

Effective Noise Blanker—This accessory is custom engineered to provide true impulse-type noise blanking performance.



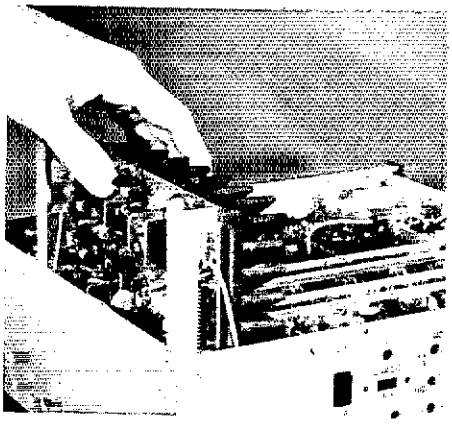
Special High Power Solid State PA—A Drake custom-designed diagonal heat sink provides for an internally mounted power amplifier with nothing mounted outboard subject to physical damage. The unique air ducting effect of this amplifier allows an optional rear-mounted fan to provide continuous duty on SSTV/RTTY. Continuous ssb/cw

(TR-7 features continued on next page)

*Note: Out-of-band transmitter coverage for MARS, Government, etc. is available only in ranges authorized by the FCC, Military, or other government agency for a specific service. Proof of license for that service must be submitted to the R. L. Drake Company, including the 500 kHz range to be covered. Upon approval, and at the discretion of the R. L. Drake Company, a special range IC will be supplied for use with the Aux-7 Range Program Board. Prices quoted from the factory. See operator's manual for details. (Not available for services requiring type acceptance.)

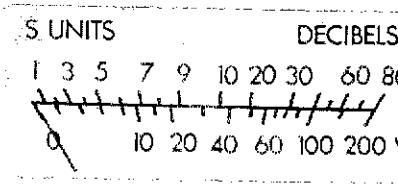
(Continued from preceding page)

DRAKE TR-7 solid state continuous coverage synthesized hf system

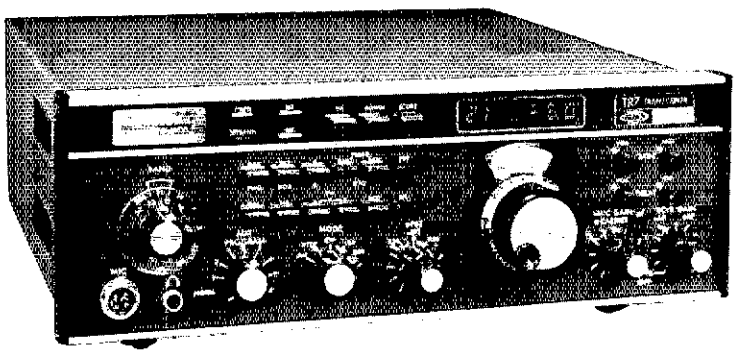


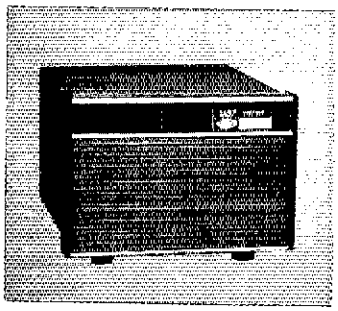
operation is available without the fan, due to the excellent heat sink design. The optional Drake PS-7 Ac Supply is rugged, rated for continuous duty, and will easily handle power requirements. The System is rated 250 watts input—in any of its modes. Fully VSWR protected.

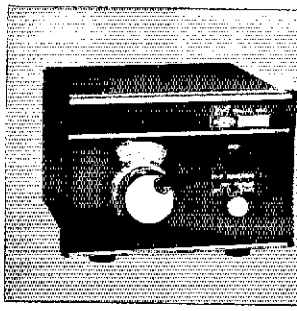
TR-7 Internal Test Facilities—As well as the standard "S" meter function, the TR-7 metering includes a built-in rf Wattmeter/VSWR Bridge. Also, the DR-7 digital counter reads frequencies to 150 MHz for test purposes. Access to the counter is from the rear panel.



Receiver Incremental Tuning (RIT)—Complete RIT Flexibility is provide for both the TR-7 and RV-7 remote V for maximum convenience. The RV-7 also includes a special "spot" functi for easy zero beating.







Model 1337 Drake TR-7 Transceiver

Model 1530 Drake DR-7 General Coverage/ Digital Readout Board

Model 1336 Drake TR-7/DR-7 General Coverage Digital R/O Transceiver

Model 1338 Drake RV-7 Remote VFO

Model 1502 Drake PS-7 120/240V Ac Supply includes special wide range voltage and frequency capability. Operates from any nominal line voltage (90-132 V/ 180-264 V; 50-60 Hz) ideal for overseas

Model 1536 Drake Aux-7 Range Program Board†

Model 1531 Drake MS-7 Matching Speaker

Model 1537 Drake NB-7 Noise Blanker

Model 1529 Drake FA-7 Fan

Model 7021 Drake SL-300 Cw Filter, 300 Hz

Model 7022 Drake SL-500 Cw Filter, 500 Hz

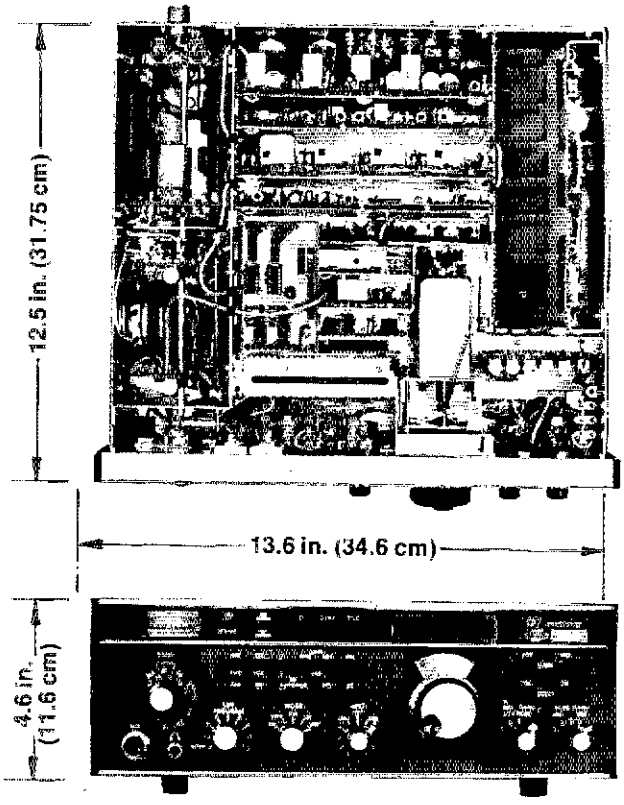
Model 7023 Drake SL-1800 Ssb/RTTY Filter, 1.8 kHz

Model 7024 Drake SL-6000 A-m Filter, 6.0 kHz

Model 1335 Drake MMK-7 Mobile Mounting Kit

Model 7037 Drake TR-7 Service Kit/Extender Board Set

Model 385-0004 Drake TR-7 Service/Schematic Book



DRAKE TR-7 SPECIFICATIONS

GENERAL

Frequency Coverage
(with DR-7 Digital R/O Gen. Cov. Board)

Receive
Without Aux-7 ... 1.5 to 30 MHz, continuous, no gaps
With Aux-7† ..... Same, plus 0 to 1.5 MHz at reduced performance in this range

Transmit
Without Aux-7 ... 1.8-2.0, 3.5-4.0, 7.0-7.5, 14.0-14.5, 21.0-21.5, 28.0-30.0 MHz
With Aux-7† ..... Above ranges, plus any eight 500 kHz segments from 1.8 to 30 MHz

Frequency Coverage
(without DR-7 Digital R/O Gen. Cov. Board)

Receive/Transmit (Transmit above 1.8 MHz only)
Without Aux-7 ... 1.5-2.0, 3.5-4.0, 7.0-7.5, 14.0-14.5, 21.0-21.5, 28.5-29.0 MHz, plus Receive only on 2.5-3.0 MHz and 5.0-5.5 MHz
With Aux-7† ..... Above ranges, plus any eight 500 kHz segments from 0 to 30 MHz, (0 to 1.8 MHz Receive only)

Modes of Operation ... Usb, Lsb, Cw, RTTY, A-m equiv. (A-3H)

Frequency Stability ... Total drift is less than 100 Hz after warm up. Total frequency change is less than 100 Hz over the 11-16 V-dc input supply range

Frequency Readout Accuracy
Analog ..... Better than ± 1 kHz when calibrated at the nearest marker point
Digital ..... 15 ppm ± 100 Hz

External Counter Mode
Maximum
Input Frequency ... 150 MHz
Input Level Range ... 50 mV to 2 V, rms

Power Supply Requirements .... 11-16 V-dc (13.6 V-dc nominal), 3A receive, 25A transmit

Dimensions
Depth ..... 12.5 in. (31.75 cm), excluding knobs and connectors.
Width ..... 13.6 in. (34.6 cm)
Height ..... 4.6 in. (11.6 cm), excluding feet
Weight ..... 17.1 lb. (7.75 kg)

RECEIVER

(1.8-30 MHz, reduced specs 0-1.8 MHz)

Sensitivity
Ssb, Cw ..... Less than 0.5 μV for 10 dB (S+N)÷N
A-m (30% Mod.) ..... Less than 2.0 μV for 10 dB (S+N)÷N

Selectivity ..... 2.3 kHz at −6 dB and 4.1 kHz at −60 dB (1.8:1 shape factor)

Ultimate Selectivity ... Greater than 100 dB

Agc ..... Less than 4 dB output variation for 100 dB input signal change, referenced to agc threshold

Intermodulation ..... Intercept Point, +20 dBm
Two-tone Dynamic Range, 99 dB
(At tone spacings of 100 kHz and greater)

I-f Frequency ..... First I-f .....48.05 MHz
Second I-f .....5.645 MHz

Image and I-f Rejection Greater than 80 dB

Spurious Response ... Greater than 60 dB down

Internally Generated Spurious ..... Less than 1 μV equivalent, except 3 μV equivalent from 5 to 6 MHz. (Reduced specs on internal osc frequencies)

Audio Output ..... 2.0 watts @ less than 10% THD (4 ohm load)

TRANSMITTER

Power Input (Nominal)
Ssb ..... 250 watts PEP
Cw ..... 250 watts
A-m equiv. ..... 80 watts (carrier), plus upper sideband

Load Impedance ..... 50 ohms, nominal

Spurious Output ..... Greater than 50 dB down

Harmonic Output ..... Greater than 45 dB down

Intermodulation Distortion ..... 30 dB below PEP (24 dB below one of two tones)

Undesired Sideband Suppression ..... Greater than 60 dB @ 1 kHz

Duty Cycle
Ssb, Cw 100%
Tune, SSTV, RTTY, A-m w/o 1529 FA-7 Fan: 33%, 5 min. transmit, max.
with 1529 FA-7 Fan: 100%

Wattmeter Accuracy ... ±5% @ 100 watts (50 ohm load)

Carrier Suppression ... Greater than 50 dB

Microphone Input ..... High impedance

VSWR Turndown (Nominal) (Percent rf power turndown)

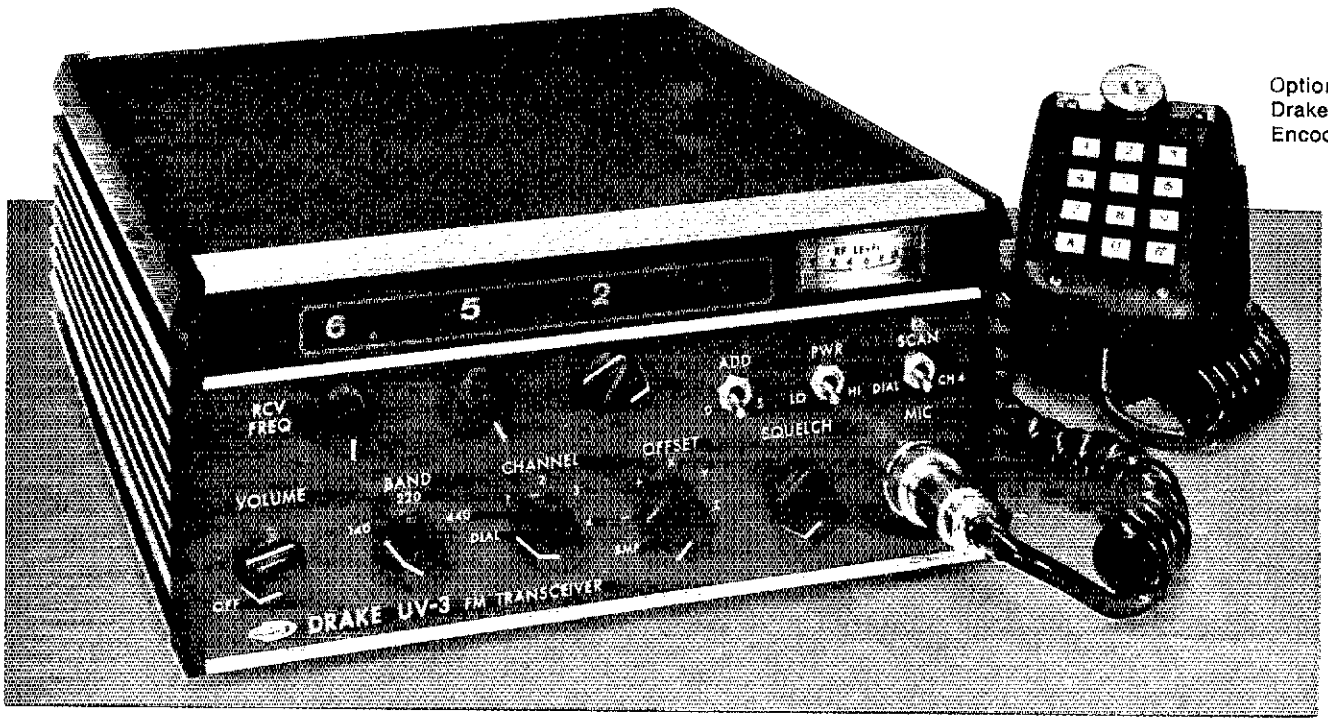
@ 1:1	0%
@ 2:1	10%
@ 3:1	25%
@ 4:1	50%
@ 5:1 and above	90%

† Aux-7 must be used with either Model 1546 RRM-7 Range Receive Module, or Model 1547 RTM-7 Range Transceive Module. Use one module per 500 kHz range. Modules plug directly into Aux-7.

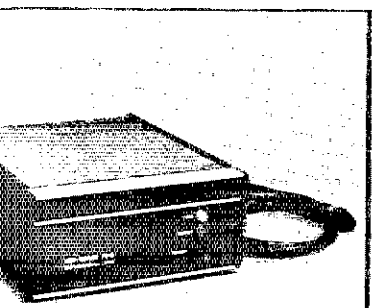
R. L. DRAKE COMPANY

540 Richard St., Miamisburg, Ohio 45342
Phone: (513) 866-2421 • Telex: 288-017

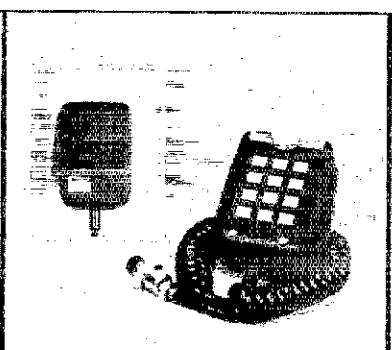
DRAKE® UV-3 uhf-vhf fm



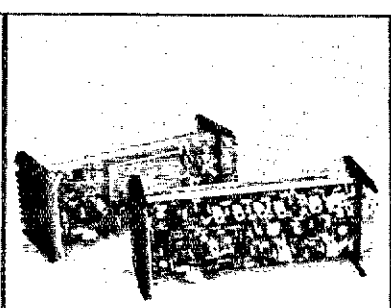
- Fully synthesized on each band, 5 kHz steps, digital read-out.
- Fm coverage on complete 144, 220 and 440 Amateur Bands, depending on model purchased. Completely band-switched from front panel.
- Four extra diode programmable fixed channels, with offsets, available for each band, in addition to the synthesizer.
- Diode programmable non-standard offsets available for each band.
- Separate SO-239 Antenna Connector for each band.
- Outstanding receiver front-end performance. Ideal for use in metropolitan areas where many repeaters are in use.
- Squelch.
- Hi-lo power, with lo-power adjustable.
- Priority scan feature:
  —scan a programmed fixed channel from any synthesizer frequency.
  —scan any synthesizer frequency from a programmed fixed channel.
  —scan a specific programmed fixed channel from another programmed fixed channel.
- Plug-in modular construction.
- Remote operation. Removable control head will operate radio in trunk compartment from driver seat. (remote kit optional)
- No frequency mixing in transmitter. Transmitter frequency derived directly from VCO frequency. Provides extremely low spurious output.
- Companion ac power supply (PS-3).
- Operate mobile or fixed station. (13.8 V supply required)
- Small, compact, rugged construction utilizing aluminum extrusion sides and panel.
- Transmit audio custom tailored for maximum communications "punch."
- Choice of one, two, or three band coverage in a single transceiver. Basic models may be purchased, with factory installed add-on modules added later.



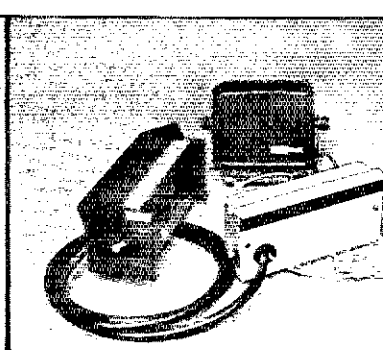
PS-3 Ac Power Supply



1525EM Encoding Microphone



220 and 440 Add-on Modules



UMK-3 Remote Trunk-Mount Kit

3-band system

Fully synthesized on each band

144 220 440 MHz

DRAKE UV-3 SPECIFICATIONS

GENERAL

Frequency Coverage: 144 ..... 144-148 MHz*
220 ..... 220-225 MHz
440 ..... 440-450 MHz

Mode: Fm (5 kHz deviation)

Supply Voltage: 11.5-15.0 V dc negative ground

Supply Current: Receive ..... 0.9 A Standby
Transmit ..... 6 A High Power
1.3 A Low Power

Dimensions: Length (single unit) ..... 9" (22.86 cm)
(two unit) ..... 11.5" (29.2 cm)
(three unit) ..... 14" (35.56 cm)
Width ..... 8.1" (20.6 cm)
Height ..... 3.5" (8.9 cm)

Weight: (One unit) ..... 7 lbs. (3.17 kg)
(Two unit) ..... 7.3 lbs. (3.31 kg)
(Three Unit) ..... 7.6 lbs. (3.45 kg)

Operating Temperature: 0°C to 60°C

*Band overlap allows tuning of most Mars frequencies

FREQUENCY SYNTHESIZER

Type: Directly programmable, digital phase locked loop, 5 kHz steps

Reference: 5 MHz crystal oscillator

Frequency Accuracy: ±.0005% over a temperature range of 0°C to 60°C with a supply voltage variation of 11.5 to 15 V dc

RECEIVER

Type: Double conversion, 1st i-f @ 10.7 MHz, 2nd i-f @ 455 kHz, 6 pole crystal filter @ 10.7 MHz and 8 pole ceramic filter at 455 kHz

Selectivity: 12 kHz @ −3 dB

Sensitivity: 146-148 MHz, 222-225 MHz, 442-447 MHz } Typically less than .35 μV for 12 dB SINAD
144-148 MHz, 220-225 MHz, 440-450 MHz } 5 μV (max.) for 12 dB SINAD

Adjacent Channel Rejection: 144 ..... greater than 80 dB min. @ ± 30 kHz
220, 440 ..... greater than 70 dB min @ ± 30 kHz
144, 220, 440 ..... greater than 60 dB min. @ ± 15 kHz

Intermodulation Attenuation (EIA RS-204-A): 144 ..... 80 dB (referenced to 12 dB SINAD)
220 ..... 75 dB (referenced to 12 dB SINAD)
440 ..... 65 dB (referenced to 12 dB SINAD)

Image Rejection: 144 ..... 80 dB
220 ..... 60 dB
440 ..... 50 dB

I-f Rejection: Greater than 95 dB

Audio Output: 2.5 watts @ less than 10% THD, 2 watts @ less than 5% THD

Squelch Sensitivity: Less than 0.2 μV

Meter: Indicates relative signal level

TRANSMITTER

Power Output (13.8 V dc): High Power: 144 ..... 25 watts nom. (144-148 MHz)
220 ..... 10 watts min. (220-225 MHz)
440 ..... 10 watts min. (440-450 MHz)
Low Power: Approx. 10% of high power (adjustable)

Harmonic and Out of Band Spurious: 144, 220 ..... −60 dB (min.) referenced to carrier
440 ..... −40 DB (min.) referenced to carrier

Spurious in Band: −75 dB (min.) referenced to carrier

Modulation: Direct fm, pre-set to ±5 kHz deviation

Hum and Noise: Greater than 40 dB below maximum deviation

Model 1346 Drake UV-3 (144-220-440)
Model 1344 Drake UV-3 (144-440)
Model 1340 Drake UV-3 (144)

(Models above include factory installed modules for bands as listed, standard dynamic mike, and mobile mounting bracket.)

Add-on modules expand band coverage of models which may have been purchased in a single band or two band configuration. Prices include factory installation which is necessary to meet FCC receiver certification requirements.

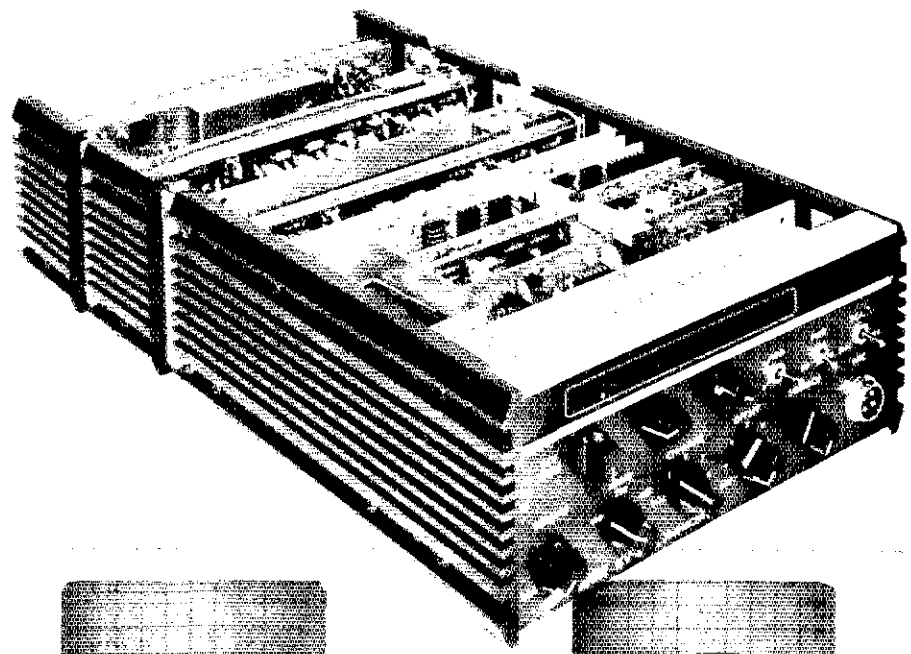
220 Add-on Module
440 Add-on Module
144 Add-on Module

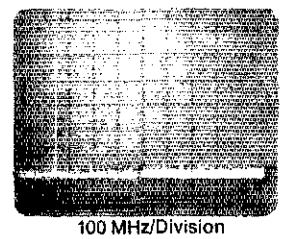
Model 1504 Drake PS-3 AC Power Supply

Model 1525 Drake 1525EM Encoding Mike (see next page)

Model 1330 Drake UMK-3 Remote Trunk-Mount Kit

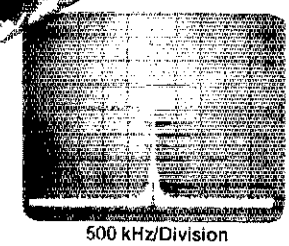
Model 385-0002 Drake UV-3 Service/Schematic Book





100 MHz/Division

UV-3 Frequency Spectrum
146.520 MHz
25 Watts



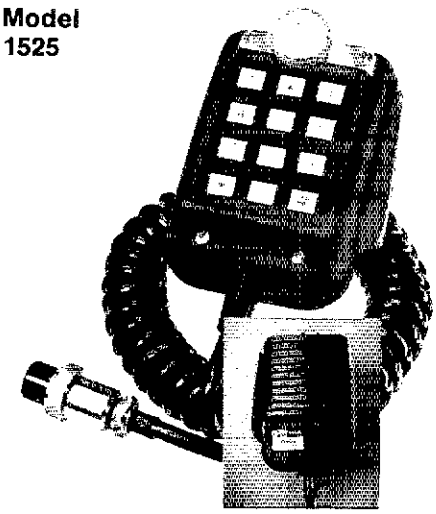
500 kHz/Division

DRAKE® MICROPHONES

Drake 1525EM Push Button Encoding Mike

- Microphone and auto-patch encoder in single convenient package with coil cord and connector. Fully wired and ready for use.
- High accuracy IC tone generator, no frequency adjustments.
- High reliability Digitran® keyboard.
- Power for tone encoder obtained from transceiver through microphone cable. No battery required. Low current drain.
- Low output impedance allows use with almost all transceivers.
- Four pin microphone plug: directly connects to Drake UV-3 without any modification in transceiver. Compatible with all previous Drake and other 2 meter units with minor modifications.
- Tone level adjustable

Model 1525



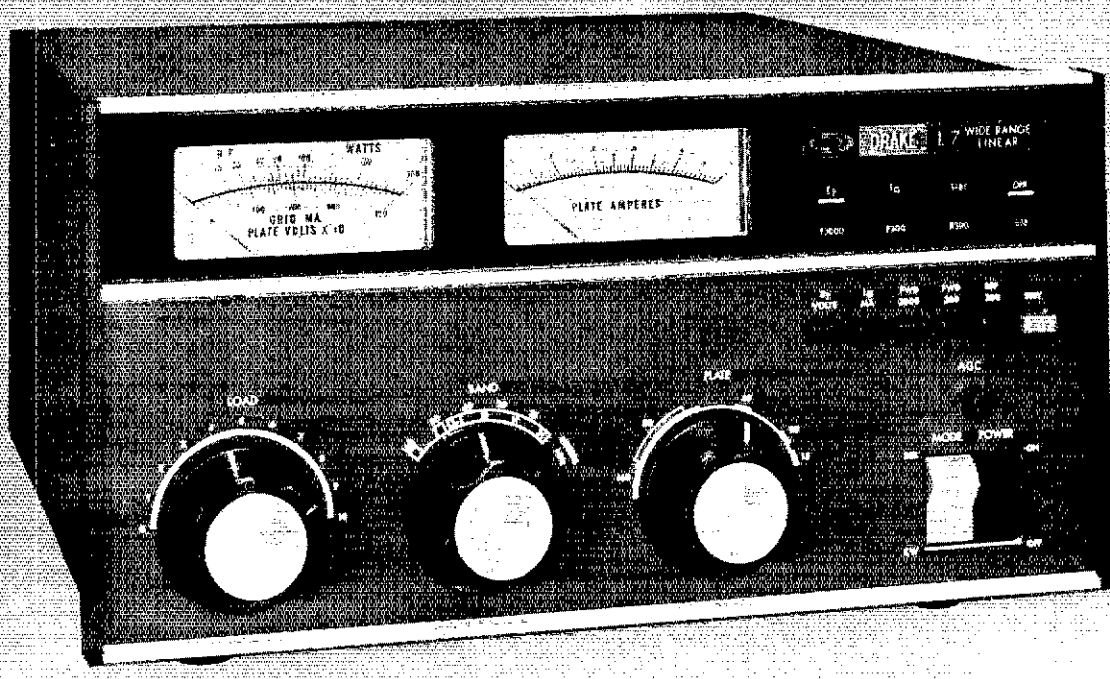
Drake 7077 Dynamic Desk Microphone

- **Audio and level characteristics** custom designed to match the transmit audio requirements of the Drake TR-7.
- **Features both VOX and PTT** operation without modification.
- **High Impedance**
- Includes coil cord and plug wired for direct installation to the Drake TR-7.
- Style and color provide a beautiful match to the Drake 7-Line.
- Size 4.3"W x 5.8"D x 9.3"H (10.9 x 14.7 x 23.6 cm). Wt. 1 lb. 7 oz (650 g).

R. L. DRAKE COMPANY DRAKE®
540 Richard St., Miamisburg, Ohio 45342
Phone: (513) 866-2421 • Telex: 288-017

Drake L-7 Continuous Duty 160-10* Meters 2kW Linear Amplifier

Model 1528



Temperature controlled design for "key-down" operation over a wide frequency range. Newly engineered for coverage of any new or expanded hf amateur bands within FCC amplifier rules. Also features wide frequency coverage for MARS, and other services authorized for this type of amplifier.

2 kW PEP, 1 kW cw, RTTY, SSTV operation—all modes, full rated input, continuous duty cycle.

160-10* meter amateur band coverage, plus expanded ranges for any future hf band expansions or additions within FCC rules. These ranges also include increased coverage for MARS, embassy, government, or other such services.

The Drake L-7 utilizes a pair of Eimac 3-500 Z triodes for rugged use, and lower replacement cost compared to equivalent ceramic types. Tubes are included.

Accurate built-in rf wattmeter, with forward/reverse readings, is switch selected. Calibrated 300/3000 watt scales.

Temperature controlled two speed fan is a high volume low noise type and offers optimum cooling.

Adjustable exciter agc feedback circuitry permits drive power to be automatically controlled at proper levels to prevent peak clipping and cw overdrive. Front panel control.

By-pass switching is included for straight through, low power operation without having to turn off amplifier.

Bandpass tuned input circuitry for low distortion and 50 ohm input impedance.

Amplifier is comprised of two units—rf deck for desk top and separate power supply.

Operates from 120/240 V ac, 50/60 Hz primary line voltage.

DRAKE L-7 SPECIFICATIONS

Frequency Coverage*: Ham bands 160 through 15 meters. Non-amateur frequencies between 6.5 and 21.5 MHz may be covered with some modification of the input circuit.

Plate Power Input: 2000 Watts PEP on SSB/AM and 1000 Watts DC on CW, RTTY, and SSTV.

Drive Power Requirements: 100 Watts PEP on SSB and 75 Watts on CW, AM, RTTY, and SSTV.

Input Impedance: 50 Ohms. (Bandpass tuned input)

Output Impedance: Adjustable pi-network matches 50 Ohm line with SWR not to exceed 2:1.

Intermodulation Distortion Products: In excess of −33 dB.

Wattmeter Accuracy: 300 Watts forward and reflected, ± (5% of reading + 3 Watts). 3000 Watts forward, ± (5% of reading + 30 Watts).

Power Requirements: 240 Volts 50-60 Hertz 15 Amperes, or 120 Volts 50-60 Hertz 30 Amperes.

Tube Complement: Two of 3-500Z or 8802/3-500Z or 8163 or 3-400Z.

Dimensions: Amplifier 13.69"W x 6.75"H x 14.25"D (34.8 x 17.1 x 36.2 cm). **Power Supply** 6.75"W x 7.88"H x 11"D (17 x 20 x 28 cm).

Weight: Amplifier 27 lbs (12.25 kg), **Power Supply** 42.5 lbs (19.3 kg).

*Export model includes coverage of the 10-meter Ham Band.

Drake R-7 Synthesized, General Coverage Receiver

Model 1240

Full general coverage recepti 0-30 MHz, with no gaps or range crystals required.

Continuous tuning all the way from vlf thru hf. Superb state-of-the-art performance on a-m, ssb, RTTY, and cw —and it transceives with the Drake TR-7.

100% solid state broadband design, fully synthesized with a permeability tuned oscillator (PTO) for smooth, continuous tuning.

Covers the complete range 0 to 30 MHz with no gaps in frequency coverage. Both digital and analog frequency readout.

Special front-end circuitry employing a high level double balanced mixer and 48 MHz "up-converted" 1st i-f for superior general coverage, image rejection and strong signal handling performance.

Complete front-end bandpass filters are included that operate from hf thru vlf. External vlf preselectors are not required.

10 dB pushbutton-controlled broadband preamp can be activated on all ranges above 1.5 MHz. Low noise design.

Various optional selectivity filters for cw, RTTY and a-m are switch-selected from the front panel. Ssb filter standard.

Special new low distortion "synchro-phase" a-m detector provides superior international shortwave broadcast reception. This new technique permits 3 kHz a-m sideband response with the use of a 4 kHz filter for better interference rejection.

Tunable i-f notch filter effectively reduces heterodyne interference from nearby stations.

The famous Drake full electronic passband tuning system is employed, permitting the passband position to be adjusted for any selectivity filter. This is a great aid in interference rejection.

Three agc time constants plus "Off" are switch-selected from the front panel.

Complete transceive/separate functions when used with the Drake TR-7 transceiver are included, along with separate R-7 R.I.T. control.

Special multi-function antenna selector/50 ohm splitter is switch-selected from the front panel, and provides simultaneous dual receive with the TR-7. This makes possible the reception of two different frequencies at the same time. Main and alternate antennas and vhf/uhf converters may also be selected with this switching network.

The digital readout of the R-7 may be used as a 150 MHz counter, and is switched from the front panel. Access thru rear panel connector.

The built-in power supply operates from 100, 120, 200 240 V-ac, 50/60 Hz, or nominal 13.8 V-dc.

The R-7 includes a built-in speaker, or an external Drake MS-7 speaker may be used.

Built-in 25 kHz calibrator for calibration of analog dia

Low level audio output for tape recorder.

Up to eight crystal controlled fixed channels can be selected. (With Drake Aux-7 installed.)

Optional Drake NB-7A Noise Blanker available. Provides true impulse type noise blanking performance.

DRAKE

R. L. DRAKE COMPAN

Optional accessories available

Model 1531 Drake MS-7 Speaker
Model 7021 Drake SL-300 Cw Filter, 300 Hz
Model 7022 Drake SL-500 Cw Filter, 500 Hz
Model 7023 Drake SL-1800 Ssb/RTTY Filter, 1800 Hz
Model 7024 Drake SL-6000 A-m Filter, 6.0 kHz
Model 7026 Drake SL-4000 A-m Filter, 4.0 kHz
Model 1532 Drake NB-7A Noise Blanker
Model 1536 Drake Aux-7 Range Program/Fixed-Frequency Board

DRAKE R-7 SPECIFICATIONS

Frequency Coverage, continuous tuning (With Drake DR-7 Digital R/O, General Coverage Board)
0 to 30 MHz continuous (With or without Aux-7 board) (No gaps in frequency coverage)

Frequency Coverage, continuous tuning (Without DR-7 Board installed)

0.01 to 0.5 MHz 0.5 to 1.0 MHz 1.0 to 1.5 MHz 1.5 to 2.0 MHz 2.5 to 3.0 MHz 3.5 to 4.0 MHz	Without Aux-7 Board	5.0 to 5.5 MHz 7.0 to 7.5 MHz 14.0 to 14.5 MHz 21.0 to 21.5 MHz 28.5 to 29.0 MHz

Plus any eight additional 500 kHz segments between 0 and 30 MHz when programmed into Aux-7 Board.

Crystal Controlled Fixed Frequencies: Up to eight crystal-controlled fixed frequencies within the 0-30 MHz range with Aux-7 Accessory Board. Proper 500 kHz range for desired fixed frequency is also programmed into Aux-7.

Frequency Stability: Less than 100 Hz drift after temperature stabilization including ±10% line voltage variation.

Digital Readout Accuracy: (DR-7 installed) 15 PPM ± 100 Hz

Analog Dial Accuracy: Better than ±1 kHz when calibrated to nearest calibrator marker.

Modes of Operation: Ssb, cw, RTTY, SSTV, a-m.

Sensitivity (ssb): 1.8-30 MHz Less than .20μV for 10dB S+N/N with preamp on (typically .15μV) (Noise floor typically −134 dBm) Less than .50μV for 10 dB S+N/N without preamp (typically .30μV) (Noise floor typically −128 dBm). .01-1.5 MHz Less than 1.0μV for 10 dB S+N/N

Sensitivity (a-m): 1.8-30 MHz Less than 1.2μV for 10dB S+N/N @ 30% modulation, preamp on. Less than 2.0μV for 10 dB S+N/N @ 30% modulation, preamp off. .01-1.5 MHz Less than 4.0μV for 10 dB S+N/N @ 30% modulation.

Selectivity (2.3 kHz filter supplied): 2.3 kHz at −6 dB, 4.2 kHz at −60 dB (1.8:1) shape factor. Optional 300 Hz, 500 Hz, 1800 Hz and 4 kHz filters are available as follows:

Ultimate Selectivity: Greater than 100 dB

Accessory Crystal Filters

SL-300 cw filter: 300 Hz @ 6 dB, 700 Hz @ 60 dB
SL-500 cw, RTTY Filter: 500 Hz @ 6 dB, 1100 Hz @ 60 dB
SL-1800 ssb/RTTY Filter: 1800 Hz @ 6 dB, 3600 Hz @ 60 dB
SL-4000 a-m Filter: 4 kHz @ 6 dB, 8 kHz @ 60 dB
SL-6000 a-m Filter: 6 kHz @ 6 dB, 12 kHz @ 60 dB

Strong Signal Handling

Two-tone dynamic range: 99 dB *	1.8-30 MHz
Third order intercept point: +20 dBm	preamp off
Two-tone dynamic range: 95 dB *	1.8-30 MHz
Third order intercept point: +10 dBm	preamp on

Blocking: >145 dB above noise floor

(at tone spacings of 100 kHz and greater)

I-f and Image Rejection: Greater than 80 dB (48.05 MHz 1st i-f) (5.645 MHz 2nd i-f) (50 kHz 3rd i-f)

Agc Performance; Less than 4 dB audio output variation for 100 dB input signal change above agc threshold. Agc threshold is typical .8μV with preamp off and .25μV with preamp on.

Attack time: 1 millisecond. Three selectable release times: Slow—2 seconds; Med—400 m sec; Fast—75 m sec. Also, "Off" position is provided.

Antenna Input Impedance: Nominal 50 ohms

Audio Output: 2.5 watts with less than 10% T.H.D. into nominal 4 ohm load.

Power Requirements: 100/120/200/240 V-ac ±10%, 50/60 Hz, 60 watts or 11.0 to 16.0 V-dc (13.8 V-dc nominal), 3 amps

External Counter Mode (DR-7 installed): Readout: to 100 Hz. Accuracy: 15 PPM ±100 Hz. Maximum input frequency: 150 MHz. Input level range: 50 mV to 2 V rms.

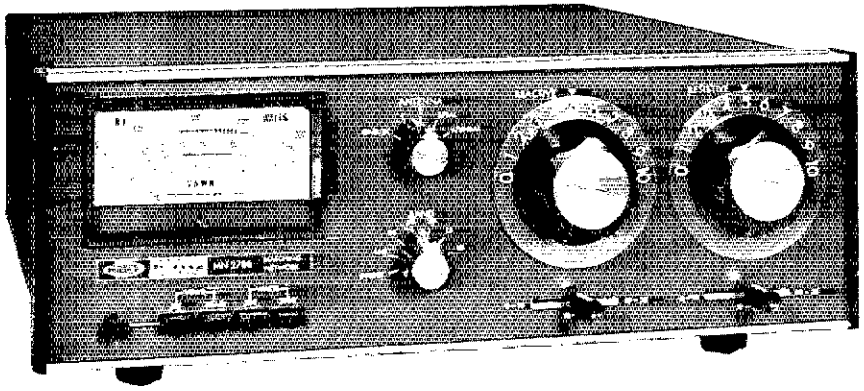
Dimensions/Weight:

Depth— 13.0 in (33.0 cm) excluding knobs and connectors.
Width— 13 6 in (34.6 cm)
Height— 4.6 in (11.6 cm) excluding feet
Weight— 18.4 lbs (8.34 kg)

540 RICHARD STREET, MIAMISBURG, OHIO 45342 • TELEPHONE (513) 866-2421 • TELEX 288-017

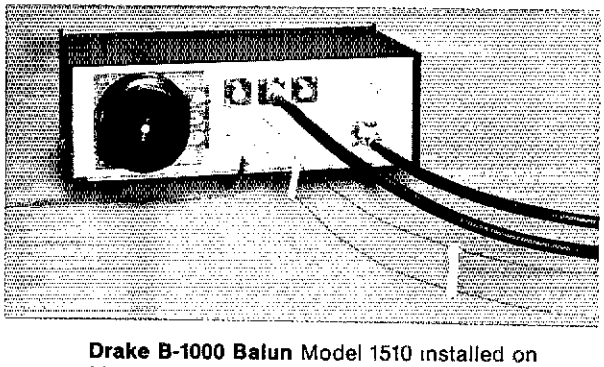
DRAKE® MATCHING NETWORKS

Precision instruments providing
rf radiation control and measurement
for your communication system

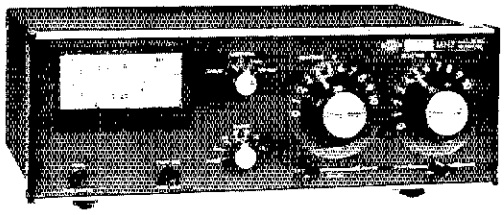


Drake MN-2700 2kW Matching Network

Model 1539



Drake B-1000 Balun Model 1510 installed on Matching Network.



Drake MN-7 Matching Network Model 1538

Same features and specifications as the Drake MN-2700, but rated at 250 watts continuous. Same width and height, but only 8.5" (21.6 cm) in depth, and weighs 10 lbs. (4.55 kg). Meter reads 0-300 watts forward power or VSWR.

The Drake MN-2700 manages rf radiation in the areas of impedance match to the antenna, rf power measurement, VSWR measurement, reduction of harmonic radiation, and antenna selection.

DRAKE MN-2700 FEATURES

160 thru 10 Meters Frequency Coverage—With out-of-band cove age for MARS, future band expansions and other applications.

Antenna Choice—Matches antennas fed with coax, balanced lir or random wire. (For balanced line use optional Drake B-1000 Balu which mounts on rear panel of MN-2700.)

Antenna By-pass Switching—Unique design allows unit to b switch-by-passed regardless of which antenna is in use, wheth coax or wire type. No need to manually disconnect feedlines. Swit also selects various antennas.

Extra Harmonic Reduction to help fight TVI—Drake Matching Ne works employ special "pi-network" low-pass filter type circuitry f maximum harmonic rejection. This feature alone makes the MI 2700 a worthwhile investment; it is a Drake exclusive.

Built-in Metering—Accurate rf wattmeter/VSWR bridge is pushbu ton controlled from front panel.

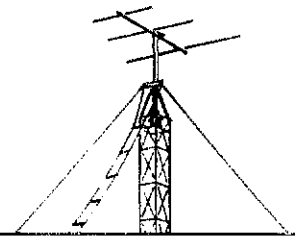
Power Capability—2000 watts PEP, 1000 watts average. Continuou Duty.

Dimensions—13.09"W x 4.53"H x 13"D including connectors (33.26 11.5 x 33 cm); **Weight** 11 lbs. (5 kg).

DRAKE MN-2700 SPECIFICATIONS

• **Frequency Coverage:** 1.8 to 30 MHz. Band Switch marked for 160, 80, 40, 20, 15, and 10 meter amateur bands; however, frequency coverage between amateur bands is possible by using the nearest band positions with a small reduction in matching capability. • **Input Impedance:** 50 ohms (resistive). • **Load Impedance:** 50 ohm coaxial with VSWR of 5:1 or less at any phase angle (3:1 on 10 meters). 75 ohm coaxial at a lower VSWR can be used. • **Balanced Feedlines:** With the Drake B-1000 accessory balun, which mounts on rear panel, tunes feed point impedances of 40 to 1000 ohms, or 5:1 VSWR referenced to 200 ohms (3:1 on 10 meters). • **Long-Wire Antennas** Feed point impedances up to 5:1 VSWR referenced to 50 ohms. Also, 5:1 referenced to 200 ohms with the Drake B-1000 accessory balun (3:1 on 10 meters). • **Meter:** Reads VSWR or forward power, 0-200 watts or 0-2000 watts. • **Wattmeter Accuracy:** ±5% of reading ±1% of full scale. • **Insertion Loss:** 0.5 dB or less on each band after tuning. • **Front Panel Controls:** Provide for the adjustment of resistive and reactive tuning, antenna switching, band switching, VSWR calibration, and selection of watts or VSWR functions of the meter. • **Rear Panel Connectors:** The rear panel has four type SO-239 connectors (one for input and 3 for outputs), three screw terminal connections (for long-wire and open-wire feeder systems), and a ground post.

really a "secret weapon" for 160 meter enthusiasts!



The Drake MN-2700 and MN-7 Matching Networks have a truly unique antenna feed switching design

Both matching networks will completely change the mode of a balanced-line fed 135 foot doublet to a special configuration that provides very effective 160 meter performance. And best of all, it's done with the simple flip of a switch on the front panel.

Consider a typical all-band antenna set-up—a 135 foot doublet, center-fed with 60 to 70 feet of balanced line at a height of 45 to 60 feet. The Drake MN-2700/B-1000 or MN-7/B-1000 will match this as a true balanced system on 80 thru 10 meters. (Fig. 1)

But what about 160 meters? Many amateurs recommend tying the feeders together and using the antenna as a vertical with a "top-hat." In fact, we suggest this ourselves in our manual.

However, the use of this, or any vertical, assumes you have a good ground or radial system for efficient operation. If you do not have enough room or do not wish to install such a radial system, performance may suffer. And if you do have radials, you still have to change the feeder connections each time you operate 160 meters.

On the other hand, when you use the MN-2700/B1000 or MN-7/B-1000 simply leave the feeders in the balanced connection as you would for 80 thru 10, and move the special antenna selector switch to Position No. 4. This automatically converts half of the antenna and feedline to an inverted "L", fed through a 4:1 impedance transformer, with the other half operating as a counterpoise. (Fig. 2)

This system offers the convenience of "stay in your chair" operation, while providing an effective means of operating 160 meters with a relatively small antenna.

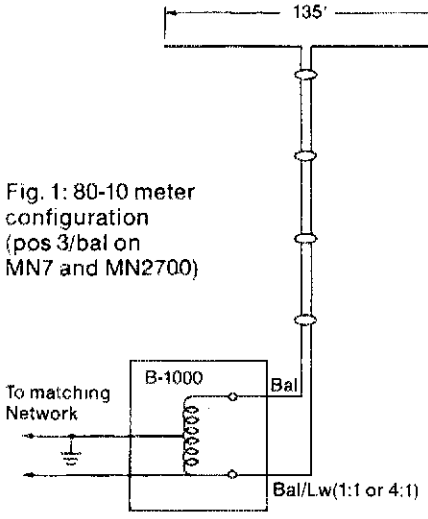


Fig. 1: 80-10 meter configuration (pos 3/bal on MN7 and MN2700)

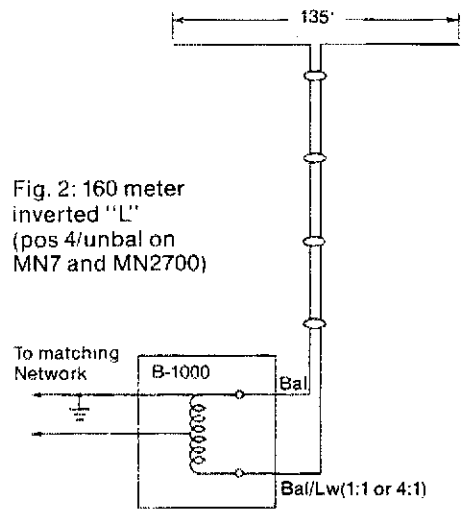


Fig. 2: 160 meter inverted "L" (pos 4/unbal on MN7 and MN2700)

Congratulations to the following licensees: KAØs FD FMP FPW FPX FPY FQC FQG FQK FON FQP FQX FQ FQZ FRA FSW FTF FTL FTM FTP FTQ FTS FTT FU FUD FVD. General: KØIGT NØs BBY BCD BCG. Tech: NØ BCL BDX BDZ BEA. The Ozark ARS and the HARC ar two clubs who are again offering license classes thi fall. Traffic: WØBMA 501, KØONK 436, KØSI 269, WØB 151, KØPCK 142, WØOTF 86, WØOUD 68, KØCW 61 WØVTF 41, NØJL 29, WDØFZJ 27, WØJVQ 16, KØBM 17 WØEPI 13, WØOAU 8, WDØBWZ 4, AGØC 2, WØGCL 2 KØRWL 2.

NEBRASKA: SCM, Rex P. Greenwell, KØKP — SEC WAØASM. It's with sorrow to report the passing o WØVEA, he is deeply missed. The Aug. combined Lin coln, AK Sar Ben club meeting was a real success Guest speaker Mr. James Ebel, USA delegate to WARC '79 reported our position is well prepared. QCWA annua meeting will be in Nov. at Grand Island, officers will b elected. WDØHBR has finished producing an ET documentary titled "Wireless on the Great Plains", th show features WØAP. WDØHFZ is on the air in Nort Platte with his SB102. Nets: Nebr. Story QNI 817, QT 30; Morning phone QNI 1455, QTC 43; Western QNI 454 QTC 44; QCWA QNI 42; Platte Valley QNI 42; Cornhuske QNI 863, QTC 24; Pawnee QNI 138. Traffic: WAØLLQ 114 KØAIE 85, WØVEA 72, WBØGWR 32, WØSGA 30, WØHO 31, WØVYX 20, WØFUT 19, WAØQEX 16, WØLJO 15 KØSFA 12, WAØQEX 11, WAØPCC 11, WØHTA 9, WDØAPY 8, WBØGMQ 8, KØTUH 8, WØLEF 4, WØNIK 3, WAØZPM 3 WØDJU 2, WØIXB 1, KØKP 1, WAØLOY 1.

NEW ENGLAND DIVISION

CONNECTICUT: SCM, William J. Pace, W1ID — SEC W1SY. STM: WB1AIU. NMs: WA1LOU K1EIC K1EI WA1ELA WB1CPF.

Net	Freq.	Time/Days	Sess.	QNI	QTC
CN	3640	1900/2200 Dy	60	381	263
CPN	3965	1900 M-S	31	413	144
WESCON	78/18	2030 Dy	31	506	100
NENN			30	237	91
NUTMEG	29/88	2130 Dy	27	335	66

W1VS getting ready for Fall-winter DX season with much antenna work going. WA1LOU shifted Wescon activities over to New Fairfield report with Naugy off the air. Ne continued without missing a beat!! Recommends monitoring ten meters as conditions improve. The SARA (Stamford) Squelch Burst sports several excellent ar ticles as always. K1VMI writes on an interesting ap proach to R.F. Shielding. WAØAPP of Westport par ticipated in the 9th annual Inner-Tube race on the Sacc river in Maine. No report on whether he operated marine mobile! September issue of FARA News did a great job on a Field Day photo-story. Credit to KA1BZO and WB1BSK who did a real professional job! Scarascope of the South-central amateur group continues to demonstrate their expertise in another info packed issue. Noteworthy in the issue was the description and critique of the SCARA service provided to the Nationa Cerebral Palsy Foundation for its national games. Belated compliments to WØRH on the first W1 worlc Radio's Worked 100 Counties award. W1NRE continues his excellent series on ATV. KA1BB reports TRI-CITY group starting training classes in Groton, New London and East Lyme. WA1RLV indicates outside garden work hampering his radio time and not much relief expected with the close of the season as the search for fire-wood comes to the fore! Many of us are doing the same to off set the hi-cost of comfort! W1EFW taking a break from his perennial traffic work to vacation and to do a little DX-ing. Nice note from W1NJM reflecting his enjoyment of retirement. Great increase in his traffic work which says much for the idyllic life. Wintering in Florida where he promises continued traffic work. W1BDN complains of heat affecting tfc. W1DFT and WB1ESJ stayed clos to the repeaters during Storm David. Correction to las month. WB1CPF NM of NENN not RASON. CPN: HI QNI K1AQE, K1CD WB1FZX CN NI QNI. W1WP WB2PJU WB1CFD WB1CPF. Traffic (Aug.) WB1CPF 252, K1GH 188, WB2PJU/1 168, W1NJM 98, W1DFT 97, W1EFW 81 K1EIG 74, WA1LOU 56, WB1FZX 48, W 1GVT 35 WA1RLV 32, K1AQE 30, K1EUW 18, W1BDN 17, WA1ZX 14, W1QV 11, W1CUH 4. (Julv) W1NJM 138.

EASTERN MASSACHUSETTS: SCM, Rick Beebe, K1PAD — SEC: WA1BLG; STM: WA1TBY; OO reports received from W1NF W1BGW W1EGE W1FJI WA1NAE W1WLW EC reports received from W1BK WA1IGL K1FMM W1XA W1HGY; OVS report received from W1JR; OBS reports received from WA1QAA K1BJZ WA1IGL W1XA W1AIP K1UR.

Net	Freq.	Time/Dy	QNI	QTC
EMRI	3.66	19/2300 Dy	505	262
EMRIPN	3.898	1730 Dy	374	216
EMRISS	3.715	1915 Dy	118	40
HHTN	04/54	2230 Dy	575	230
NEEPN	3.945	0830 Su	65	20
EM2MN	90/30	2000 MWF	117	30
EM2MN	145.8	2000 TTh		

Very exciting news this month!!!! WA1VQZ reports that Ch 68 Tv in Boston may air a weekly or monthly program on Ham Radio probably by the time you read this. It wil air between 6 and 7 P.M. and last between 5 and 15 minutes. This will take a tremendous amount of work which WA1VQZ will need help with. He needs your ideas and help in spreading the word on this. Lets take advan tage of this golden opportunity and help him out. The Quannapowitt Radio Assn. held its annual meeting with W1HL installed as president and W1HR guest speaker. Massasoit Club had some old photos from previous club functions shown by K1DC. Wellesley and Middlesex clubs as well as the Billerica and Chelmsford Clubs held joint picnics. Framingham Club had its annual picnic at WA1IGL's QTH. Framingham Flea Market on Nov 11 at 10 A.M. listen 75/15. Honeywell/Waltham Auction Nov 17 11 A.M. listen 72/12. Whitman Club swapping newsletters with club in Ft. Wayne, IN. I would like to thank all those who responded to the Crossbander's first issue. Over 250 replies were received and the results of the questionaire were forwarded to our NE Division Director, W1HHR. People who have volunteered to help, have been asked to be the eyes and ears of the publication, standing ready to contribute ideas and items to the publication when they see something of in terest in their areas. The first issue went to ARRL members only, so spread the word to your non leaque friends. W1ALP received letter from W1ASI a former EM SCM. Traffic: (Aug.) WB1DXR 425, KA1CC 371, WA1TBY 354, WA1EYY 297, K1BA 288, WA1VAB 252, KA1BJY 209 WA1LPM 204, W1PEX 165, KA1BMJ 155, K1GN 129 KA1BDE 94, W1DMS 93, WB1EZT 91, WB1ACA 68, W1HU 62, W1CZB 52, WB1EMU 52, W1FJI 52, K1BSO 47, AD1P 38, KA1AHD 33, WA1ZGK 28, WA1FNM 24, K1PJ 21 N1EE 18, WB1ABM 16, WB7TPY 14, WA1IFE 12, W1CS 11, KH6JNQ 9, K1BZD 8, W1PJ 8, WA1ZAZ 8, W1XA 6

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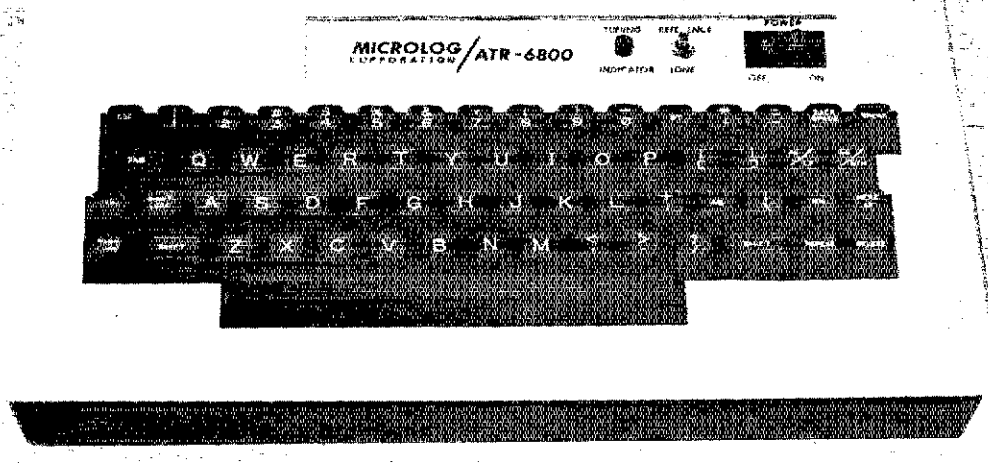

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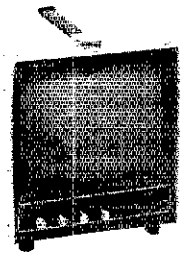

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W1ALP 6, W1AEC 4, W1EGE 2. (July) WB1ACA 8, WA1IGL 36, WA1FNM 31, WA1ZGK 23, W1CE 21, N1AF 16, WB1EMU 16.

MAINE: SCM, Ed Bristow, WA1MUX — Maine vac tioners were VE1BIO, VE1BIP, WA2ASC, K2ORS, K1QC K1WYF, W1RCJ, W1ZEN, W1VYI, WA1APP, WB1CQ WB1BZW, KA1CRG & N2LR and more.

PTN	3596 kHz	7 P.M. local	Dy
SGN	3940 kHz	5 P.M. local	Dy exc Sun
MPSN	3940 kHz	9 A.M. local	Sun.

Sess/QNI/QTC: SPSN/8/41/12; PTN/31/210/123 AEN/4/42/0; CMEN/14/129/13; MPSN/4/42/7. PSH WB1BYR, W1RWG, AF1L, YRC off.: WA1SMY, pres W1GUW, vice pres.; W1EZR, secy.; WB1FAK, treas K1VFG, dir. N1RP has raised 5 single-band antennas with switching, happy band-hopping. Traffic: (Aug W1RWG 90, WB1BYR 84, W1KX 63, N5YX/1 58, N1RP 5 WA1JZP 41, K1GUP 35, AF1L 32, W1AHM 25, WB1GLI 16, W1BMX 13, W1CTR 10, WA1YNZ 9, KA1EO 6 (July WA1FCM 4, W1CTR 4, N1RP 44.

NEW HAMPSHIRE: SCM, Robert C. Mitchell, W1SWX/W1NH — SEC: K1RSC. NMs: W1TN & N1NH Seen on the highways & byways, WA1PEL, WA1NZ, WA1SIR & W1UN. N1AEO skeds his Dad K1ZZY. New General is WB1HFI. The NHN had 119 check-ins & 12 traffic. WA1PVN is moving to Ontario. WB1CDN now Ex tra. It is sad to record K1NZK a Silent Key. W1JY is out o the hospital after freak accident with crank fron generator. Instructor/surveyor N1CB class yielded KA1CZK, KA1DGW & KA1DIS. DXer K1HDO worked Revilla Gigedo & Kure. W1UN vacationed in Greece W1BXM now working in Amherst. W1BFT won the NH QSO Party. WA1YDC was 2nd & K1UTS 3rd. W1GUX se up rig for W1JY while in hospital. K1MFQ is busy with the moon bounce. K1BCS made BPL. The Century Kids K4RO & W1MPP, are back in Jackson, EC, K1OIO, keeps the Mt. Washington repeater going strong. SEC, K1RSC vacationed in Canada. W1NR worked most of the NH Field Day stations. The Concord Brasspounders (W1OC) held their last meeting at Cushcraft. Traffic (Aug. K1BCS 506, W1TN 343, W1GUX 275, K1ACL 30, WB1HFI 27, WA1SRU 17, K1UQX 17, WA1PEL 16, WB1HGQ 13, WA1HOB 13, W1BYS 10, W1NH 9, WB1CTJ 6, N1ALM 4 (July) WA1HOB 7 (June) K1BCS 372, W1GUX 225, W1TN 242, N1NH 103, WB1HFI 35, K1ACL 28, WA1PEL 19, K1UQX 19, K1OIO 13, WA1SRU 10, WB1HGQ 9, W1BYS 8, N1ALM 4, W1NH 3.

RHODE ISLAND: SCM, J. Titterington, W1EOF — SEC: K1DT. STM: N1RI. Top spot must go to WA1KKP for her net control work on the Hurricane Alert Net on 14325 kHz. She was tireless and while doing a public service, really put Little Rhody on the map, too! Tnx. Newport County RC folks furnished the communications for the annual Battle of Rhode Island re-creation on Aquidneck Island. Good job W1JFF, W1AXO & W1PDL. To new hams in particular, all others, also, we need more cw check-ins in tfc nets. Contact me and I will give you ways to get educated for traffic. RIEM 2-mtr Tfc Net, WA1CSO, net mgr., Sessions 23, QNI 254 and Traffic 89. This net is bright spot in the RI ham radio world. Happy Holidays to all. W1EOF 67, WA1CSO 37, N1RI 16, K1DT 3, W1OP 1.

VERMONT: SCM, Bob Scott, W1RNA — SEC: W1VSA. It is with deep regret I report the passing of the XYL of W1MMV on 08/31. If you DX hounds hear SM6BNU extra loud it is probably because of his being located in N. Thetford, VT. 2-mtr Rpt WA1HSG assisted in communication of an auto accident to VSP in Derby. Due to the accident being quite some distance from the VSP, they were doubting 'Thomases,' but were finally convinced it was not a hoax. WA1OVW was the originator from Franklin. Due to illness of W2DSK, NM Carrier net, the net report is estimated in part. Carrier 27/486/54; GMN 27/460/55; VTSSB 28/465/78; VTP 4/40/4. New ham father and son team — KA1DTP & KA1DRN, both named Mike, in Montpelier.

WESTERN MASSACHUSETTS: SCM, Bill Lowe, W1TM — SEC: WA1DNB. STM: W1KK. NMs WA1MJE and W1UD. SCM attended 1RN picnic at OTH of W1QYY in NH. WMass reps were W1UD, K1JHC and WB1AUV. WB1CGK doing fine job with tfc on NENN and WMN. WB1AUV 1RN RX REP on EAN. WA1ZKT now editing HCRA "Zero Beat." Congrats to KA1AVM on General, WB1DLE on Advanced, also to K1MAL on DXCC award. K1BCS reports K1QQI, WB1BZW and KA1CRG at York Beach ME. W1WF in hospital recovering from multiple injuries received in auto/moped accident. Check into the NENN and improve your cw (3720 kHz at 6:15 PM daily.) Traffic: (Aug.) WA1MJE 387, W1IM 181, W1KK 101, WB1AUV 94, W1EFC 50, WB1CGK 36, W1BVR 30, K1BE 20, W12PB 20, W1DOY 16, W1ETH 6. (July) K1SSH 215, W1UD 147, N1CQ 8.

NORTHWESTERN DIVISION

ALASKA: SCM, Roy Davis, KL7CUK — The following nets are active in Alaska.

Net	Freq.	Times/Days
Snipers	3920 kHz	6:00 PM Dy
Sourdough	3915 kHz	6:30 PM M-F
Seasaw	3900 kHz	4:30 PM Dy
DX Assoc.	7265 kHz	8:00 PM 1st Su, Mo.
AK Civil Preparedness	14292 kHz	8:00-9:00 AM M-F
AK Bush	7250 kHz	6:30-8:30 Dy
AK Iditarod	28849 kHz	10:00 AM Sa

The Kodiak Club is planning considerable activity for this fall. The Matanuska Susitna Clubs new repeater on 146.25 - 146.85 MHz has been moved and now has considerable better coverage. The Alaska Iditarod Net has a nice certificate for those participating in the exchange of 10/10 numbers. Traffic: KL7P 71, AL7O 24, KL7Q 19.

IDAHO: SCM, Lem Allen, W7JMH — W7GHT and XYL were hosts to about sixty Hams at Craigmont for a County Hunters Confab — congrats — big feat there, tracks all over the West! Nice coverage in the newspaper, too. The KARS now has 51 members and a new repeater in operation during August, a real joint effort — many thanks! PARC hosted a new Ham visitor from Yugoslavia, YU3TIZ, here for training. Their FD activity was 204 contacts on 80, 40, 20, 2-meters (6 was tried — NG). A good time had by all. Boise and Mt. Home clubs active in new Novice classes. Congrats to new Hams KA7DKZ, KA7FCB, KA7FCA, KA7EDE, KA7FBY, KA7FBZ and my XYL, KA7FOV. Vacationing in New Hampshire is W7THB. KA7CPT is come convalescing from surgery. KN7WLF is now AI7R. WA7IBT is now KB7HN.

Net	Freq.	Time	Sess	QNI	QTC
Farm	3935 SSB	8 P Dy	29	1020	15
CD	3990 SSB	8:10 A M-F	23	549	6
IMN	3635 CW	9 P M-F	23	590	186

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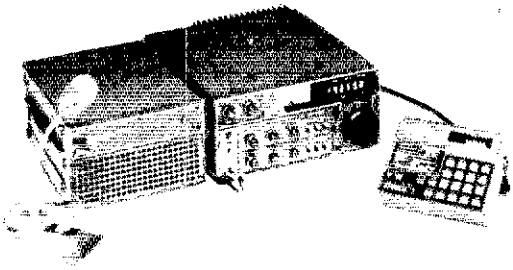

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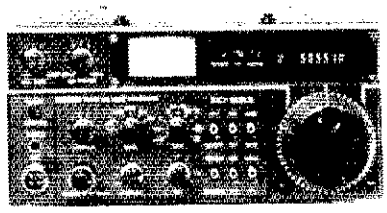

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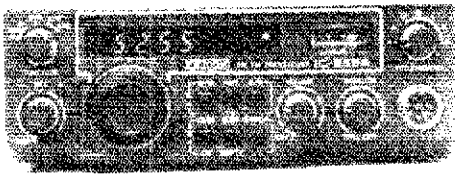

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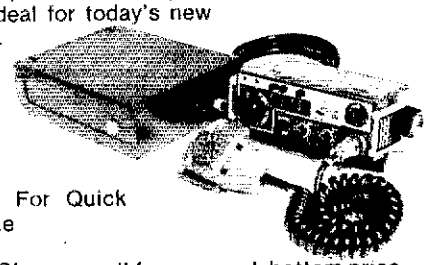

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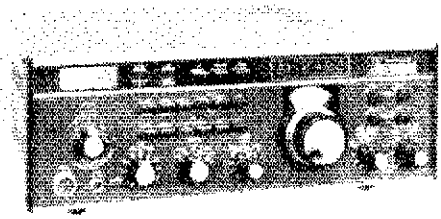

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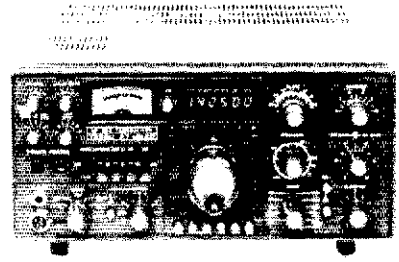

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800

fic: W7GHT 210, WA7CTS 68, W7JMH 27.

MONTANA: SCM, Robert Leo, W7LR — W7DB sends ARRL bulletins on MTN. QCWA net meets every Sun 9 A.M. 3938. WA7OBH sez 01/61 Red Lodge rptr has super coverage, also 22/82 Sheridan Wyo. He has new amp & preamp for 2-meters. WB7SWH has new Drake TR7. W7IXD & W7LR had short eyeball QSO in Denver Lodge. IMN Aug QTC 59, QNI 186, shifts to 0130Z end of Oct. K7WNE reports monthly Missoula 2-mtr bunny hunts, TH nite net with QTC 4, KA7DIQ new Tech, KA7DUN new General, W7KNT top MT June VHF contest score & has 49 states on 6 meters, W1JXN prepares Moon-Bounce QSO's. Plan ARRL Nat'l Conv Seattle July 25-27 1980, K7BON wants to hear from MT hams active in SSTV, and more QST articles on SSTV. W7IDK reports Havre ARC has good booth in Fair - display RTTY, emergency gear, satellite gear. Contrats to Gt. Falls ARC, newly ARRL affiliated. WA7KMP got award for aiding in solar eclipse efforts. W7BKM reports 20 mtr mobile DX: CT, I, SM 4X4. 13/73 rptr now on from Highwood Baldy. Anaconda shifts rptr to 19/79. Rates for additional ARRL family memberships are $2 a year after one full membership paid. WB7TNH issues nice Gt. Falls newsletter, with K7ABV DX editor, KA7DPF YL news, W7MAF VHF news. Traffic: W7TGU 143, W7IXD 44, W7WNE 10, W7NEG 6.

OREGON: SCM, Dale T. Justice, K7WWR — SEC: W7HLF. Section nets

Net	Time Days	Freq.	QNI	QTC	Sess.	Mgr.
Arest	0115Z Dy	3993.5	449	18	31	W7HLF
BSN	0145Z Dy	3908	526	27	31	WB7PQU
JCARES		147.06	134	12	10	W7VSE
OSN	0245Z Dy	3585				WB7OFI
PdxAARES	0330Z Dy	147.32	353	23	19	K7WWR
WCN	0300Z Dy	3702	297	130	31	K7ZIG
OEN	0200Z Dy 0300Z DY	3980				W7VIP

W7LNE received WAC and QTC certificates. The Hoodview Club is helping start a station and new Hams at the Shriners Hospital for Crippled Children in Portland. The Hoodview Club had a campout at Cape Lookout. W1XX, ARRL Communications Mgr. was at the Salem ARC meeting in August. 73 (coincidence?) Hams attended. Many ideas were exchanged about contests, ARES/RACES, traffic nets, etc. Traffic: W7VSE 727, WA7IHS 232, WB7OEX 126, W7MW 69, K7OPW 54, K7WWR 43, KA7AUZ 37, W7LNE 28, W7LT 26, W7HLF 23, W7BNS 12, W7IWN 9, W7DAN 4.

WASHINGTON: SCM, Bob Kiepper, W7IEU — SEC: WA7RWK. STM: W7DZX. Nets reporting for August: NTN, QNI 1522, QTC 82; WARTS, QNI 3040, QTC 314; NWSSBN, QNI 663, QTC 47; WSN, QNI 423, QTC 109. Thanks for your support in the recent election, again I will try to meet your expectations. I'm sorry to report the following Silent Keys: W7HDG WA7JKE K7MQJ and W7AIW. New officers for the NWSSBN are: K7AJT, mgr.; WB7EBP, secy/treas., W7SAP K7UWY W7GTJ WA7FKK K7OUV, directors. West Seattle ARC has some good programs planned for their fall meetings. KB7BF W7APK K7SMY from the Pasco area have upgraded to Extra class. Been working DX? Do you have envelopes on hand at the "Burro"? AF7P is now in charge of the letter "L" and suggests you keep a supply on hand for those rare ones you expect to work. If you have RFI problems in West Seattle, contact K7NC or W7WOG, the RFI committee for West Seattle ARC. New officers of the REBELS are: K7SUQ, pres.; WB7OOH, vice pres.; W7ZMG, secy/treas.; W7VCI, custodian. Look for NTS traffic nets to appear on some of the Puget Sound area repeaters. The Mt Pilchuck Repeater (32/92) Traffic Net went into operation on Sept. 24. It is a part of NTS and operates 7 days a week. If your repeater group wants to start one, let me know and I'll send you the format used. WA7LQV has a new Harley "80" and getting ready to install both 2-mtr and low band equipment. Look for members of WWDX Club to be sporting new name badges soon. Lower Columbia ARC has 2 new classes this fall. WA7ILC will instruct the upgrade to General Class and KA7BWF will instruct the computer class. New officers for WARTS Net are: W7EQY, mgr.; WA7RCR, asst mgr.; W7BUN, secy/treas. At large, K7s AJT NE WB7s TQF SE K7s OBE SW WA7s RCR NW WA7BTZ, directors at large. Clark Cty ARC Repeater also has an ELT monitor on it. WB7QWC working hard to get antenna system ready for emergencies before bad wx sets in. W7ERH and many others enjoyed the Tacoma Hamfest in spite of the wet wx. Members of HAMS Club and Snoco ARES combined to provide communications for an Olympic style horse jump. I'm looking for more OBS appointees who can copy W1AW and who can work with local repeaters in getting the information out. I'm also looking for OOs in any class, but primarily of Class III. I hope everyone has a very nice Thanksgiving. Traffic: (Aug.) W7DZX 565, KL7JEB 304, K7GXZ 158, W7FJZ 84, N7AJ 83, WA7PHD 55, N7AFZ 54, W7IEU 51, WA7YCM 51, W7BUN 49, WA7BDD 47, WA3WPY 46, WB7WOW 36, W7EBU 33, WB7PSP 31, W7KZ 28, KA7AWH 24, W7LUP 24, W7HHU 23, W7APS 19, W7LG 19, W7ZEV 19, N7RV 10, WA7OJI 6, N7AFY 5, WB7CFH 5. (July) KA7AWH 14, WB7PSP 11, AF7P 10.

PACIFIC DIVISION

EAST BAY: SCM, Bob Vallio, W6RGG — Asst SCMs: K6UWR W6ZF VE2AQV/W6. SEC: K6UWR. PSHR for Aug: W6JXK W6OA. W6OA/7 on vacation found OSN "a great bunch of ops." K6UGS managed 27 check-ins on NCN-VHF. WD6BMX on OSCAR mode B&J. N6NE has 99 countries confirmed toward DXCC as does WA6JVZ. OO, K6ARE, visited K1LSN in Maine during July. OO, N6OP, active from new apartment QTH. WA6VEF QRL with college. WA6BOB sporting a new S-1 H/T. EBARC held picnics in July and Aug., and will hold their meetings at the Richmond Salvation Army HQ starting in Sept. MDARC also held a picnic in Aug. Alameda County RACES provided communications for the YMCA Centennial Relay Run which stretched from Livermore to Lake Merrit in Oakland. Communications were handled on the NCCC-sponsored repeaters, WR6ADM vhf & uhf. NCCC meetings on 4th Mon of month at American Savings & Loan in Hayward. Traffic: (Aug) W6JXK 386, W6OA 156, K6UGS 81, WB6UZX 65, N6NE 8, WD6BMX 4. (July) W6OA 247, WB6UZX 40, K6UGS 26, WD6BMX 4. (June) W6JXK 300, W6OA 145, WB6UZX 41, K6UGS 39, WB6UMT 31, WD6BMX 5, WA6JVZ 2.

NEVADA: SCM, Ralph E. Covington, W7SK — Asst. ACM: N7RH. Congratulations to N7RH on being appointed as Asst. SCM. Clark Co. EC, KA7AGM, charging full steam and doing fb job. K6MQX/7 with new station back on the air. K7IWLY has resigned as West Nev. EC. He has been EC for two years and really has a good organization to pass along. Nevada Sagebrush Net meets nightly at 0030Z (Winter Schedule) at 3898 kHz.

Our best wishes to KA7CUX recovering from operation at home. W7IKT and KA7AVA departing for Georgia for 9 months. Good trip and we look forward to your return. Traffic: N7AKX 258, W7BS 109.

PACIFIC: SCM, Pat Corrigan, KH6DD — SEC: KH6CKJ. STM: WØKON. EC - Commonwealth of the Marianas: KG6SW. A special welcome back to WØKON (KH6IQU) and we put him right back to work as new STM. Our congratulations to KH6H for a superb job developing Maui Emerg. Plan & solid local ARES org. Had nice note from former SCM N7HR and spouse. He will be on air soon as KA2HR. SEC, KH6CKJ & EC-Hono, KH6ILR, have developed agreement & plan for working with Nat. Weath. Serv. during Nov., poss group going to Kingman Reef. W6ENK from Hono., new XO at Midway Isl., KH6HJM visited Guam after only passing thru during Navy career. AH6AQ & KH6JUZ got Olomana Rptr. working well again (KH6JUZ/R - .16/.76) Traffic: KH6H 7.

SACRAMENTO VALLEY: SCM, Norman Wilson, N6JV — SEC: WB6GJF. ASCM: W6NJU. The Nevada County ARC had another successful booth at the Nevada County Fair and originated 243 radiograms. Congratulations to KA6s HDG HID and HIZ on their new Novice calls. KA6EZF got his Tech, and WD6GHI made 2nd Phone Commercial. KB6JM is trying to drum up support for a change in motor vehicle rules to allow ham plates on motorcycles. The John I. Sabin Pioneer RC's Newsline (916-484-7388) is very active with check-ins as far east as Maryland. WB6GFJ has survived another DX-pedition as FOØFB. N6JV is trying to mount a new prop pitch motor. The Northern California Net meets nightly on 3630 kHz at 7 P.M. local time and a slow speed session at 8:30 P.M. Traffic: W6RSP 250, W6SX 44, K6RPN 28, WB6DEF 25, WB6LFD 2.

SAN FRANCISCO: SCM, Art Samuelson, W6VV — SEC: N6KM. Traffic for anywhere (legal) in world handled nightly at 1930 local on NCN-VHF session via 144.81/145.41 repeater. I2OFF visiting in area. Congrats to KA6DBB on upgrade to General. K6CWM active on QRP. W6HHP K6OBL WA6BXJ WB6WDH WB6RTE and WB6QCT active in lost hiker search in Del Norte County. SF ARES Net meets 2000 local Thurs. on 144.55/145.15. WA6NJS visiting Maine and New Hampshire. W6URA already planning Field Day menu for SFRG! Fifty-three operators of W6LFJ provided great public relations at Sonoma County Fair. Traffic: (Aug) K6TP 103, W6RNL 100. (July) W6LFJ 540, WB6RTE 40, W6CYM 8. (June) WB6RTE 10. (May) WB6RTE 14. (Apr.) WB6RTE 23. (Mar.) WB6RTE 13.

SAN JOAQUIN VALLEY: SCM, Charles McConnell W6DPD — SEC: WA6YAR. Asst SCMs: WA6YAK WA6HIN W6TRP. Renewed appts: WA6EXV as OVS. WA6JDB as OTS. N6AYI as EC. ECs are needed in Amador and Calaveras Counties. N6AWH made PSHR for Aug. N6BPX is Silent Key. KA6CUN now N6BNW and made General. WA6PJN is Advanced. KA6CCA is Tech. NCN-I for August QNI 406, QTC 487. NCN/VHF for August QNI 1212, QTC 346. W6BVM and W6YP have TR-7s. W6UZ has a FT901DM. WB6WPC is on 220 and has a TR8300. W6UBA has a new tower. WB6OWI has a TS 120. WB6WYA has a S-1. NCN Honor Roll for July: KA6AQV N6AWH N6BGS W6DBH W6DPD and WA6JDB. WB6ITM has DXCC. K6RPH is back on the air. KA6HME is a new Novice. W6NPI is building 2-meter antennas. K6XJ and W6XP are approaching DXCC Honor Roll. Happy THanksgiving to all. Traffic: (Aug.) N6AWH 265, W6DPD 23, N6AMA 18, WA6WDL 14, WA6IQZ 11, WA6YAB 8, WA5JDB 6. (July) WB6TTP 25, WA6WDL 6, K6RAU 3.

SANTA CLARA VALLEY: SCM, Jettie Hill, W6REF — SEC: WB6IZF. W6PDD is on the recovery list from recent surgery. W6XN gave a presentation on OSCAR and W6MXV on SSTV before the West Valley ARA. W6JQR received a 25 year and W6BJB a 40 year pin for ARRL membership. Congrats to both. WA6JQC spoke to SCCARA on the Ham's roll in the recent earthquake. Hams provided communications when the telephone system became overloaded. WR6ADE was used to provide communications. K6DTX moving his business to San Jose. San Lorenzo Valley ARC reports a successful breakfast meeting with the Santa Cruz club. WB6RDE passed his General exam. An Apple II computer group is being formed, for info contact K6HJU. PAARA has WB6CFV as a speaker on "The World of OSCAR." WB6MLY recovering from 6 1/2 hours of surgery and should be back on the air by now. WA6VEF was guest speaker at SCCARC. New upgrades from Monterey area are: KA6ACH to Advanced and N6ALS to General. Speaker before EMARC was WB6FKO and subject was "Ham radio in Japan." EMARC provided communications for the Electric Automobile Assoc. rally in Sunnyvale, and will have a Homebrew Night on Nov 19 - bring your projects. W6TWU and KB6IH reported on Reno convention to LERA ARC. FARS annual picnic was a success and held at the home of K6OG. W6RFF spoke before the G.S. Ladd Pioneer RC on NTS and emergency traffic handling. Repeater call for NCN has changed from WR6ADC to WA6EUZ/R - same rig and frequencies. K6TP authored an excellent four part article on "Raising Your Code Speed," for NCNs RELAY. Welcome to W6VV as new SCM for SF. Honor Roll for NCN listed SCV's KA6ETB KA6FAZ WD6GUA WA6JWK WA6KRA K6KZ W6KZJ WA6NMQ W6RFF W6YBV N6YF K6YKG and WA6ZFK. NPS ARC manned booth at Monterey County Fair and handled 156 msgs., the bulk going through W6OII and KB2ID/6. Nets are keeping W6AUC busy as usual. W6OII also busy on many nets. WA6HAD busy with OBS and NCN. N6XI reporting into NCN, as well as contests. Traffic: W6YBV 330, W6OII 194, W6AUC 55, W6RFF 47, WA6HAD 36, W6KZJ 15, N6XI 4.

ROANOKE DIVISION

NORTH CAROLINA: SCM, Bill Parris, AA4R — STM: N4UE. SEC: K4CJZ. Hamfests in Concord, Fayetteville, & Shelby received excellent attendance this year. Congrats to the clubs that make these fine events possible. Many grouped in NC were active in Hurricane David activities. The JFK and THEN were in emergency session thanks to WA4CUD KB4IZ and others. Mecklenburg ARS reports outstanding scores in the Fall VHF Contest from Roan Mtn. Look for W4BFB in the standings. Charlotte ARC reports the loss of K4GFH who is moving out of state. He will be missed by the club, thanks for all the work you have done while in Charlotte. KA4BGX reports the Carolinas Novice Net (CNN) is now on 3720 kHz daily at 1815 local time, be sure to check-in with them. Brightleaf ARC has begun selling shares to help finance a new club station. Recent upgrades include KA4DMW to General & K4HHM to Advanced. FCC will be in Winston on Dec 5-6, be sure to get your 610 into Norfolk. Alamance Club reminds all of the NC QSO Party Dec 1-3.

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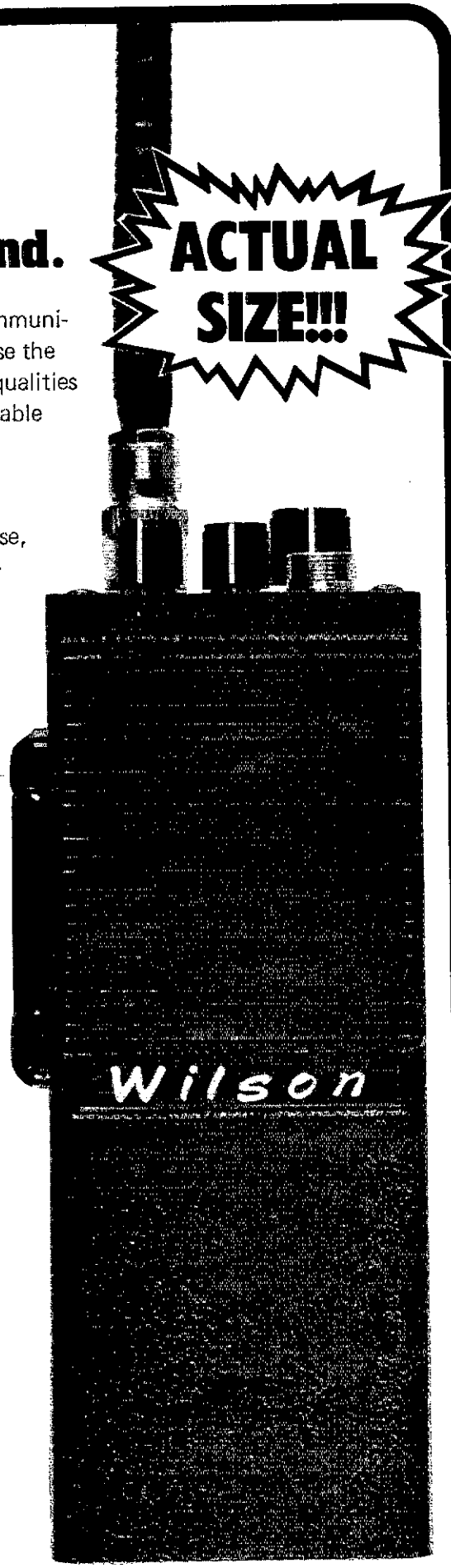

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Check QST Contest Calendar for details. Let's all get
to the contest & put NC on the map. Recent appoi
ments include: WB4OKG WD8NYN & WD4EPO as OT
Congrats to WB4MMK & WD4EPO for their traf
originations this month. Both qualifying for BPL. Traff
(Aug) WB4MMK 271, WD4EPO 265, WB4WII 24
WD4CNO 164, W4EAT 151, WB4MXG 148, K4MC 14
KB4IZ 120, K4VHT 111, AB4S 102, KK4M 84, AB4V 8
K4DHX 74, WD4ABZ 63, W4FMN 63, N4UE 60, N4ZH 5
WA4SRD 56, K4FTB 47, K4TPK 38, WA4IHG 37, WD4FJ
36, WD4AIE 34, WA4CUD 33, WB4CYN 31, WA4AAV 3
WB4CES 26, WB4VOZ 24, WD4CFZ 16, WA4FSC 1
WA4OJU 16, WB4SLF 16, WD4NAO 14, WD4JNZ 1
W4RVE 13, WA4QAW 10, K4AI 4, KA4IUY 4, W4EHF
WD4JOC 3, WA4UPH 3, KA4GBJ 2. (July) WD8NYN 13
WD4SCH 106, WD4CFZ 16, WA4AKB 12, W4EHF
WA4UPH 3, WA4OJU 1.

SOUTH CAROLINA: SCM, Richard McAbee, W4MTK
Asst. SCM: WB4UDK. STM: W4UDK. STM: W4ANK. NM
WA4SJS N4PO W4OCX KA4BGX. Check-ins/traffi
August. SC SSBN 1303/155; Anderson 2-M Net 533/3
CMN 293/112; Lancaster City 2-M Net 151/13; CN
141/72; Dillion Cty. Emerg. Net 18/0. Many thanks to all
you who spent tireless hours on the ham bands durin
our visit of Hurricane David through the state, a job we
done. Time and freq. change in CNN, 6:15 P.M. local tim
on 3.720 MHz. Won't you join them? Congrats. to ne
licensee and up-grades: KA4JWR KA4KLK KA4KM
KA4IZO N4BSE & WD4ESP. W4HDO, pres. Palmett
State Chapter QCWA, reports that one of the stronges
chapters in QCWA continues to get stronger. Traffi
(Aug.) K4ZN 216, WD4AWN 208, KA4BGX 80, W4NTO 7
W4ANK 74, W4NQL 72, W4FMZ 64, W4OCX 51, KA4AU
50, W4DAW 44, WB4UDK 42, W4MTK 34, W4FVV 3
K4VIA 23, WA4SJS 20, WB4JNE 16, WD4DOL 1
WD4HBX 13, AF4E 11, WA4VYS 10, WD4EDM
WD4BUM 7, W4DRF 6, N4EE 5, WD4DOM 3, WB8TCT/4
WD4FJP 1, WB4NBK 1. (July) WD4BUM 6.

VIRGINIA: SCM, Rick Genter, K4BKX — ASCM: Budd
Smith, W4YE. STM: W4SQQ. SEC: N4NK. Chief OO
W4HU. Chief OVS WA4PGI.

Net	kHz	Time (PM)	Sess.	QTC	QNI	Mgr.
VNTN	3907	NOON	31	207/201	302	N4LE
VSBN-E	3947	6:00	31	276/249	497	W4JK
VSN	3680	6:30	30	86/69	258	WA4YIU
VN-E	3680	7:00	30	216/186	430	WB4FLT
VN-L	3680	10:00	30	176/151	271	WB4FLT
VSBN-L	3947	10:15	31	225/197	612	W4JK

FLASH: As this was going to press, Hurricane David h
VA. Our ARES operation on Sept. 5th was a big succes
and has brought praise from both Federal and State o
ficials. We can all be proud of our ARES organization.
want to thank WA4ISA and the VFN for their cooperatio
and participation. SEC, N4NK, will report on David i
greater detail later. W3HD presented W4ZM with a 60 y
award from ARRL. K4MM presented W4ST with a 50 y
QCWA award. W4SQQ, STM, and K4BKX, SCM, attende
the Bristol and Winchester hamfests. Virginians atte
ding the 2RN picnic and EAS meeting were WB4PN
WA4CCK WA4EQW W4SQQ and K4BKX. WA4NTP has
new tower ant., rig and amp. The Alexandria R
celebrated 25 yrs. of service to the American Red Cros
and to City Civil Defense programs. WA4LJI has a ne
tri-band quad up. WB4ZNB talked about traffic an
ARES to his local radio club and a Cub Scout day cam
and also set up a display at the Southampton Co. Por
Festival. N5BA will be returning to 5-Land. W4YE i
keeping busy with the OSL bureau. WA4YJF made a
ARES presentation to the Roanoke Valley ARC. K4BA
was by ITU Geneva. N3RC just returned from the
Bahamas. An enjoyable time was had by all at the ARP
SC picnic in Crewe; next year, more bear, less meeting
Traffic: WB4PNY 691, W4JK 547, WA4CCK 512, KB4
481, N4NK 401, K8LGA 302, W4SQQ 289, W3BBN 242
WB4FLT 203, WA4LJI 171, K4KNP 111, K4BKX 136
K4JM 124, WA4STO 121, WB4DBK 117, W4UQ 114, N4RF
95, KB4QG 93, WA4ISA 82, N4LE 67, WD4NEI 65, W3BB
64, WA4YIU 55, K4EJ 55, KF4R 50, AA4CK 45, K8JH 38
N4BJX 37, WB4FDT 36, W4SHJ 34, WA4UYD 34, K4DHB
33, N4IF 33, WB4NEE 30, W4NWM 26, N4OT 25, WA4FDV
23, K4GR 22, N4YQ 22, WB4ZNB 22, WB4RWY 21, N5BA
20, WB4DQZ 20, N4FM 20, N4AZI 19, WD4FTK 18,
W4OKN 18, W4SUS 18, N4ATT 16, WB4MAE 16, KB4OB
16, WB4ODZ 16, KB4OF 16, WB4KIT 14, WA4ONR 14,
N4UY 14, WB4ZWT 14, W4YE 12, W4CFV 11, KJ4J 11,
W4YVG 10, KA4ETG 9, WD4EUV 8, WB4UHC 7, W4KXE 6,
W4LXB 6, WA4EGW 5, WB4FNW 5, WA4PBG 5, WA4YJF
5, N4BHI 4, WA4WQG 4, K4AXF 3, W4DM 2, K4ITV 2,
W4JUJ 2, WD4KUK 2, WB4FWL 1, WB4LAB 1, K4MLC 1,
WA4RXY 1, WB4SHK 1, KI4W 1, KM4X 1.

WEST VIRGINIA: SCM, Karl Thompson, K8KT — STM:
WA8WPW. SEC: K8QEW. NMs: K8MHR WD8JYM
WB8AKQ. Weirton area Hams were very actively involv
ed in c.d. work during August flooding. ECs still needed
in several counties, contact K8QEW if interested.
WB8TDA is recipient of one of six scholarships given by
The Foundation for Amateur Radio. Congratulations.
Black Diamond Traffic Net meets at 9:00 P.M. local time
each Mon. on 25/85 Beckley area. WD8EAV Net Mgr.
WB8VAZ is back from FL. No reports on activity while
away. First male hurricane was named after WD8LDY
because it was so windy and informal. Congrats. New
harmonic at KT/BT residence. Name is Brent — no call
as yet.

Net	Freq.	Time-Z	Ck-In	Tfc.	Sess.
Hillbilly	14290	1700-Su	117	25	4
Novice	3730	2215 Dy	78	3	26
Phone MD	3990	1600 Dy	328	73	31
Phone	3990	2300 Dy	708	129	31
CW	3567	2300 Dy	140	48	31

Traffic: WA8WPW 231, N8AJC 54, WB8AKQ 47, WB8TDA
40, WD8JYN 37, W8HZA 35, K8MHR 34, WD8LDY 31,
WD8EAV 19, KA8ETV 19, W8YP 17, WD8JYM 16, AI8I 14,
W8CNF 11, K8KT 10, W8JWX 8, K8QEW 8, K8ZDY 7,
W8FG 6, WB8CNN 4, K8MS 4.

ROCKY MOUNTAIN DIVISION

COLORADO: SCM, Robert W. Porter, K0DJ — SEC:
W0GOW. STM: WB0MCL. NM: K0CNV WB0ZQG.
WD0DNM active on OSCAR. CWN net dinner was a huge
success with nearly thirty members present. W0DYK
starting new job this Fall. As of this writing, Colo.
Springs 37/97 repeater again operational from its moun-
taintop location. Contacts have been made as far away
as McCook, NE and Chugwater, WY. Hopefully it will not
suffer the same ills as the old machine. NTS nets
boasting two new managers who took over their respec-
tive nets August 31. Congrats to WD0AIT CWN manager
and AD0A TWN (E) manager. It is with the deepest regret
I report the passing of W0GPP of Fowler and WB0MCL's
dad. Those who knew and loved them know all too well

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1108	Antenna Adaptor Cord	$ 9.95
1110	Carrying Case (Leather)	$17.85
1111	Carrying Case (Vinyl)	$ 9.95
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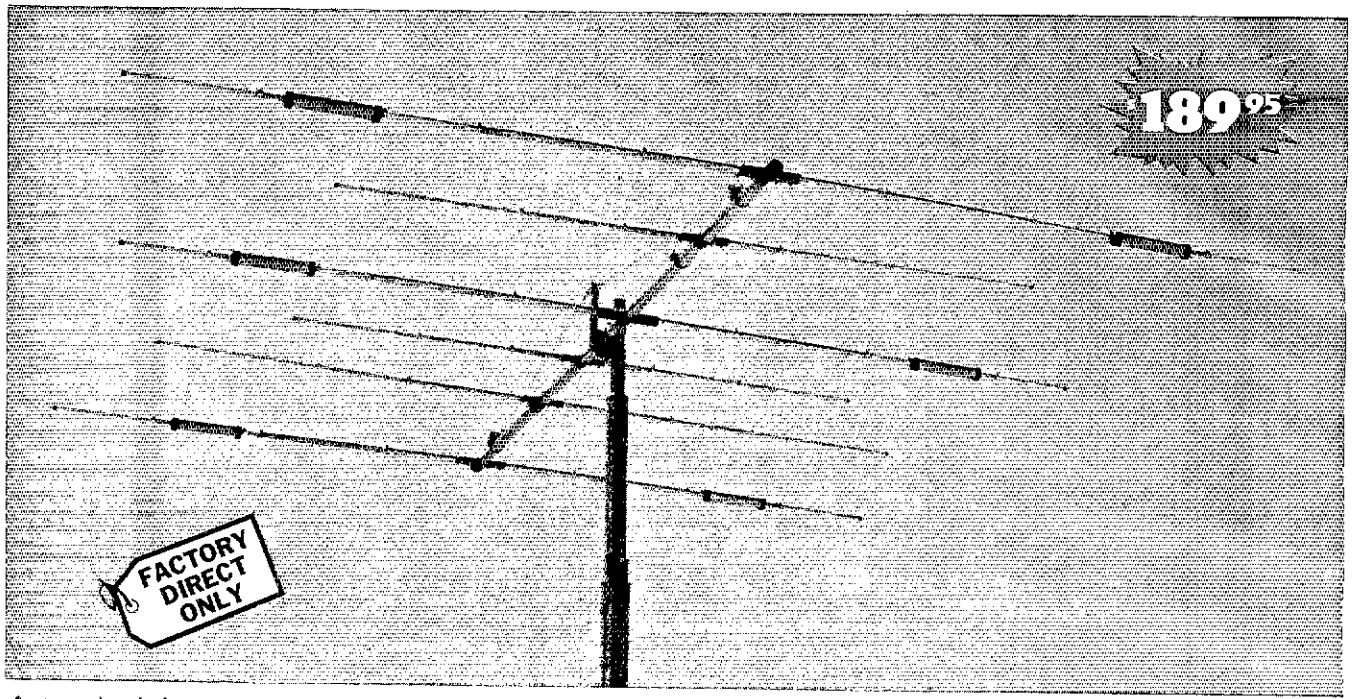
WILSON SYSTEMS, INC. presents the SYSTEM 36

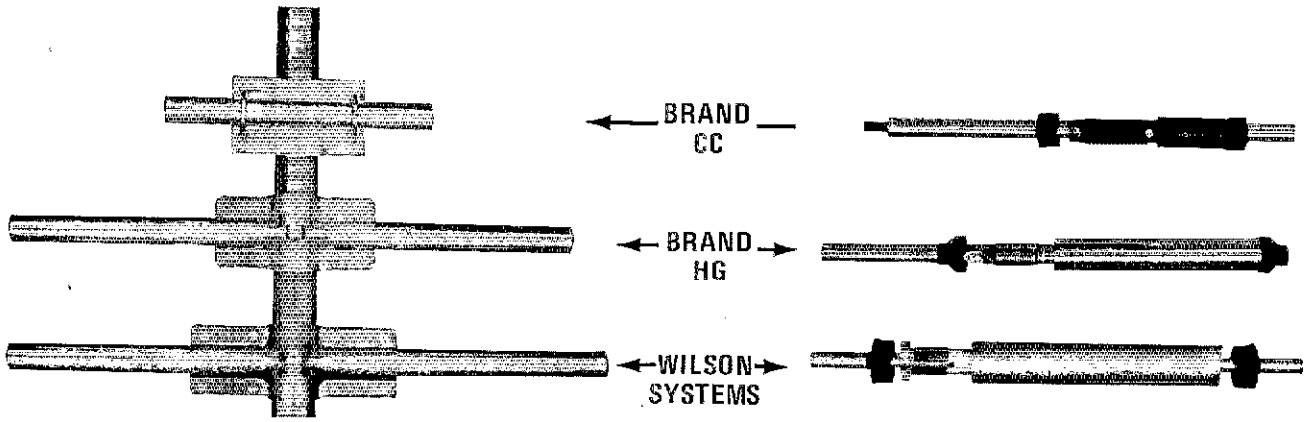


A trap loaded antenna that performs like a monobander! That's the characteristic of this six element three band beam. Through the use of wide spacing and interlacing of elements, the following is possible: three active elements on 20, three active elements on 15, and four active elements on 10 meters. No need to run separate coax feed lines for each band, as the bandswitching is automatically made via the High-Q Wilson traps. Designed to handle the maximum legal power, the traps are capped at each end to provide a weather-proof seal against rain and dust. The special High-Q traps are the strongest available in the industry today.

SPECIFICATIONS

Band MHz 14-21-28	Boom (O.D. x Length) . . 2" x 24'2½"	Wind loading @ 80 mph . . 215 lbs.
Maximum power input. Legal limit	No. of elements. 6	Maximum wind survival . . 100 mph
Gain (dBd) . . . . . Call Factory	Longest element . . . . . 28'2½"	Feed method . . . . . Coaxial Balun
VSWR @ resonance . . . 1.3:1	Turning radius . . . . . 18'6"	Assembled weight (approx. 53 lbs.
Impedance . . . . . 50 Ω	Maximum mast diameter. 2"	Shipping weight (approx.). 62 lbs.
F/B ratio . . . . . Call Factory	Surface area . . . . . 8.6 sq. ft.	

Compare the SY-36 with others . . .



Compare the size and strength of the boom to element clamps. See who offers the largest and heaviest duty. Which would you prefer?

Wilson Systems traps offer a larger diameter trap coil and a larger outside housing, giving excellent Q and power capabilities.

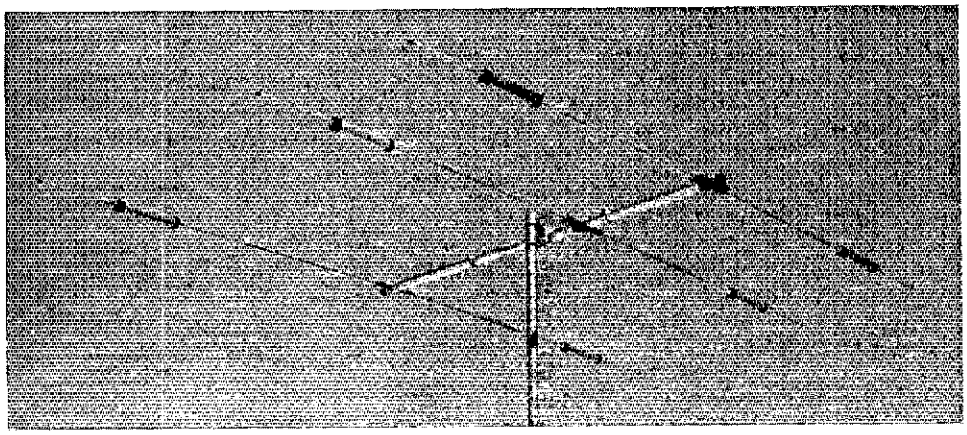
CALL FACTORY DIRECT 1-800-634-6898

WSI WILSON SYSTEMS, INC.

4286 S. Polaris Ave., Las Vegas, Nevada 89103

Prices and specifications subject to change without notice.

WILSON SYSTEMS INC. MULTI-BAND ANTENNAS



$139.95

SYSTEM 33

(FORMERLY SYSTEM THREE)

FACTORY DIRECT ONLY

Capable of handling the Legal Limit, the "SYSTEM 33" is the finest compact tri-bander available to the amateur.

Designed and produced by one of the world's largest antenna manufacturers, the traditional quality of workmanship and materials excells with the "SYSTEM 33".

New boom-to-element mount consists of two 1/8" thick formed aluminum plates that will provide more clamping and holding strength to prevent element misalignment.

Superior clamping power is obtained with the use of a rugged 1/4" thick aluminum plate for boom to mast mounting.

The use of large diameter High-Q traps in the "SYSTEM 33" makes it a high performing tri-bander and at a very economical price.

A complete step-by-step illustrated instruction manual guides you to easy assembly and the lighweight antenna makes installation of the "SYSTEM 33" quick and simple.

The same quality traps are used in the SY33 that are used in the SY36.

SPECIFICATIONS

Band MHz	14-21-28	**Turning radius**	15'9"
Maximum power input	Legal limit	**Maximum mast diameter**	2" O.D.
Gain (dbd)	Call Factory	**Surface area**	5.7 sq. ft.
VSWR at resonance	1.3:1	**Wind loading at 80 mph**	114 lbs.
Impedance	50 ohms	**Assembled weight (approx.)**	37 lbs.
F/B ratio	Call Factory	**Shipping weight (approx.)**	42 lbs.
Boom (O.D. x length)	2" x 14'4"	**Direct 52 ohm feed--no balun required maximum wind survival**	100 mph
No. elements	3		
Longest element	27'4"		

$74.95

WV-1A

4 BAND TRAP VERTICAL (10 - 40 METERS)

No bandswitching necessary with this vertical. An excellent low cost DX antenna with an electrical quarter wavelength on each band and low angle radiation. Advanced design provides low SWR and exceptionally flat response across the full width of each band.

Featured is the Wilson large diameter High-Q traps which will maintain resonant points with varying temperatures and humidity.

Easily assembled, the WV-1A is supplied with a hot dipped galvanized base mount bracket to attach to vent pipe or to a mast driven in the ground.

Note:
Radials are required for peak operation.
(See GR-1 below).

SPECIFICATIONS:

- Self supporting—no guys required.
- Input Impedance: 50 Ω
- Powerhandling capability: Legal Limit
- Two High-Q Traps with large diamater coils
- Low Angle Radiation
- Omnidirectional performance
- Taper Swaged Aluminum Tubing
- Automatic Bandswitching
- Mast Bracket furnished
- SWR: 1.1:1 or less on all Bands

GR-1

$9.95

The GR-1 is the complete ground radial kit for the WV-1A. It consists of: 150' of 7/14 stranded copper wire and heavy duty egg insulators, instructions. The GR-1 will increase the efficiency of the GR-1 by providing the correct counterpoise.

CALL FACTORY DIRECT 1-800-634-6898

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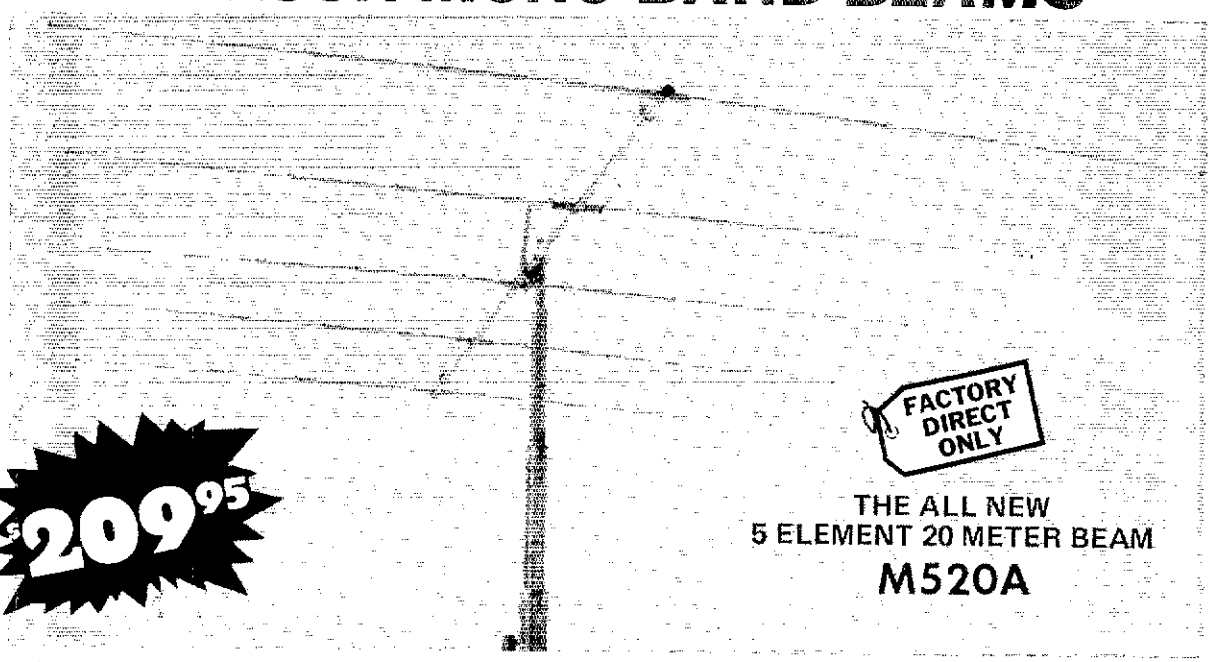
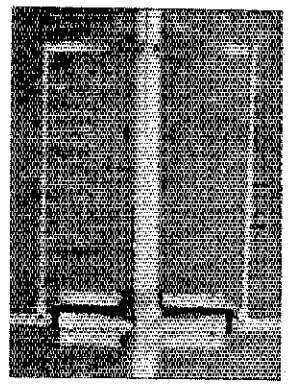
WILSON MONO-BAND BEAMS



At last, the antennas that you have been waiting for are here! The top quality, optimum spaced, and newest designed monobanders. The Wilson Systems' new Monoband beams are the latest in modern design and incorporate the latest in design principles utilizing some of the strongest materials available. Through the select use of the current production of aluminum and the new boom to element plates, the Wilson Systems' antennas will stay up when others are falling down due to heavy ice loading or strong winds. Note the following features:

1. Taper Swaged Elements — The taper swaged elements provide strength where it counts and lowers the wind loading more efficiently than the conventional method of telescoping elements of different sizes.
2. Mounting Plates — Element to Boom — The new formed aluminum plates provide the strongest method of mounting the elements to the boom that is available in the entire market today. No longer will the elements tilt out of line if a bird should land on one end of the element.
3. Mounting Plates — Boom to Mast — Rugged 1/4" thick aluminum plates are used in combination with sturdy U-bolts and saddles for superior clamping power.
4. Holes — There are no holes drilled in the elements of the Wilson HF Monobanders. The careful attention given to the design has made it possible to eliminate this requirement as the use of holes adds an unneccessary weak point to the antenna boom.

With the Wilson Beta-match method, it is a "set it and forget it" process. You can now assemble the antenna on the ground, and using the guidelines from the detailed instruction manual, adjust the tuning of the Beta-match so that it will remain set when raised to the top of the tower.



Wilson's Beta match offers maximum power transfer.

The Wilson Beta-match offers the ability to adjust the terminating impedance that is far superior to the other matching methods including the Gamma match and other Beta-matches. As this method of matching requires a balanced line it will be necessary to use a 1:1 balun, or RF choke, for the most efficient use of the HF Monobanders.

The Wilson Monobanders are the perfect answer to the Ham who wants to stack antennas for maximum utilization of space and gain. They offer the most economical method to have more antenna for less money with better gain and maximum strength. Order yours today and see why the serious DXers are running up that impressive score in contests and number of countries worked.

SPECIFICATIONS

Model	Band Mtrs	Gain dBd	F/B Ratio	Bandwidth @ Resonance 2:1 VSWR Limit	VSWR @ Resonance	Impedance	Matching	Elements	Longest Element	Boom O.D.	Boom Length	Turning Radius	Surface Area (Sq.Ft.)	Windload @ 80 mph (Lbs.)	Maximum Mast	Assembled Weight (Lbs.)
M520A	20	CALL FACTORY		500 KHz	1.1:1	50 Ω	Beta	5	36'6"	2"	34'2¼"	25'1"	8.9	227	2"	68
M420A	20			500 KHz	1.1:1	50 Ω	Beta	4	36'6"	2"	26'0"	22'6"	7.6	189	2"	50
M515A	15			400 KHz	1.1:1	50 Ω	Beta	5	25'3"	2"	26'0"	17'6"	4.2	107	2"	41
M415A	15			400 KHz	1.1:1	50 Ω	Beta	4	24'2½"	2"	17'0"	14'11"	3.1	54	2"	25
M510A	10			1.5 MHz	1.1:1	50 Ω	Beta	5	18'6"	2"	26'0"	16'0"	2.8	72	2"	36
M410A	10			1.5 MHz	1.1:1	50 Ω	Beta	4	18'3"	2"	12'11"	11'3"	1.4	36	2"	20

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WILSON SYSTEMS, INC.

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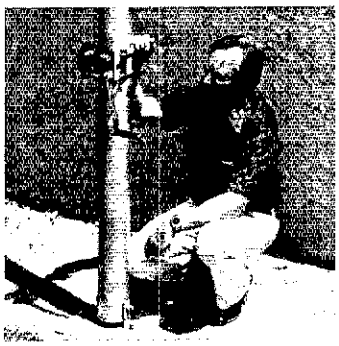
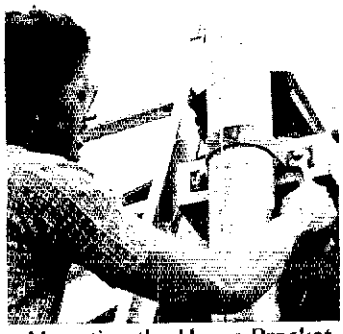
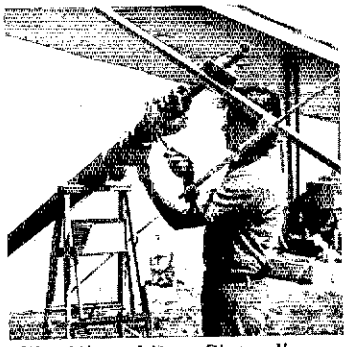
New, Improved Wilson Towers



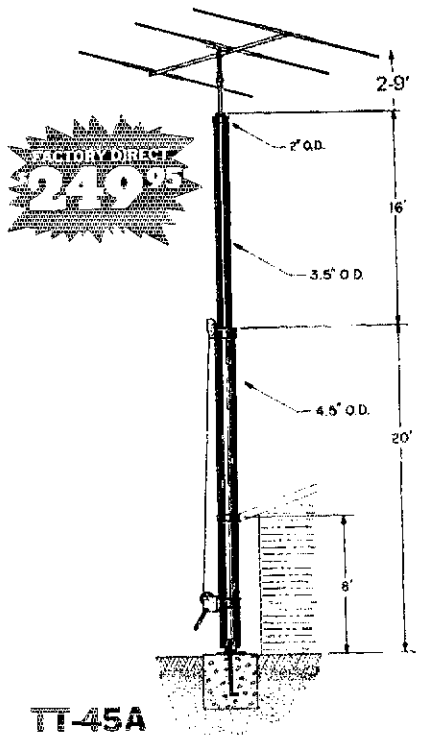
Hinged Base Plate - Concrete Pad, Heavy Duty Winch



Mounting the House Bracket



The Hinged Base Plate allows tower to be tilted over for access to antenna and rotor from the ground.



FACTORY DIRECT $249.95

TT-45A

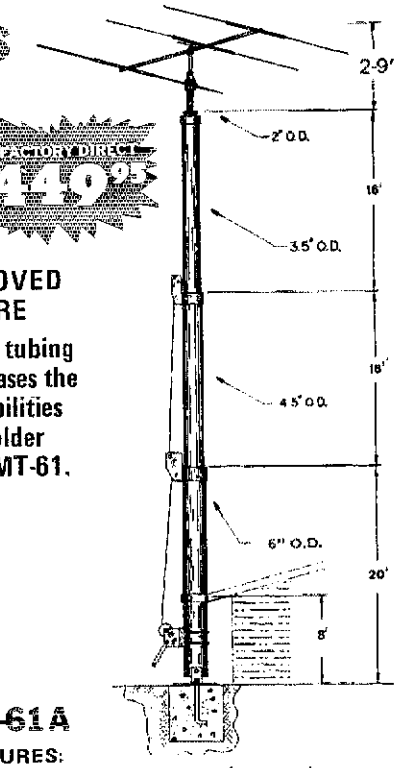
FEATURES:

- Maximum Height 45' (will handle 12 sq. ft. at 38') @ 50 mph
- 1200 lb. winch
- Totally freestanding with proper base
- Total Weight, 243 lbs.

The TT-45A is a freestanding tower, ideal for installations where guys cannot be used. If the tower is not being supported against the house, the proper base fixture accessory must be selected. (Requires 12"x12"x36" of concrete.)

NEW IMPROVED FEATURE

Heavier wall tubing greatly increases the stress capabilities over the older TT-45 and MT-61.



FACTORY DIRECT $449.95

MT-61A

FEATURES:

- Is freestanding with use of proper base
- Maximum Height is 61' (will handle 12 sq. ft. at 53') @ 50 mph
- 1200 lb. brake winch
- 4200 lb. raising cable
- Total Weight, 400 lbs.

Recommended base accessory: RB-61A, FB-61A.

The MT-61A is our largest and tallest freestanding tower. By using the RB-61A rotating base fixture the MT-61A is ideally suited for the SY33 or SY-36. If you plan to mount the tower to your house, caution should be taken to make certain the eave is properly reinforced to handle the tower. If not, one of the base accessory fixtures should be used. (Requires 18"x18"x48" concrete.)

GENERAL FEATURES

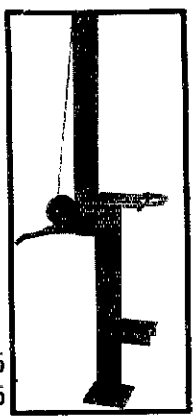
All towers use high strength heavy galvanized steel tubing that conforms to ASTM specifications for years of maintenance-free service. The large diameters provide unexcelled strength. All welding is performed with state-of-the-art equipment. Top sections are 2" O.D. for proper antenna/rotor mounting. A 10' push-up mast is included in the top section of each tower. Hinge-over base plates are standard with each tower. The high loads of today's antennas make Wilson crank-ups a logical choice.

TILT-OVER BASES FOR TOWERS

FIXED BASE

The FB Series was designed to provide an economical method of moving the tower away from the house. It will support the tower in a completely free-standing vertical position, while also having the capabilities of tilting the tower over to provide an easy access to the antenna. The rotor mounts at the top of the tower in the conventional manner, and will not rotate the complete tower. (Requires 3'x3'x5½' of concrete.)

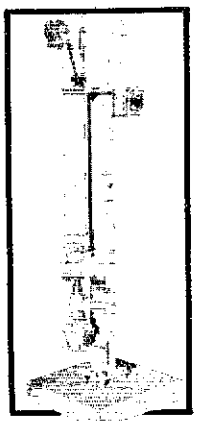
FB-45A . . . $ 99.95
FB-61A . . . 129.95



ROTATING BASE

The RB Series was designed for the Amateur who wants the added convenience of being able to work on the rotor from the ground position. This series of bases will give that ease plus rotate the complete tower and antenna system by the use of a heavy duty thrust bearing at the base of the tower mounting position, while still being able to tilt the tower over when desiring to make changes on the antenna system. (Requires 3'x3'x6' of concrete.)

RB-45A . . . $139.95
RB-61A . . . 199.95



Tilting the tower over is a one-man task with the Wilson bases.
(Shown above is the RB-61A.)
(Rotor not included)

WILSON SYSTEMS, INC.

4286 S. Polaris Avenue
Las Vegas, Nevada 89103
(702) 739-7401
Toll-Free Order Number 800-634-6898

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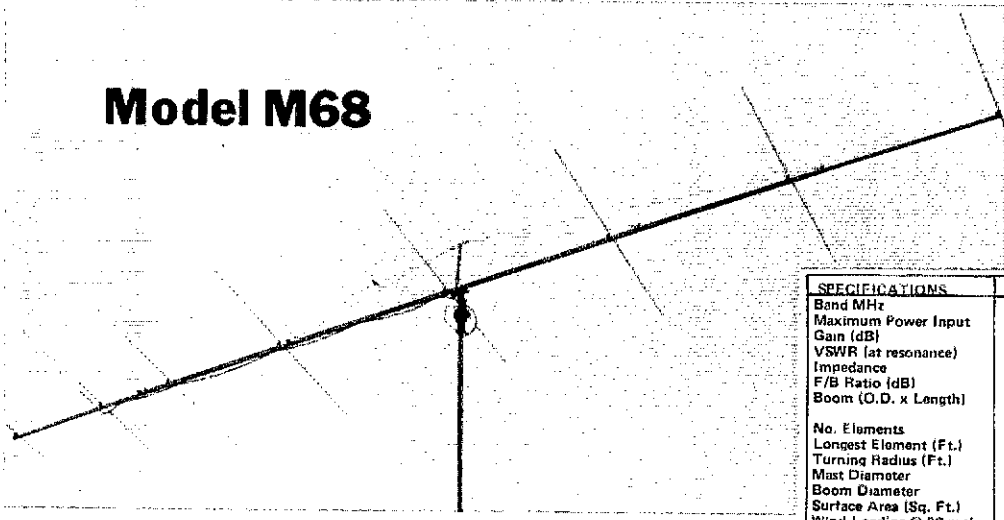
6 METER BEAMS

Model M68



As low as $27.95

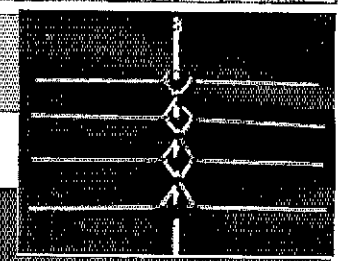
SPECIFICATIONS	MODEL M68	MODEL M66	MODEL M64
Band MHz	50	50	50
Maximum Power Input	4 Kw	4 Kw	4 Kw
Gain (dB)	Call Factory	Call Factory	Call Factory
VSWR (at resonance)	1.1:1	1.1:1	1.1:1
Impedance	50 ohms	50 ohms	50 ohms
F/B Ratio (dB)	Call Factory	Call Factory	Call Factory
Boom (O.D. x Length)	2" to 1¼"	2" x 25'8" x 38'10"	1¼" x 11'6"
No. Elements	8	6	4
Longest Element (Ft.)	9'8"	9'8"	9'8"
Turning Radius (Ft.)	19'0"	13'10"	7'6"
Mast Diameter	2" O.D.	2" O.D.	1¼" O.D.
Boom Diameter	2" to 1¼" O.D.	2" O.D.	1¼" O.D.
Surface Area (Sq. Ft.)	5.8	4.5	1.5
Wind Loading @ 80 mph	145	112	37
Assembled wght. Approx.	34 lbs.	26 lbs.	11 lbs.
Shipping wght. Approx.	39 lbs.	31 lbs.	13 lbs.
Matching Method	Gamma	Gamma	Gamma
PRICE	$64.95	$54.95	$27.95

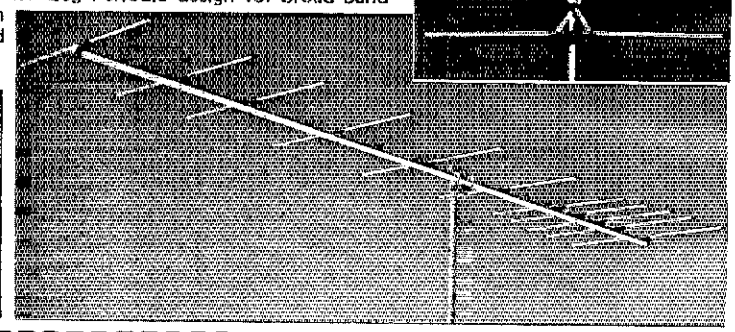
8 elements W - I - D - E spaced on a L - O - N - G 37' boom . . . for those long hauls to JA and VK land! Choose 4, 6 or 8 elements to put you in the action on six meters.

2 METER BEAMS

Starting at $19.95

Wilson's new 2 meter series combines the ultimate in design and quality materials. These top performing beams feature 7, 9 or 11 aluminum elements held to the heavy walled boom with the exclusive molded Lexan® boom to element mounting. The four driven elements use Log Periodic design for broad band characteristics providing full 144-148 MHz coverage with less than 1.2 to 1 VSWR across the band. Universal mounting is provided for vertical or horizontal polarization.





SPECIFICATIONS	M27	M29	M211
Band MHz	144-148 MHz	144-148 MHz	144-148 MHz
Gain (dB)	Call Factory	Call Factory	Call Factory
VSWR	Less than 1.2:1 across band	Less than 1.2:1 across band	Less than 1.2:1 across band
Impedance	50 ohms balanced	50 ohms balanced	50 ohms balanced
Number of Elements	7	9	11
Boom (O.D. x Length)	1" O.D. x 5'4"L.	1" O.D. x 10'0"L.	1¼" O.D. x 12'6"
Longest Element	40"	40"	40"
Surface Area (Sq. Ft.)	.8	1.5	2.8
Assembled wght Approx.	3.5 lbs.	5 lbs.	6 lbs.
Shipping wght. Approx.	6.5 lbs.	8 lbs.	9 lbs.
Turning Radius	38"	64"	78"
PRICE	$19.95	$24.95	$29.95

WILSON SYSTEMS, INC. – 4286 S. Polaris
Las Vegas, NV 89103 – (702) 739-7401

FACTORY DIRECT ORDER BLANK

Toll-Free Order Number
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WILSON SYSTEMS ANTENNAS

Qty	Model	Description	Shipping	Price
	SY33	3 Ele. Tribander for 10, 15, 20 Mtrs.	UPS	$139.95
	SY36	6 Ele. Tribander for 10, 15, 20 Mtrs.	UPS	189.95
	WV-1A	Trap Vertical for 10, 15, 20, 40 Mtrs.	UPS	44.95
	GH-1	Ground Radials for WV-1A	UPS	9.95
	M-520A	5 Elements on 20 Mtrs.	TRUCK	209.95
	M-420A	4 Elements on 20 Mtrs.	UPS	139.95
	M-515A	5 Elements on 15 Mtrs.	UPS	119.95
	M-415A	4 Elements on 15 Mtrs.	UPS	79.95
	M-510A	5 Elements on 10 Mtrs.	UPS	84.95
	M-410A	4 Elements on 10 Mtrs.	UPS	64.95
	WM-62A	Mobile Antenna. 5/8 λ on 2, 1/4 λ on 6	UPS	19.95
	M-86	8 Elements on 6 Mtrs.	UPS	84.95
	M-66A	6 Elements on 6 Mtrs.	UPS	54.95
	M-46	4 Elements on 6 Mtrs.	UPS	27.95
	M-112	11 Elements on 2 Mtrs.	UPS	29.95
	M-92	9 Elements on 2 Mtrs.	UPS	24.95
	M-72	7 Elements on 2 Mtrs.	UPS	19.95
		ACCESSORIES -		
	HD-73	Alliance Heavy Duty Rotor	UPS	109.95
	RC-8C	8/C Rotor Cable	UPS	12/ft.
	RG-8U	RG-8U Foam-Ultra Flexible Coaxial Cable. 38 strand center conductor, 11 guage	UPS	21/ft.

WILSON SYSTEMS TOWERS

Qty.	Model	Description	Shipping	Price
	TT-45A	Freestanding 45' Tubular Tower	TRUCK	$249.95
	RB-45A	Rotating Base for TT-45A w/tilt over feature	TRUCK	139.95
	FB-45A	Fixed Base for TT-45A w/tilt over feature	TRUCK	99.95
	MT-61A	Freestanding 61' Tubular Tower	TRUCK	449.95
	RB-61A	Rotating Base for MT-61A w/tilt over feature	TRUCK	199.95
	FB-61A	Fixed Base for MT-61A w/tilt over feature	TRUCK	129.95

NOTE:
On Coaxial and Rotor Cable, minimum order is 100 ft. and in 50' multiples.
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how dearly they will be missed. Net tfc. Aug.: Columbine 31 sessions, QNI 911, QTC 116, Informals 178, QNF 1188; CWN 31 sessions, QNI 216, QTC 254, QNF 998; Hi-Noon 29 sessions, QNI 1044, QTC 66, Informals 147, QNF 1218. Traffic: (Aug) WØWYX 2824, WAØHJZ 1043, WØMDT 140, WØLAE 133, ADØA 128, WBØYKH 96, KØDJ 96, WDØAIT 93, NØACW 71, WBØZOG 36, WØGO 28, WØNFW 9, WDØDNM 2. (July) NØACW 363. (June) NØACW 64. (May) NØACW 137.

NEW MEXICO: SCM, Joe T. Knight, W5PDY — SEC: W5ALR. NM: WD5AHH K5KPS. Southwest Net (SWN) meets daily on 3585 kHz, at 2000 local time and handled 160 msgs with 172 stations reporting in. New Mexico Roadrunner Net (NMRRN) meets daily on 3940 kHz at 1800 local and handled 117 msgs with 1096 stations reporting in. New Mexico Breakfast Club meets daily on 3940 kHz at 0700 local, handled 99 msgs with 844 checkins. Yucca 2 mtr net handled 18 msgs with 408 checkins. Congrats to WB5YOH and WBØECV on their ALL HAM WEDDING in Ojo Sarco, NM, August 18th, with details elsehwere in this issue. Traffic: N5NG 287, W5DAD 266, W5UH 223, WD5AHH 126, KL7HSF 112, K5KPS 111, W5ENI 74, W5JOV 22, WA5MIY 12.

UTAH: SCM, Royce Henningson, K7QEQ — STM: W7OCX, WB7FCB appointed as new SEC. EC N7DF, reports that the AREC of Uintah Basin provided communications for crowd control, and stage lighting system for the Uintah Basin Industrial Conference in Roosevelt, UT. Helping on the project was: N7DF KØHGW KA7BPB K7HEN and two Novice students. On August 26, a motorist, stranded in the high Uintahs was assisted by N7DF via the Grand Junction, CO 34-94 repeater in getting assistance. A 1 watt Handi-talkie was used to access the repeater which was over 100 miles away and WØLAE of Grand Junction called a party in La-Point, UT on the land line to send help. It turned out that the motorist in distress was the Justice of the Peace for LaPoint. AI7H reports that on Saturday, August 11, a 20 year old woman fell down a glacier and broke her ankle on Mt. Timpanogos, Utah County. Shortly thereafter, she was discovered by K7UA who was hiking on the mountain. He issued an emergency call over WR7AFT 16-76 which was answered by AI7H. Helicopter aircraft was arranged through telephone contact with the Sheriff's Department. AI7H formerly W7LUA is now active on ht with an IC701, DTR2000L and LKM KT34. K7QEQ and NØAD hope to have a 01-61 repeater on the air by the time this is in print. The repeater will be on Abajo Peak, west of Monticello, UT and will serve the Four Corner area of Arizona, Colorado, New Mexico, and Utah, from the 11,360 foot peak. WB7VEA upgraded to KB7HY Advanced. Public service honor roll NØAHA 62. Traffic: K7HLR 294, WA7MEL 90, WA7IRC 62, NØAHA 36, W7OCX 26, W7BE 14, W7UTM 14, W7RO 7.

WYOMING: SCM, Chester C. Stanwaity, W7SDA — Assistant SCM: K7IKO. SEC: WB7EIN. NMs: WB7NHR WA7WFC W7LYA. OTS: WA7WZQ W7SQT K7WY W7LYA.

Net	Freq.	Time	Days
Wyo. Weather net	3923 kHz	1330 Z	M-Sat.
Jackalope net	7260 kHz	1915 Z	M-Sat
Colo/Wyo net	3715 kHz	0130 Z	Dly
Wyo. Cowboy net	3923 kHz	0145 Z	Tues-Sat

K7WUR has just finished working all counties. K7YPT recovering from heart surgery in Denver. K7TWK recovering from heart attack. Fremont County ARC working on repeater site on Limestone Mountain and hope to have repeater operational soon. Repeater frequency will be 146.19/79. WB7NHR reports Wyo. Cowboy Net held 23 sessions, 659 QNI, 17 QTC. Wyo Jackalope Net held 27 sessions, 442 QNI, 3 QTC. Traffic: W7LYA 405, WA7GYQ 60, WA7SGG 22, K7SLM 8, K7TFW 2.

SOUTHEASTERN DIVISION

ALABAMA: SCM, William E. Scates, WA4JYU — SEC: K4WYT. STM: WA4JDH. New appointments: N4BEN, OTS; N4CCT, OBS. From Tuscaloosa's Novice class these new calls: KA4JOE KA4JIC KA4JWE KA4JWD and still more to come. Congratulations, groups. Speaking of Novice classes, what is your club or group doing to help youngsters and prospective amateurs? Let me give you a bit of information on what two clubs are doing. First, the BARC will start its Novice and upgrade class during the 1st week in Sept. The BARC runs two sessions a year for Novice through Advanced, and every year it is a sellout situation. This is one fine program, and this ham can tell you about it 1st hand, as I came up in this program. The second thing is a program by HAYLARC out of Huntsville. These gals are working the Huntsville school system with "Moving Up With Amateur Radio", and they are getting radio and TV coverage. Tnx for a super job. It's not hard, group. Look around your area and see what you can do to pay your dues. You'll just have to listen to a favorite expression of mine — "Paying your dues." No matter how you got into ham radio, you owe someone. The only way you can repay him is to help someone else. "Pay your dues." Congratulations are in order for N4CCT and WB4WRO to Advanced, K4JXS and WB4FIR to Extra and KA4HSN and WA4WNV to 20 wpm code. Traffic: WA4JDH 925, WA4UKD 595, N4CCT 402, W4CKS 80, K4AOZ 78, WA4ZPZ 33, WA4JPK 29, KA4EWD 21, W4IBU 21.

CANAL ZONE: SCM, Alvin Sholk, KZ5AS — On October 1, 1979, the Canal Zone will cease to exist. This means that the "KZ5" prefix will be deleted and the Canal Zone Section will no longer exist after that date. Most KZ5 operators have already obtained or will obtain HP1X — or HP2X — call signs and continue to operate. It is with pleasure that I served as SCM during the last year and take this opportunity to thank all the KZ5 operators for their assistance.

GEORGIA: SCM, Eddy Kosnbucki, K4JNL — Asst SCM: K4VHC. SEC: K4SWJ. Asst. SEC: WD4HXE. STM: WA3NAZ/4. NMs: K4DMK W4HON K4VHC W4WXA WB4ZOJ.

Net	Freq.	Time
GCN	3995	0700 M/S 0800 Sun EST
GTN	3718	1815 Dy EST
GSN	3595	1900 & 2200 Dy EST
GSSBN	3975	1930 Dy EST
ARES	3975	1700 Sun EST

Hats off to all in the section who devoted their time during the Labor Day weekend furnishing communications for Hurricane David. It seems that when the need arises during emergencies, the section is out in full force. Tnx to all of you from the citizens affected by the storm. A life was saved by the members of the Columbus ARC during the running of the 10,000 meter run sponsored by the Arthritis Foundation. When asked to furnish communications for any event, please cooperate with the sponsors request. K4WC back from Europe after a FB

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- Provision to call subprograms from the M800 operating system. This feature allows for future expandability of the M800 software. As a demonstration of its potential, you will receive a subprogram on cassette which will send either of two different real-time pictures (Custom PIX!).
- Instant callsign insertion. Enter other fellow's call just once, then press a single key to send entire ID exchange: W9XYZ HERB DE RON N6EE
- Select output to your line printer.
- Auto line numbering.
- Auto ID in RTTY and CW, CW only, or RTTY only.
- Auto left margin labeling.
- Auto carriage return/line feed-selectable carriage width.
- Auto suppress carriage returns and line feeds on receive to compact display.
- Output speed control-like the UT4-set as slow as you like to ensure uniform output rate and realtime editing.
- Four programmable messages of 255 characters each plus one *big* message limited only by RAM available (around 2.5 K on a 16K TRS-80). Save brag tapes, pix, etc. on cassette.
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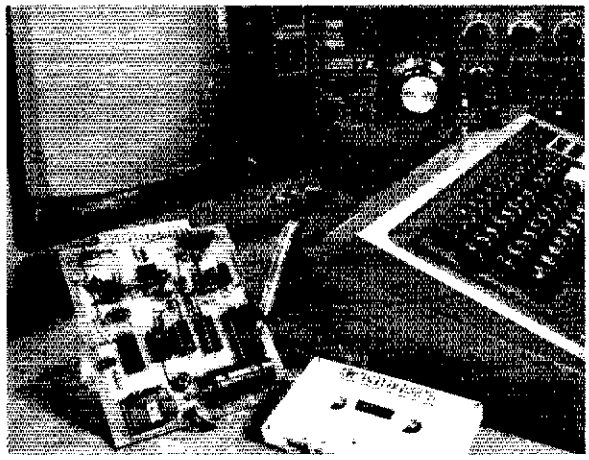

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time. Stone Mt. Famvention will be closing out th years Hamfest. This will be the last shot this yea Albany reports good activity with ATV in the area. C net QNIs increase every month, great to see some of th old calls participating. Deadline for Ham Call Lett plates in Georgia is Nov. 15th. Hurry you still have tim As colder weather sets in the Sun ARES net shou become more active, won't you join us for a fe minutes. Many clubs in the state continue to sponso new and upgrading classes. This is the true spirit Amateur Radio. If you desire a League appointmen please contact your SCM. Have a Happy Thanksgivin Traffic: WD4ADV 235, W4PIM 226, WA3NAZ/4 18 WB4ZOJ 143, W4HON 70, W4GH 69, N4UZ 53, N4BHX 3 K4EV 34, K4JNL 34, W4ELO 25, WD4LYV 22, W4CMX 1 W4CZN 12, AA4GA 12, K4BAI 8, WB4BDP 5, WA4PUP WA4PZD 4, N4AWZ 3, K4WC 2.

NORTHERN FLORIDA: SCM, Frank M. Butler, Jr., W4R

Net	Freq.	Time/Days	QNI	QTC	Mgr.
NFPN	3950 kHz	2330Z Dy	1146	176	WD4PDK
QFN	3651 kHz	0000/0030Z Dy	726	448	WD4LUG
AFPN	7272 kHz	1730Z Dy			WA4NBE

New/renewed appts: WD4HXS as NM of TPTN and OT W4ZTW & K4MZK as OO; N4PL as OBS & OTS; N4S and N4ARP as OTS; WA2GIN/4 as OFS. Net certificate earned by W4MIW on FMTN; and by K4HDQ WB4I WA4JTY WA4QNY WB4TZR WB4YNN on GCARC C Tng. Net. KA4A won Omni-D first prize at Pensaco Hamfest. PFMRA now meets on second Thurs. eac month. WB4QBB new LM of ARRL; he has monoba beams for 20-15-10 on an 80 ft. tower. K7TBT has a 20 System 1 beam up 70 ft. KØMC at Corry Field active c cw nets. N4BWR Asst EC for Santa Rosa County ar liaison to Escambia County ARES. WB4JCM recoverir nicely after kidney transplant. New calls: WB4GKV no KM4O; KB4KF now KO4Z; WD4OSH now K4BU KA4GVH now N4CFK; W4JGD now KM4N. N4WA recei ed his PhD. from FSU. WN4IIV and N4AQD upgraded Advanced. Sorry to report WD4LRX a Silent Ke WB4RIS appointed EC for Navy MARS in N. Fla. All sta traffic nets and local nets on the East Coast stayed a tive throughout Hurricane David. NFPN moved to alternate frequency of 7272 kHz when 3950 becam unusable. The Brooksville repeater has been hit b lightning twice; they are looking into the ARRL surance program! WB4TZR, EC Pasco County, settir up a net to feed weather info to the Ruskin Weather S tion. Traffic: (Aug.) WD4HIF 650, AA4FG 193, WD4N 163, N4PL 104, WB4TZR 88, N4WA 77, WD4LUG 7 WD4PDK 74, WA4EYU 64, W4JL 64, WA4CRI 60, W4K 52, KF4U 50, W4LDM 47, WA4IWW 42, W4MGO 3 W4RH 32, WB4DTS 31, K4RNS 26, WB4ADL 25, W4MV 24, WD4IIO 22, WA2GIN/4 16, N4BZH 16, WB4GHU 1 WB4WOO 12, KØMC/4 8, N4ARP 1. (July) WB4QBB 55.

SOUTHERN FLORIDA: SCM, Woodrow Huddlesto K4SCL — Asst SCM: W4KGJ. SEC: AA4WJ. New a pointments: KB4OW EC South Brevard. BPLs issu W3CUL/4 W4MEE W3VR/4 K4TH and WD4COL. W4B received ARRL 40 year pin. Congrats. N4XR worked 12 stations during his August trip to HH2VP. W3C reports "getting back to normal (look at her traffic tota with . . . all temporary in shack but permanent install tion in the process." KE4O has new tower and tri-bande Seems like most of August was spent in meetings, pla ning for emergency operations. Pinellas Coun recruited Radio Amateurs to revitalize their RACES pr gram. AA4WJ issued a revised Southern Flori Emergency Plan. KB4OW very active setting up a ne net and revitalizing South Brevard ARES. Everybody t ing to get ready for October SET. Then Hurricane Dav hits. At 1316Z Sept. 2, AA4WJ placed Southern Flori Section on Condition 3 — full emergency. The secti phone nets were in emergency session continuous 7272 day and 3940 night, until the hurricane passed o of our section and emergency traffic subsided. In ad tion, FMTN, operating independently, was in continuo emergency session on 7247 day and 3925 night. 2300Z Sept. 3 Northern Florida Section went into Con tion 3 and Southern Florida reverted to supporting ro Southern Florida had felt the brunt of David as it pr ceeded along the coast from Miami to Cape Canaver Perhaps hardest hit was Melbourne area. KB4OW, as newly appointed EC had his work cut out for him. But came through with flying colors. The EC of Northe Brevard County resigned as the storm approached, WB4WYG took over, accepting his appointment radio. We thank God for people with this kind of dedic tion who will step in and help out in an emergency. H ricane David gave us a real good drill — excelle preparation for the October SET! Traffic:(Aug.) W3CUL 3646, W4MEE 902, W3VR 802, K4TH 508, K4SCL 3 WD4COL 251, WA4PFK 210, WA4NBE 189, K4EUK 1 WA4LGT 170, WB4FVV 158, W4NFK 147, WB4A 142,WB4WYG 139, KM4G 137, W4IRA 134, W4GPL 12 WB4PIB 112, K4ZK 99, WB4SNX 86, WD4ISN 81, W4N 75, WD4CHO 64, WA4EIC 54, W4MNZ 54, W4DVO 4 WD4HMC 43, W4WYR 39, KE4O 37, WB4ZVD WA4HXU 29, WA4HDH 25, N4AUO 21, KA4GDV 2 W4SMK 19, WD4PUV 13, W4TJM 2, N4XR 1. (Ju WB4DWU 1.

SOUTHWESTERN DIVISION

ARIZONA: SCM, Willard L. Haskell, AC7D — Seana (80), 1980 ARRL National Convention will be in Seatt WA (July 25-27). The theme: World Friendship Throu Amateur Radio. Details later! RACES, Pima County a in the process of organizing a unit that will operate part of the Police Assist Group. Interested amateu should contact K7CET or K7NTG in Tucson. N7EH h been appointed as your SEC for Arizona Section, Western Div. All ECs and ARES appointees will receiving further details in respect to this subject ma ter. K7TLP is a Silent Key. Resided in Phoenix and w be missed by all. His MARS call was FA6BF. WB7QO known by many of our traffic nets, recently upgraded Extra, congratulations! ARCA is considering t possibility of having a Winter Hamfest at the Son Fairgrounds, more on this later. Attn all RCs — plea forward copies of your CLUB MINUTES OR NEWS LE TERS TO YOUR SCM. Items of interest are needed QST publication! Aug. net Traffic: A-10 Net QNI 81 QTC 217; Cactus Net QNI 1174, QTC 102; SWN Net Q 172, QTC 160. Traffic: W7EP 176, K7MC 164, WA7K 36, WB7NJY 36, K7NMO 15, K7JKM 11, WA7NXL K7VDG 9, WA7WEB 7, W7JU 7, N7AUX 5, WB7VON N7EH 4.

LOS ANGELES: SCM, Perry Masterson, KD6C — T section news is not too heavy this month. Lot of members on vacation this last part of the summ before school starts. W6INH has not let the summer by with out finishing some of his antenna projects.

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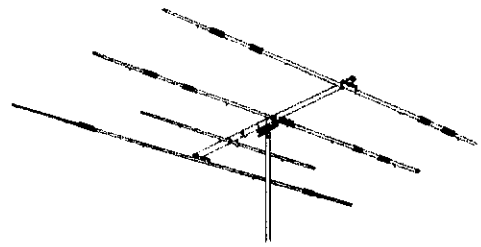

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TH3JR	3 el. 10-15-20M beam	169.95	139.95	14AVQ/WB	40-10M Trap vertical	69.95	57.00
Hy-Quad	2 el. 10-15-20M Quad	274.95	219.95	12AVQ	20-10M Trap Vertical	42.95	34.95
205BA	5 el. "Long John" 20M beam	329.95	259.95	14RMQ	Roof Mounting kit (verticals)	33.95	29.95
155BA	5 el. "Long John" 15M beam	199.95	159.95	5BDQ	80-10M Trap doublet	109.95	89.95
105BA	5 el;"Long John" 10M beam	129.95	109.95	2BDQ	80-40M Trap doublet	59.95	49.95
204BA	4 el. 20M beam	249.95	199.95	66B	6 el. 6M beam	119.95	99.95
204MK5	5 el. conversion kit	99.95	79.95	203	3 el. 2M beam	15.95	
153BA	3 el. 15M beam	89.95	79.95	205	5 el. 2M beam	21.95	
103BA	3 el. 10M beam	74.95	59.95	208	8 el. 2M beam	29.95	
402BA	2 el. 40M beam	239.95	189.95	214	14 el. 2M beam	34.95	
BN-86	Balun for beam antennas	15.95	15.95	LA-1	Deluxe lightning arrestor	59.95	49.95
TH2MK3	2 el. 10-15-20M beam	149.95	119.95	TH5DX		269.95	209.95

MOSLEY

		Regular	Special
Classic 33	3 el. 10, 15, 20 Mtr. beam	304.75	209.95
Classic 36	6 el. 10, 15, 20 Mtr. beam	392.75	249.95
TA-33	3 el. 10, 15, 20 Mtr. beam	264.00	189.95
TA-36	6 el. 10, 15, 20 Mtr. beam	392.75	249.95
TA-33 Jr.	3 el. 10, 15, 20 Mtr. beam	197.00	149.95
TA-40KR	40 Mtr. Add On	119.95	89.95

CUSHCRAFT

ATB-34	4 ele. 10, 15, 20 Mtr. beam	289.95	219.95	A147-11	11 ele. 146-148 Mhz. beam	36.95	30.95
ATV-4	10, 15, 20, 40 Mtr. Vertical	89.95	69.95	A147-22	22 ele. Power Pack	109.95	89.95
ATV-5	10, 15, 20, 40, 80 Mtr. Vertical	109.95	89.95	A144-10T	2 Mtr. "Twist" 10 ele.	42.95	34.95
ARX-2	2 Mtr. Ringo Ranger	39.95	32.95	A144-20T	2 Mtr. "Twist" 20 ele.	62.95	52.95
AR-6	6 Mtr. Ringo	36.95	32.95	A147-20T	2 Mtr. beam	62.95	52.95
ARX-220	220 Mhz. Ringo Ranger	39.95	32.95	A430-11	432 Mhz. 11 ele. beam	34.95	29.95
ARX-450	435 Mhz. Ringo Ranger	39.95	32.95	A432-20T	430-436 Mhz. Beam	59.95	49.95
A144-11	11 ele. 144-146 Mhz. beam	36.95	30.95				

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RM-75S	75 Meter Super Resonator	31.95	27.50
G6-144B	2 Mtr. Base Colinear	79.95	59.95
G7-144	2 Mtr. Base Colinear	119.95	89.95

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reports that his Hy-Gain 205 Long mono-bander for 2 meters is up to 65 feet. Out of two tries to get the nam of United Radio Amateurs Club right — I still miss spe ed it. I stand corrected. Thanks to N6HE for setting m straight. N6HE reports that he is sending a large volum of traffic to folks who have cards and NO envelopes DX QSL bureau. Those of you who don't have envelope please get them in - The bureau needs the space. K6E is going to be away again for a couple of months. guess the summers in MN are great. For Novic Operators — the National Novice Net meets Sun 2300Z near 21150 MHz. The net may go back to dai operation this winter, that is if activity warrants. ARE net meets in San Fernando Valley Sun at 8:30 P.M. loca 146.52 fm or am. SCN RTTY traffic now has moved i time to 8 P.M. local as of 3 Sept. SCN Net Schedules a as follows:

8:30 P.M. (local)	SCN/1	CW	3598 kHz
8:00 P.M. (local)	SCN/RTTY		3637.5 kHz
8:30 P.M. (local)	SCN/2	CW	3598 kHz
9:00 P.M. (local)	SCN/V	FM	146.645/045 MHz

Any non traffic oriented ham will be given the basic i structions, so all are welcome. I feel I must commer again on the OO reports. The reports I receive show tremendous willful disregard for the rules and laws tha govern Amateur Radio. Please don't you be one of th offenders. Traffic: W6INH 246, W6QEO 116, N6PZ 11 WA6LVO 109, WB5FKU 71, K6OWA 71, K6EA 51, W6BR 46, N6HE 35, W6BWG 23, WA6OCM 22, W6NKE 8, K6C 5.

ORANGE: SCM, Roy Zukerman, AC6H. Sec: WA6WZ WA6TLE is now EC for all of Orange County. New ECs the desert area: WA6WYP, Victor Valley; WA6PTU, Yu ca Valley; WA6MBE, Barstow. WA6PTU reports settin up coordination with the Red Cross at 29 Palms Marin Corps Base. SET plans are well under way in sever areas, with the Victor Valley group aiming for an ear "disaster" in Sept. WA6WYP also reports activi assisting with parking communications for the San Be nadino County Fair in Aug. OO I, WA6IQL, reports he up and running on RTTY and will be monitoring tha mode. Hemet area RACES aided the Riverside Mountai Rescue Unit with a fallen climber near Idyllwil WA6NUW W6IWU WA6QMW W6TTG/6 WA6UVF an WB6VXD used WR6BAQ to coordinate with medical a Aug. 25. SCATS held a picnic at the home of RT pioneer W6AEE for its Sept. meeting. W6IWO als reports a lot of interest in the worldwide RTTY art co test sponsored by SCATS through Nov. 30 with beautif plaques for the top four entries. RATS new mailing a dress: P.O. Box 384, Palm Desert, CA 92260. pre W6SQE, area EC, reports many area hams assisting the local floods. OCARC sponsored Orange County OS party will be Jan. 13, 1980. Info. from W6LEN. Traffi (Aug) WB6EIG 382, W6DXL 255, WB6QBZ 83, W6NTN 6 K6XI 65, W6RE 69, KA6A 43, AC6H 31, W6CPB 2 KA8GRY/6 19, K6JT 11, WA6PEE 11, WB6QCA 1 WB6ULU 7. (July) W6DXL 214, KA6A 19.

SAN DIEGO: SCM, Arthur R. Smith, W6INI — STM N6GW. SEC: W6INI. Asst SEC: N6RD. To get into traff handling check into one of the following.

Mode	Net	Freq	Time
Phone	SCN/VHF	147.045/645 MHz	2100
Phone	N. County Tfc	146.13/73 MHz	2000
Phone	Daytime RN6	7275 kHz	1045, 1230
CW	SCN	3597 kHz	1830(20 + wpm) 2030(13wpm)
RTTY	SCN/RTTY	3637.5 kHz	2000

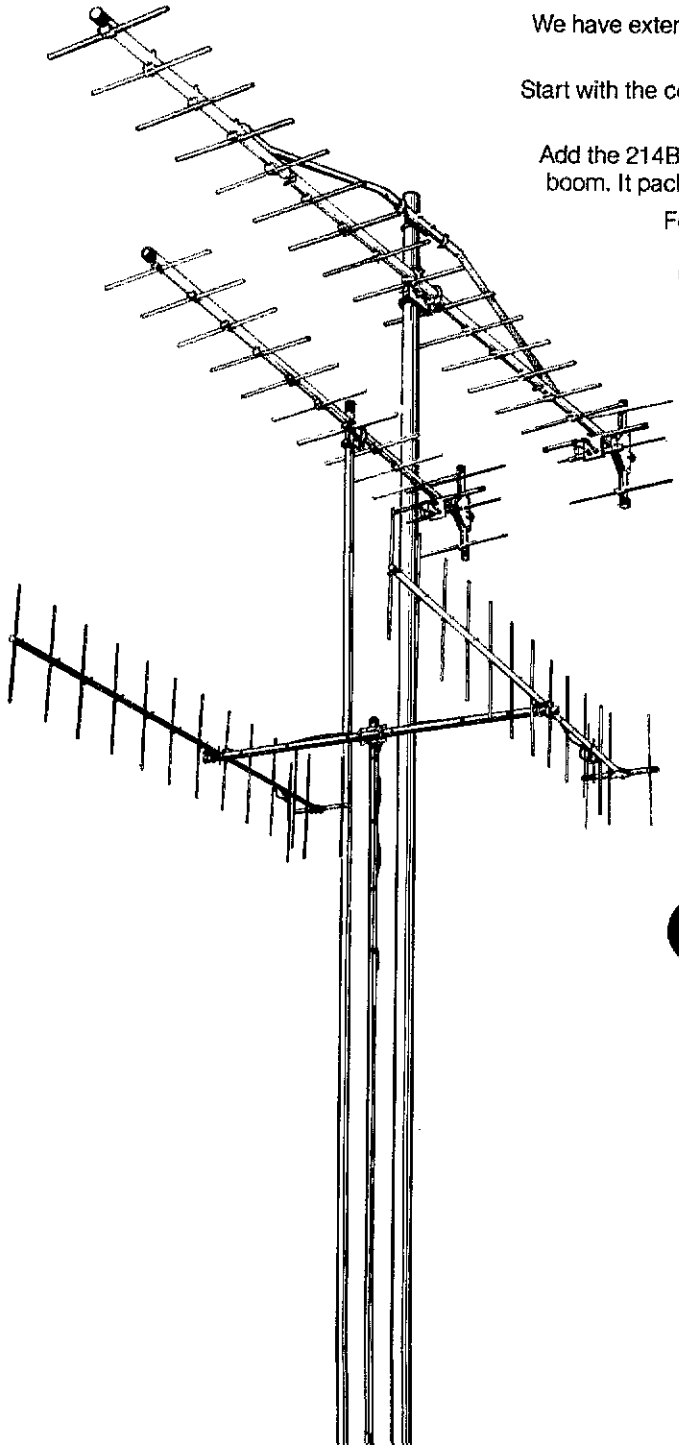
SET 1979-2 saw ARES in a county-wide drill with Red Cro staff and volunteers. The ARC of El Cajon meets secon Thurs. at 1930, Convair Gun Club, Reuben H Fleet Dr, Sante WA6UAZ has been apptd Net Manager for RN6(N). Call sig change N6BSY to KB6QO. AA6EE racking up DX with ne TS-820 and 3 vags on 71 ft. tower. W6BXJ won an ATLA xcvr at Palomar ARC picnic. WB6HMY is getting his raintg reporting crew ready for a busy season. W6SCI provide Palomar ARC members with list of club members and ma locations to assist T-hunters, etc. No. County Traffic N handled 30 msgs. during Aug. Traffic: (Aug) WA6UAZ 64 N6GW 287, WB6PVH 332, W6HUJ 148, WA6AMK 13 N6AWC 113, WB6MLB 73, N6AT 67, K6HAP 51, WB6FT 30, WB6SUA 24, WA6COE 14, WA6UFY 2. (July) K6HA 125, WB6MLB 59.

SANTA BARBARA: SCM, D. Paul Gagnon, N6MA - WB6TRP is active as an OO and helps solve the pr blems. W6QMV was honored on Manny Appreciatio Day in Santa Maria. WD6BNH has WAC-YL! A speake spoke on Microwave comm at the Satellite AR meeting. N6MA visited friends in Japan. The number c reports has dropped off. Remember, monthly reports ar a requirement for holding an appointment. The PSH reporting system was changed recently. The rules wer revised and the points are different. Refer to the QC bulletin. See you at the division convention in Anahei on Oct. 9. PSHR: N6YH 48, K6YD 83. Traffic: K6YD 17 N6YH 73, WB6TRP 18,N6MA 16.

WEST GULF DIVISION

NORTHERN TEXAS: SCM, Phil Clements, K5PC — Ass SCM: AE5C. SEC: N5WB. STM: W5VMP. NMs AA5J/AE5 The Denton Co. ARES starting weekly tfc/emerting ne each Tue at 2100 CDT on 31/91 rptr. WA5QFD is Net Mg K5UPN new Net Mgr-CGCH Net. Abilene area op helped with Angel Derby Air Race. AE5I WA5IN WD5IKV WA5PPF WB5LPG K5KOW. Greenvill amateurs furnished communications for local hospita Aug. 2 & 3 during 20 hour telephone outage Grayson/Fannin ARES group drilled with Sherma Police Aug. 26th; with WR5AKZ & 8 mobiles replacin normal PD radio equipment for an entire shift, with loca TV coverage. D/FW Metro Tfc Net for Aug. ONI 468, QT 168/138 in 31 sess. BPL W5TI and K5OUK. PSH WD5IVD AA5J WB5SDD WA5QFD KA5Q W5HM WD5EUE WD5JYI W5VMP AJ5F WD5HHK and WB5LA Time to winterize and "beef up" those antenna system for winter wx. Dallas RTTY Rptr on 10/70 being use more and more; lots of new "green key" enthusiasts ti ing up, and some formal tfc being passed; what a fa tastic mode for relaying tfc! Of the 74 Sections in th ARRL, N. TX. was rated no. 1 ARES Organization, an no. 20 in Tfc handling for 1978! this is determined solel from monthly SEC/EC reports and individual Stn. Activ ty Rpts; so keep those cards, letters, and radiogram coming in! If you handle 1 piece of traffic per month, le me hear about it. It all adds up at year's end. With just little more reporting, we can win all the marbles nex year. Traffic: W5TI 514, WB5SDD 293, K5OUK 256, AA5 217, WB5BKM 206, WD5EUE 174, WD5HHK 158, WA5 QFD 111, K5MC 96, N5BT 90, WD5IVD 84, WB5LAT 8 W5HMR 79, W5VMP 78, AE5I 70, WD5JYI 57, KA5O 5 N5AWG 47, AJ5F 46, WA5EZT 42I, WA5INJ 42, K5PC 3 WB5YYK 29, KB5DR 20, WB5SBO 19, W5IAR 13, W5Y 10, W5CTZ 8, K5LHL 7, AE5U 6, WA5UBK 8, WD5GFP K5HSZ 2.

B=DX



We have extended the Boomer formula for fun and excitement with three new models.

Start with the contest winning A32-19 Boomer. The best commercial 2-meter Yagi available today.

Add the 214B CW/SSB Junior Boomer with 14 elements on a 2.2λ boom. It packages performance in a size that every ham can use.

For the FM enthusiast add a vertically polarized Junior Boomer with 14 elements on a 2.2λ boom and the ultimate Power Pack 28 element 228FB FM Boomer.

The formula for 6-meter DX success is the all new 617-6B, a 33-foot long 6-element Yagi with gain that disproves all of the old formulas.

For maximum front to back ratio, the 2-meter antennas include a trigon reflector. All Boomers feature high efficiency balanced feed systems with integral KW balun for a clear precise pattern; a large diameter round boom for more endurance with less wind load; all stainless steel hardware and easy installation. Boomers have the right combination of features which will give you long path DX capability or allow you to participate in tropo, sporadic E, meteor scatter and EME fun.

When you're ready to move up to even higher gain, complete stacking kits are available with everything necessary to assemble two, four and larger arrays.

See your dealer today anywhere in the world for more ham radio fun.

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Manchester, NH 03108

OKLAHOMA: SCM, Leonard Hollar, WA5FSN — Activity Reports from 9 out of 12 registered Section Nets. W5REC has received Commendation Certificates from work in the Texas-Oklahoma Storms in April and Iowa Storm in June. Congrats, Enid will be helping a YMCA Marathon Race in Sept. WB5KKT & WB5NMB both in new QTH's. K5TEY needed Antenna Party this month. tnx Tulsa gang. N5AZT WB5SIJ KA5BWC & KA5GER new Amateur family at Meeker. New Muskogee Club Officers N5KW, pres.; WB5YLN, vice pres.; WB5AOH, secy. New Repeater on 147.96/36 north of Laverne; ID WD5CSW announced by former Miss America. Hi! Ardmore Club provided commo for "Runners Club" run for Red Cross. W5JJ still building things, keyer this time. Your name/Call not in column? I did not hear from you, or about you from someone in your area. A card (form 1) or radiogram can tell a lot. Many of our traffic handlers are missing out by not reporting their PSHR points. August traffic report is BEAUTIFUL, no summer slump here. 4 BPLs over 6000 total QTCs handled with 1638 originations, 377 delivered. Delivery reports are always misleading. Many, many ops take traffic for delivery and do not report. It is time to prepare for holiday traffic. Let's make it an even larger report. Traffic: WB5MVP 2722, K5OWK 1143, WB5NKC 619, K5JGZ 412, W5REC 389, WB5NKD 304, W5RB 159, WB5ELG 144, W5BYO 96, WD5IFB 51, WA5OUV 50, WD5ETB 44, WA5FSN 44, W5SUG 43, W5VXU 40, W5DRZ 34, K5CAY 31, K5MGD 22, W5VOR 21, W5UYH 16, WD5GLO 12, WB5AOH 9, KA5DRD 7, W5JJ 7, W5HGH 4, KB5EK 2, WB5OV1 2.

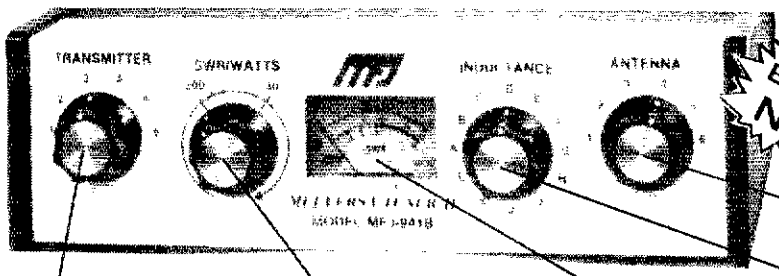
SOUTHERN TEXAS: SCM R. Ross, W5KR — Assistant SCM: N5TC. SEC: AK5N. Net-Managers at large: N5TC phone; WA5RKU, cw. OOs reporting this month: WB5CIT. OVS reporting this month: WB5CIT N5AF WD5JJS. OVS N5AF worked XE1FE W4LGO WB5GRE WA5UFH KA5EZO WB5IMM on 6 meter ssb Aug. 15, all in 18 minutes! Also copied good ID on XEWO-TV (CH 2) and some Spanish speaking fm on 49 MHz. EC WA5RVT reports Brazoria County ARES putting operational facilities at County Court House; also received letter of thanks from Red Cross for ARES services during Claudette. WB5UER has acquired excellent emergency van. KA5EUG upgraded from Tech to Advanced. WB5TKO upgraded from Novice to General and passed 20 wpm; KB5FN, first licensed in September 1978, upgraded to Extra; Great work, fellers! OVS/OES WD5JJS learning many things about TVI. OES W5SPD has new TS-180S. OTS WB5UYV working on new antenna traps. K5DG is new EC for northern Cameron County. WB5ASA is new EC for Galveston County. Next Southern Texas Section report will come from new SCM N5FN. I wish to thank all hands for excellent cooperation. There have been some remarkable events during my tenure; I am sure that there will be many more. Just keep up the good work, gang. Traffic: (Aug) W5KLV 785 WB5YDD 396, K5HZR 236, N5TC 221, W5SBE 176, WB5CIT 147, WB5MMI 54, WA5RVT 44, K5PE 32, AK5N 27, WD5IEB 17, AK5M 14, K5RVF 14, AE5X 11, WD5JJS 9, AC5R 9, W5SPD 7, WB5UYV 4, WD5BEP 2 (July) W5SBE 117, K5PE 48, K5QEW 35.

This NEW MFJ Versa Tuner II . . .

has SWR and dual range wattmeter, antenna switch, efficient airwound inductor, built in balun. Up to 300 watts RF output. Matches everything from 1.8 thru 30 MHz: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced lines, coax lines.

MFJ LOWER PRICES!

NEW, IMPROVED MFJ-941B HAS . . .
- More inductance for wider matching range
- More flexible antenna switch
- More sensitive meter for SWR measurements down to 5 watts output



NEW LOWER PRICE

$79.95

Transmitter matching capacitor. 208 pf. 1000 volt spacing.

Sets power range, 300 and 30 watts. Pull for SWR.

Meter reads SWR and RF watts in 2 ranges.

Efficient airwound inductor gives more watts out and less losses.

Antenna matching capacitor. 208 pf. 1000 volt spacing.

Only MFJ gives you this MFJ-941B Versa Tuner II with all these features at this price:

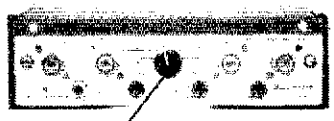
A SWR and dual range wattmeter (300 and 30 watts full scale) lets you measure RF power output for simplified tuning.

An antenna switch lets you select 2 coax lines direct or thru tuner, random wire/balanced line, and tuner bypass for dummy load.

A new efficient airwound inductor (12 positions) gives you less losses than a tapped toroid for more watts out.

A 1:4 balun for balanced lines. 1000 volt capacitor spacing. Mounting brackets for mobile installations (not shown).

With the NEW MFJ Versa Tuner II you can run your full transceiver power output — up to 300 watts RF power output — and match your transmitter to **any** feedline from 160 thru 10 Meters whether you have coax cable, balanced line, or random wire.



ANTENNA SWITCH lets you select 2 coax lines direct or thru tuner, wire/balanced line, dummy load.

You can tune out the SWR on your dipole, inverted vee, random wire, vertical, mobile whip, beam, quad, or whatever you have.

You can even operate all bands with just one existing antenna. No need to put up separate antennas for each band.

Increase the usable bandwidth of your mobile whip by tuning out the SWR **from inside your car.** Works great with all solid state rigs (like the Atlas) and with all tube type rigs.

It travels well, too. Its ultra compact size 8x2x6 inches fits easily in a small corner of your suitcase.

This beautiful little tuner is housed in a deluxe eggshell white Ten-Tec enclosure with walnut grain sides.

SO-239 coax connectors are provided for transmitter input and coax fed antennas. Quality five way binding posts are used for the balanced line inputs (2), random wire input (1), and ground (1).

NEW 300 WATT MFJ VERSA TUNER II'S: SELECT FEATURES YOU NEED.

NEW MFJ-945 HAS SWR AND DUAL RANGE WATTMETER. NEW LOWER PRICE

$69.95

Same as MFJ-941B but less 6 position antenna switch.

NEW MFJ-944 HAS 6 POSITION ANTENNA SWITCH ON FRONT PANEL. NEW LOWER PRICE

$69.95

Same as MFJ-941B but less SWR/Wattmeter.

NEW MFJ-943 MATCHES ALMOST ANYTHING FROM 1.8 THRU 30 MHz. NEW LOWER PRICE

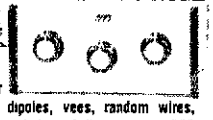
$59.95

Same as MFJ-941B, less SWR/Wattmeter, antenna switch, mounting bracket. 7x2x6 in.

ULTRA COMPACT 200 WATT VERSA TUNERS FOR ALL YOUR NEEDS.

MFJ-901 VERSA TUNER MATCHES ANYTHING, 1.8 THRU 30 MHz. NEW LOWER PRICE

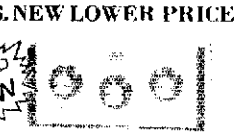
$49.95



Efficient 12 position air inductor for more watts out. Matches dipoles, vees, random wires, verticals, mobile whips, beams, balanced lines, coax. 200 watts RF, 1:4 balun, 5x2x6 in.

MFJ-900 ECONO TUNER MATCHES COAX LINES/RANDOM WIRES. NEW LOWER PRICE

$39.95



Same as MFJ-901 but less balun for balanced lines. Tunes coax lines and random lines.

MFJ-16010 RANDOM WIRE TUNER FOR LONG WIRES. NEW LOWER PRICE

$29.95

1.8 thru 30 MHz. Up to 200 watts RF output. Matches high and low impedances. 12 position inductor. SO-239 connectors. 2x3x4 inches. Matches 25 to 200 ohms at 1.8 MHz. Does not tune coax lines.

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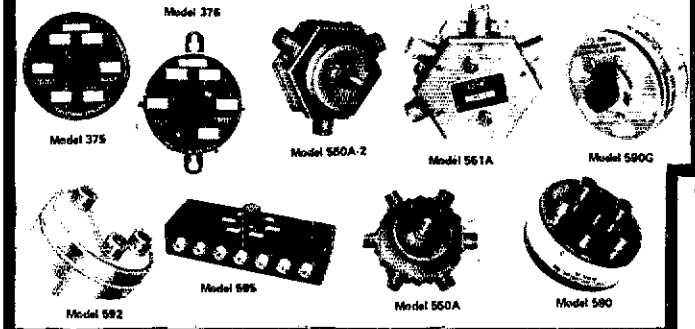
COAXIAL SWITCHES AND ACCESSORIES

for antenna selection and RF switching

B&W

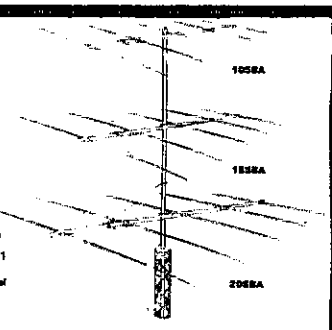
Model	PRICE	Outputs	Remarks
375	19.75	6	PROTAX switch. Grounds all except selected output circuit.
376	19.75	5	PROTAX switch. Grounds all except selected output circuit. Sixth switch position grounds *all* outputs.
550A	16.95	5	
550A-2	13.75	2	
551A	17.95	2	Special 2 pole, 2 position switch used to switch any RF device in or out of series connection in a coaxial line. See figure (over)
556	.95	–	Bracket only for wall mounting of radial connector switches.
590	18.50	5	
590G	18.50	5	Grounds all except selected output circuit.
592	17.25	2	
595	19.75	6	Grounds all except selected output circuit.

COAXIAL SWITCHES AND ACCESSORIES for antenna selection and RF switching. These high-quality switches have set the standard for the industry for years. Ceramic switches with silver alloy contacts and silver-plated conductors give unmatched performance and reliability from audio frequencies to 150 MHz. B&W coaxial switches are designed for use with 52- to 75-ohm non-reactive loads, and are power rated at 1000 watts AM, 2000 watts SSB. Connectors are UHF type. Insertion loss is negligible, and VSWR is less than 1.2:1 up to 150 MHz. Crosstalk (measured at 30 MHz) is 45 dB between adjacent outlets and -60 dB between alternate outlets.



hy-gain

BE PREPARED FOR CYCLE 21 GET HY-GAIN'S NEW LONG-JOHNS *THE STACKABLES*



5 Element Maximum Performance Monoband Beams for 10, 15, and 20 meters

Specifications:			
Order Number	377	376	375
Model Number	20SBA	15SBA	10SBA
	$289.95	$169.95	$119.95
SWR (at resonance)	Less than 1.5:1	Less than 1.5:1	Less than 1.5:1
Impedance	50 ohms	50 ohms	50 ohms
Power rating	Maximum Legal	Maximum Legal	Maximum Legal
2:1 VSWR Bandwidth	400 KHz	500 KHz	1.5 MHz
Longest Element	36'6"	24'6"	18'6"
Boom Length	34'	26'	24'
Boom Diameter	2"	2"	2"
Turning Radius	23'	17'6"	15'
Surface Area	9.0 sq. ft.	5.8 sq. ft.	3.9 sq. ft.
Wind Load at 80 mph	230 lbs.	133 lbs.	100 lbs.
Maximum Wind Survival	80 mph	100 mph	100 mph
Mast DIA Accepted	1¼" to 2⅜"	1¼" to 2⅜"	1¼" to 2⅜"

With sunspot cycle 21 now in the upswing, you should be prepared for the DX available on the 3 top HF bands, if not, our new "Long-Johns" are for you. The new 5 element "Long-John" monobanders are ideal for the serious DX'er. Each utilizes Hy-Gain's unique Beta-match for optimum power transfer. Also each antenna uses taper-swaged tubing for minimum wind load and maximum strength. For maximum durability each "Long-John" uses Hy-Gain's rugged boom-to-mast clamp.

Larsen Kulrod Antennas

- Handle full 200 watts ● low-low V.S.W.R.
- Deliver 3 dB gain and more!
- Pick the one that best fits your needs:

MAGNETIC MOUNT
stays put even at 100 mph!

MM-JM-150 for 144 MHz use
MM-JM-220 for 220 MHz use
MM-JM-440 for 440 MHz use
} Only $38.50 complete

TRUNK LID MOUNT
No holes and low silhouette too!

TLM-JM-150 for 144 MHz use
TLM-JM-220 for 220 MHz use
TLM-JM-440 for 440 MHz use
} Only $38.50 complete

And 1/4 wave antenna for trunk and magnetic mount – $18.50

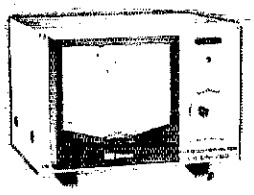
ROOF or FENDER MOUNT
Goes on quick and easy in 3/8" or 3/4" with fewest parts.

JM-150-K for 144 MHz use
JM-220-K for 220 MHz use
JM-440-K for 440 MHz use
} Only $31.50 complete

And 1/4 wave antenna for roof and fender mounts $11.50

Communications Essentials From DAIWA CORPORATION

J.W. Miller Division BELL INDUSTRIES



SWR & Power Meter / Model CN-720 $166.95

Simultaneous direct reading SWR, Forward Power and Reflected Power.
Frequency Range: 1.8-150 MHz
SWR Detection Sensitivity: 5 W Min
Power: 3 Ranges (FWD 20/200/1000 W) (REF 4/40/200 W)
Input/Output Impedance: 50 Ohm
Dimensions: 180 x 120 x 130 mm, 6 x 4 x 4.5 in.
Tolerance: ± 10% full scale

RF Speech Processor/Model RF-440 $135.95

Increases talk power with splatter free operation. RF clipping assures low distortion. Simply install between microphone and transmitter.
Talk Power: Better than 6 dB
Clipping Threshold: Less than 2 mV at 1 KHz
Bandwidth: 2200 Hz at 6 dB down
Frequency Response: 300-3000 Hz at 12 dB down
Distortion: Less than 3% at 1 KHz, 20 dB clipping
Output Level: More than 50 mV at 1 KHz
Power Requirement: 115 VAC, 60 Hz, 1.4 W; or 13.5 VDC, 55 mA
Dimensions: 150 x 70 x 150 mm, 6 x 2.8 x 6 in.

PRODUCTS OF SOUND RESEARCH

TELEX COMMUNICATIONS, INC

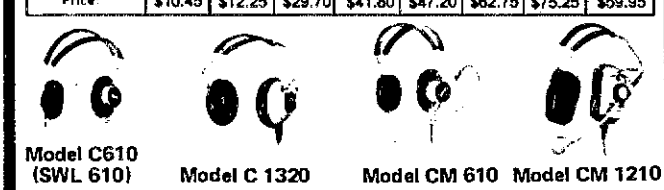
PROFESSIONAL HEADPHONES & HEADSETS

BOOM MIC HEADSETS

For the ultimate in communications convenience and efficiency select a boom mic headset. Long time favorites of professional communications, boom mic headsets allow more personal mobility while always keeping the mic properly positioned for fast, precise voice transmission. Boom microphones are completely adjustable to allow perfect positioning. And boom mic headsets leave both hands free to perform other tasks.

All models are supplied with "close talking" microphones to limit ambient noise pick up and provide superior intelligibility. Each model has a convenient, inline push to talk switch, which can be wired for either push to talk relay control or mic circuit interrupt for voice operated transmitters. The push-to-talk may be used as a momentary push button or it can be locked in the down position. All models have tough, flexible, 8 foot cords which are stripped and tinned, interconnected, communication grey with black trim.

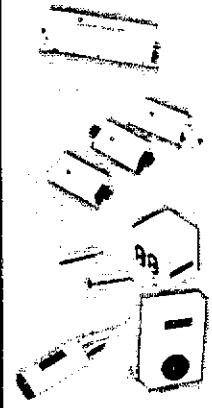
MODEL	C 610	SWL 610	C 1210	C 1320	CM 610	CM 1210	CM 1320	CM-1320S
Headphone Sensitivity Ref. 0002 Dynes cm² at 1mW input, 1kHz	103dB SPL ±5dB	103dB SPL ±5dB	103dB SPL ±3dB	105dB SPL ±5dB	103dB SPL ±3dB	103dB SPL ±3dB	105dB SPL ±5dB	105dB SPL ±5dB
Headphone Impedance	32 20 ohms	2000 ohms	32 20 ohms	32 20 ohms	32 20 ohms	32 20 ohms	32 20 ohms	32 20 ohms
Microphone Frequency Response					50 8000 Hz	50 8000 Hz	50 8000 Hz	50 8000 Hz
Microphone Impedance					High	High	High	High
Microphone Sensitivity Below 1 volt microbar at 1kHz					51dB ±5dB	51dB ±5dB	51dB ±5dB	51dB ±5dB
Price:	$10.45	$12.25	$29.70	$41.80	$47.20	$62.75	$75.25	$59.95



Model C610 (SWL 610) | Model C 1320 | Model CM 610 | Model CM 1210

Model C 1210 | Model CM 1320 | Model CM 1320S

Interference Filters From J.W. Miller



LOW PASS FILTERS
Input/output impedance 50 ohms. Insertion loss .3 dB max.; VWSR 1.2:1; Attenuation greater than 75 dB above 41 MHz.
C-511-T — $19.50
25 W AM 50 W PEP SSB
C-514-T — $26.50
1000 W AM 2000 W PEP SSB.

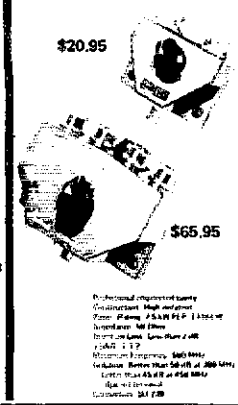
HIGH PASS FILTERS
Filter attenuates signals below 40 MHz by a power factor greater than 1,000,000:1.
C-513-T1 — $10.18: 75/300 ohm
C-513-T2 — $10.18: 75/ 75 ohm
C-513-T3 — $10.18 300/300 ohm

AUDIO INTERFERENCE FILTERS
C-505-R — $5.07
Installs in the input lines of audio equipment. Consists of 1 pair.
C-506-R — $6.07
Installs in speaker lines. Unit will take care of stereo speaker systems.

AC POWER LINE FILTERS
An easy way to prevent radio signals from entering power line.
C-508-L — $8.33
3-section LC filter, 3 A max.
C-509-L — $18.35
5-section LC filter (for more severe interference). 5 A max.

Coaxial Switches

2 Position/Model CS-201
4 Position/Model CS-401



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R-X NOISE BRIDGE $49.95

- Learn the truth about your antenna.
- Find its resonant frequency.
- Find R and X off-resonance.
- Broadband 1-100 MHz.
- Simple to use. — Self contained.

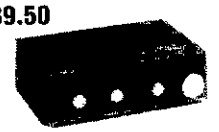
VLF CONVERTER $55.00

- New device opens up the world of VLF radio.
- Converts VLF to 80 meters. For use with any shortwave receiver covering 3.5-4 MHz.
- Advanced design for simple operation, high performance.
- Gives reception of the 1750 meter band.
- Also covers navigation radiobeacons, WWVB, ship-to-shore, and LF broadcast band.

LOOP ANTENNA
Loop Amplifier $67.50
Plug-in loops $47.50 ea.

- Plug-in loops available for:
  1600-5000 KHz (160/80 meter amateur bands)
  550-1600 KHz (Broadcast Band)
  150-550 KHz (VLF, 1750 meter band)
  40-150 KHz (WWVB, Loran)
  10-40 KHz (Omega)
- Nulls out interference

ALL BANDS PREAMPLIFIER $89.50



- Tunes 1.8 to 54 MHz. Covers ALL amateur bands 160 to 6 meters. ALL shortwave broadcast bands.
- For receivers AND transceivers.
- Up to 20 db gain.
- Peps up that tired receiver.
- Reduces image and spurious response.

Nye Viking

Model MB II $295
(with Balun) $325

MB II provides:

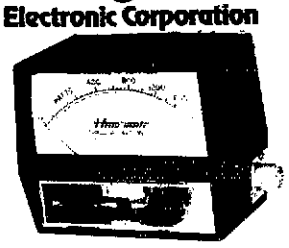
*Constant SWR monitoring. *Precision tuning of final amp. *Harmonic suppression. *Receiver input impedance-matching. *Maximum power transfer to antenna. *Continuous frequency coverage 1.6 to 30 MHz. *Precision tuning of any wire ¼ wavelength or longer, with SWR of 1:1.

MB II features:

*Finest quality, made-in-USA components. *Large, precision, easy-to-read dials with 360° readout. *Optional 3000 watt Balun for twin lead antennas.

BIRD Electronic Corporation

$94 VHF model 4362 (140-180 MHz)
$94 HF model 4360 (18- 30 MHz)



The 4360, 4362 HAM-MATE Directional Wattmeters are insertion type instruments for measuring forward or reflected power in 50-ohm coaxial transmission lines. They are direct descendants of the model 43 THRULINE® Wattmeter – the professional standard of the industry–and will accurately measure RF power flow under any load condition. Each wattmeter is made up of a precisely machined section of 50-ohm line, a rotatable sensing element and meter calibrated in watts, all mounted in a high-impact plastic housing. It is this type of solid construction and the directional THRULINE coupling circuit, without toroids, that account for the superiority of the HAM-MATE Wattmeters.

the indispensable BIRD 43 THRULINE WATTMETER

Power Range	Frequency Bands (MHz) 2-30	25-60	100-250	200-500	400-1000
5 watts	—	5A	5C	5D	5E
10 watts	—	10A	10C	10D	10E
25 watts	—	25A	25C	25D	25E
50 watts	50H	50A	50C	50D	50E
100 watts	100H	100A	100C	100D	100E
250 watts	250H	250A	250C	250D	250E
500 watts	500H	500A	500C	500D	500E
1000 watts	1000H	1000A	1000C	1000D	1000E
2500 watts	2500H				
5000 watts	5000H				

MODEL 43	$125.00
Elements (Table 1) 2-30 MHz	45.00
Elements (Table 1) 25-1000 MHz	38.00
Carrying case for Model 43 & 6 elements	27.50
Carrying case for 12 elements	17.00

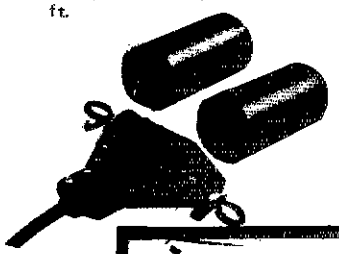
READ RF WATTS DIRECTLY! (Specify Type N or SO239 connectors) 0.45 – 2300 MHz, 1-10,000 Watts ±5%, low insertion VSWR – 1.05. Unequalled economy and flexibility. Buy only the element(s) covering your present frequency and power needs, add extra ranges later if your requirements expand.

B&W Barker & Williamson

5 –BAND TRAP DIPOLE (80 thru 10 Meters)

Power rated 2k WPEP, approx. 110 ft. span

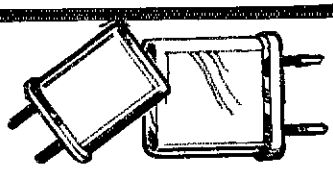
Complete with: wire, traps, end insulators, 50 ft. RG-8/U, PL-259 connector, heavy-duty cast aluminum and steatite center connector. 4-Band (40 thru 10M) 55 ft.



Pre-assembled:
Model 370-11
– $59.95

Kit (illustrated):
Model 370-12 – $49.95

TWO METER CRYSTALS IN STOCK



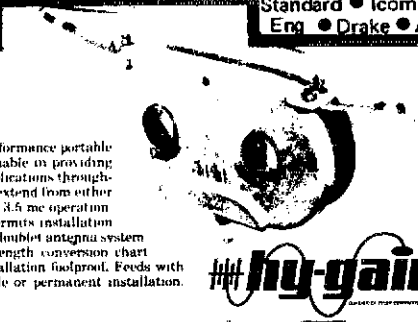
Standard ● Icom ● Heathkit ● Ken ● Clegg ● Regency ● Wilson ● VHF Eng ● Drake ● And Others! **Lifetime Guarantee! Now only $9/pair.**

Hy-Gain REEL TAPE PORTABLE DIPOLE for 10 thru 80 Meters Model 18TD

The most portable high performance dipole ever...

The Model 18TD is unquestionably the most foolproof high performance portable doublet antenna system ever developed. It has proven invaluable in providing reliable communications in vital military and commercial applications throughout the world. Two stainless steel tapes, calibrated in meters, extend from either side of the main housing up to a total distance of 132 feet for 3.5 mc operation. 25 ft. lengths of polypropylene rope attached to each tape permits installation to poles, trees, buildings...whatever is available for forming a doublet antenna system. Integrated in the high impact housing is a frequency to length conversion chart calibrated to meter measurements on the tapes...makes installation foolproof. Feeds with 52 ohm coax. Delivers outstanding performance as a portable or permanent installation. Measures 10x5¼x2 inches retracted. Wt., 4.1 lbs.

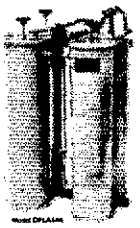
Order No. 228 Price: $94.95



hy-gain

BANDPASS-REJECT DUPLEXER DPLA-144 FOR 144-174 MHz

Also available for 54, 220, 450 MHz.



$409.95

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The World's biggest Regency® scanner sale!

Communications Electronics,™ the world's largest distributor of radio scanners, is pleased to announce that all *Regency* brand scanners are on sale during our **world's biggest** scanner sale. Even the new *Regency* models K500, M100 and R-804 are on sale. If you don't own at least one scanner, your missing all the action of police, fire, marine and government transmissions. Since you can monitor most business or government broadcasts in your area, it's like listening to a party line full of *vital* information. *Regency* scanners bring home the action. From now until January 31, 1980, you can save hundreds of dollars during our ***multi-million dollar scanner sale.*** Since we distribute more scanners worldwide than *anyone* else, we can sell the newest factory production models with the *latest* engineering updates, at rock bottom prices. Our warehouse facilities are equipped to process over 1,000 *Regency* orders per week and our order lines are always staffed 24 hours. We also export *Regency* scanners to more than 300 countries and military installations. Almost all items are **in stock** for **immediate shipment,** so **save now** and get a new *Regency* scanner during the ***world's largest*** scanner sale!

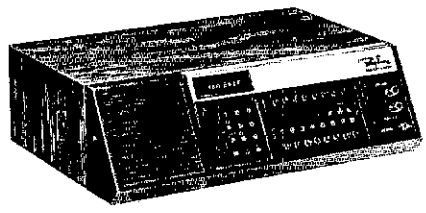
NEW! Regency® K500

List price $399.00/**CE price $259.00**
40 Channel • Synthesized • Service Search Digital count • Weather with tone alert Search/Store • Priority Channel • AC/DC
Frequency range: 30-50, 144-174, 440-512 MHz.
The new *Regency* Touch K500 is an advanced synthesized scanner with many new features. In addition to the conventional no-crystal touch entry programming for 40 channels, there are over 500 *preprogrammed* channels for receiving selected services such as police, fire, marine and mobile phone. It's like having an accurate frequency directory built into your scanner. The K500 will also find new frequencies in your area and store them in memory so you may enjoy them later. Any frequency found in the search mode or manually entered, will be displayed in the LED digital readout. There is a built in digital clock that also functions as an alarm clock to wake you to a 60 second beep.

When you activate the priority feature, you can program calls coming in on your favorite frequency to override all others. If you have a National Weather Service transmitter in your area, the K500 can alert you to severe weather warnings. With the "count" feature, frequency "traffic analysis" may be easily recorded to keep track of potentially hostile forces. Automatically counts the number of transmissions on each channel to determine the most active frequencies. The Touch K500...for those who won't settle for anything less than everything.

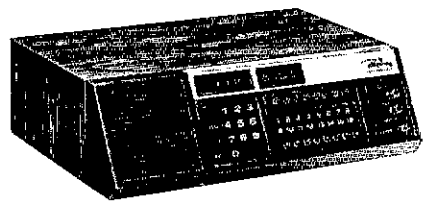
Regency® K100

List price $279.00/**CE price $179.00**
10 Channels • Crystalless • Searches Wood Cabinet • AC/DC • Delay feature
Frequency range: 30-50, 144-174, 440-512 MHz.
The *Regency* Touch K100 brings the versatility of a totally synthesized scanner within anyone's reach. It's the lowest cost no-crystal scanner that we have ever offered. By merely touching the pressure pads, you can receive any one of 15,757 frequencies. The possibilities are endless. Imagine putting the whole world of police, fire, weather, emergency broadcasts and more at the tip of your finger. It's the kind of exciting listening you'd expect from *Regency*, the people who built the first transistor radio. The *Regency* Touch K100...where computer control brings new dimensions to scanning.



NEW! Improved Regency K500

NEW! Aircraft Regency 720-A



NEW! Aircraft radio Regency® Touch 720-A

List price $349.00/**CE price $229.00**
16 channels • Two separate priority channels AC/DC • Search or Scan • Synthesized
Frequency range: 108-136 MHz.
The new *Regency* Digital Flight Scan uses advanced computer circuitry to put any civil aircraft navigation or communications frequency at the tip of your finger. From Lear Jet to DC-10 you'll hear it all.

You can store your favorite frequencies in the sixteen channels then watch the LED's sequentially scan for a call. There's even a two channel *priority* scan function. So you can listen for bone chilling "maydays" on 121.5 MHz., plus any other frequency of your choice.

NEW! Regency® M100

Available February – March, 1980
List price $279.00/**CE price $179.00**
10 Channels • Backlighted Program Panel Synthesized • Priority • AC/DC • Searches
Frequency range: 30-50, 144-174, 440-512 Mhz.
The *Regency* Touch M100 provides the ease of computer controlled, touch-entry programming in a compact sized scanner for use at home or on the road. Enter your favorite public service frequencies by simply touching the numbered pressure pads. You'll even hear a "beep" tone to ensure you've entered a command. The multi-function digital display shows channel numbers during the scan mode, channel and frequency when a call is received, loss of power, delay function status, channel lockout and search mode selection. In addition to scanning the programmed channels, the M100 has the ability to search through an entire band for an active frequency. When a call is received, the frequency will appear in the digital display. Special features of the M100 include: channel 1 priority, scan or search delay and a brightness switch for day or night operation. Reserve your *Regency* Touch M100 now for February–March, 1980 delivery.

Regency® E-106

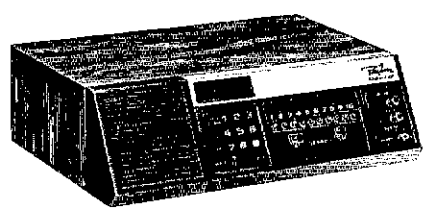
List price $149.00/**CE price $99.00**
Performance and Priority in one Scanner
Frequency range: 30-50, 146-174, 450-512 MHz.
Easy. That's the word to describe the *Regency* E-106 scanner. First, easy crystal access is made possible through a special bottom panel. Second, listening to your favorite frequency is easy with the Priority feature on channel one. An all-new wood grain cabinet and smart control panel design make the *Regency* E-106 one of the best looking scanners around. Not to mention that you get ten crystal controlled channels to listen in on police, fire and emergency calls. Crystal certificates **#A-135cc** are $4.00 each.

Regency® R-106

List price $129.00/**CE price $85.00**
Hear 10 channel action at home or on the go.
Frequency range: 30-50, 146-174, 450-512 MHz.
A versatile scanner the *Regency* R-106 is built to provide maximum reception at home or on the road. AC/DC power cords for versatility of operation from almost anywhere. External speaker jack, external antenna jack and mobile mounting bracket are standard.

New! Regency® R-804

List price $119.00/**CE price $79.00**
The first full feature budget priced scanner.
Frequency range 30-50, 146-174, 450-512 MHz.
Value. That's the word that best describes the R-804. Because this is the first full-featured scanner that we have ever offered at such a low price. You'll hear all the action of police, fire, weather, and emergency calls on a full eight channels. Crystals are easily inserted and programmed through a flip-top panel. Supplied with detachable, swivel mount antenna and AC power cord. AC only. Also order crystal certificates at $4.00 each.



Lowest Cost! Regency K100

INCREASED PERFORMANCE ANTENNAS

If you want the utmost in performance from your *Regency* scanner, it is essential that you use an external antenna. We have six base and mobile antennas specifically designed for receiving all bands. Order **#A60** is a magnet mount mobile antenna. Order **#A61** is a gutter clip mobile antenna. Order **#A62** is a trunk-lip mobile antenna. Order **#A63** is a ⅜ inch hole mount, order **#A64** is a ⅜ snap-in mount antenna and **#A70** is an all band base station antenna. All antennas are $25.00 and $3.00 for UPS shipping in the continental United States.

TEST A REGENCY SCANNER FREE

Test any *Regency* brand scanner from **Communications Electronics**™ for 31 days before you decide to keep it. If for any reason you are not completely satisfied, return it in new condition with all accessories in 31 days, for a courteous and prompt refund (less shipping charges).

NATIONAL SERVICE BY MAIL

With your *Regency* scanner, we will send a complete set of simple operating instructions and a one-year limited warranty. If service is ever required on any *Regency* scanner purchased from **Communications Electronics,** just send your receiver to *Regency* at their headquarters in Indianapolis, Indiana for prompt repair. If you need engineering assistance or additional information on any *Regency* scanner, feel free to call the factory during the day at 317-545-4281. It is your responsibility to pay for return insured shipping if you want a refund, repair or replacement.

BUY IN QUANTITY – SAVE EVEN MORE

As incredible as our sale prices are on *Regency* scanners, you can save even more when you order in quantity or in our incentive program. Order one extra scanner with your order, save 1%. Order two extra scanners, save 2%. You can save up to 5% when you order five or more extra scanners at the same time.

BUY WITH CONFIDENCE

All *Regency* scanners are extraordinary scanning instruments. They provide virtually any scanning function that the most professional monitor could require. To ***get the fastest delivery*** of any *Regency* scanner, send or phone your order directly to our Scanner Distribution Center.™ Be sure to calculate your price using the CE prices in this ad. Michigan residents please add 4% sales tax. Written purchase orders are accepted from approved government agencies and well rated firms at a 10% surcharge for net 30 billing. All sales are subject to availability. All sales on accessories are final. Prices and specifications are subject to change without notice. Out of stock items will be placed on back-order automatically unless CE is instructed differently. International orders are invited with a $10.00 surcharge for special handling in addition to shipping charges. All shipments are F.O.B. Ann Arbor, Michigan. No COD's please. Cashier's checks will be processed immediately and receive an order priority number. Personal checks require three weeks bank clearance. Mail orders to: **Communications Electronics,**™ Box 1002, Ann Arbor, Michigan 48106 U.S.A. Add $5.00 per scanner for U.P.S. *ground* shipping, $9.00 for faster U.P.S. *air* shipping or $30.00 for *overnight delivery to most major* U.S. cities via Airborne Air Freight or Federal Express. If you have a Master Charge or Visa card, you may call anytime and place a credit card order. **Order toll free** 800-521-4414. If you are outside the U.S. or in Michigan, dial 313-994-4444. You may also order via TWX 810-223-2400. **Dealer inquiries invited.** All order lines at **Communications Electronics**™ are staffed 24 hours.
Since this ***multi-million dollar Regency sale*** is the world's largest, please order today at no obligation to assure a prompt order confirmation and delivery.

When you follow the leader to real excitement, your journey ends at Communications Electronics.

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We're first with the best.℠

The World's biggest Bearcat® scanner sale!

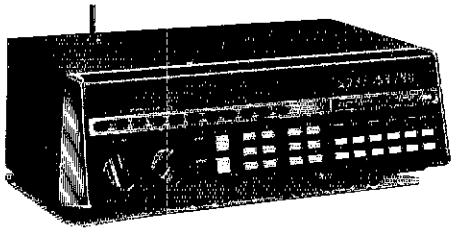
Communications Electronics,™ the world's largest distributor of radio scanners, celebrates the introduction of four new *Bearcat* brand monitors with the world's largest scanner sale. From now, until January 31, 1980, you can save hundreds of dollars during our ***two-million dollar Bearcat sale.*** Even the new *Bearcat* models 300, 220 and Eight Track scanners are on sale. If you've previously purchased a *Bearcat* scanner from **Communications Electronics,** then you *already* know you're getting all the real, live excitement that a television program or newspaper can't provide. If you don't have at least one *Bearcat* scanner, the time to buy is now! Since we distribute more scanners worldwide than *anyone* else, we can sell the newest factory production models with the *latest* engineering updates, at rock bottom prices. Our warehouse facilities are equipped to process over 1,000 *Bearcat* orders per week and our order lines are always staffed 24 hours. We also export *Bearcat* scanners to more than 300 countries and military installations. Almost all items are **in stock for immediate shipment, so save now** and get a *Bearcat* scanner during the ***world's largest*** two-million dollar scanner sale!

NEW! Bearcat® 300

Available February – March, 1980
List price $499.95/**CE price $329.00**
7-Band, 50 Channel • Service Search • No-crystal scanner • AM Aircraft and Public Service bands. • Priority Channel • AC/DC
Bands: 32-50, 118-136 AM, 144-174, 420-512 MHz.
The new *Bearcat* 300 is the most advanced automatic scanning radio that **Communications Electronics** has ever offered to the public. Since the *Bearcat* 300 has over 2,100 active frequencies in memory, you can touch one button and search any of many preprogrammed services such as police, fire, marine and government. Of course, you still can program your own frequencies and monitor up to 50 channels at once. Since the *Bearcat* 300 uses a bright green flourescent digital display, it's ideal for mobile applications. The *Bearcat* 300 now has these added features: Service Search, Display Intensity Control, Hold Search and Resume Search keys, Separate Band keys to permit lock-in/lock-out of any band for more efficient service search and a new vacuum fluorescent digital display. Reserve your *Bearcat* 300 now for February – March, 1980 delivery.

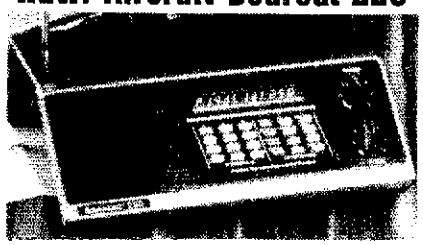
Bearcat® 250

List price $399.95/**CE price $259.00**
50 Channels • Crystalless • Searches Stores • Recalls • Self-Destruct • Priority channel • 50 Channel • 6-Band.
Frequency range 32-50, 146-174, 420-512 MHz.
The *Bearcat* 250 performs any scanning function you could possibly want. With push button ease you can program up to 50 channels for automatic monitoring. Push another button and search for new frequencies. There are no crystals to limit what you want to hear. A special search feature of the *Bearcat* 250 actually stores 64 frequencies, and recalls them, one at a time, at your convenience. Automatic "count" remembers how often frequencies are activated by transmission—so you know where the action is. Decimal display shows the channel, frequency and other programmed features. The priority feature samples your programmed frequency every two seconds. Plus, a digital clock shows the time at the touch of a button. This is the only monitor radio that has received the **Communications Electronics** quality control approval rating #1. Our highest quality grade for technologically sophisticated equipment. The *Bearcat* 250. Scanning like you've never seen or heard before. Now in stock!



NEW! 50-Channel Bearcat 300

NEW! Aircraft Bearcat 220



Aircraft Bearcat® 220

List price $399.95/**CE price $259.00**
Aircraft and public service monitor. *Frequency range 32-50, 118-136 AM, 144-174, 420-512 MHz.*
The *Bearcat* 220 is one scanner which can monitor all public service bands plus the exciting aircraft band channels. Up to twenty frequencies may be scanned at the same time.

Not only does this new scanner feature normal search operation, where frequency limits are set and the scanner searches between your programmed parameters, it also searches marine or aircraft frequencies by pressing a single button. These frequencies are already stored in memory so no reprogramming is required. The *Bearcat* 220 also features a Priority channel, Dual scanning speeds, Patented track tuning and Direct channel access and AC/DC operation.

New! Bearcat® 211

List price $339.95/**CE price $229.00**
Frequency range: 32-50, 146-174, 420-512 MHz.
The *Bearcat* 211. It's an evolutionary explosion of features and function. 18-channel monitoring. With no-crystal six-band coverage. Dual scan speeds. Color-coded keyboard. Even a digital clock. All at a modest price. More scanning excitement than you bargained for.

Bearcat® 210

List price $299.95/**CE price $199.00**
10 Channels • 5 Bands • Crystalless
Frequency range: 30-50, 146-174, 416-512 MHz.
Use the simple keyboard to select the 10 channels to be scanned. Automatic search finds new frequencies. The 210 features patented selectable scan delay, push button lockout, single antenna, patented track tuning, AC/DC operation. With no crystals to buy. Ever!

NEW! Bearcat® 8 Track

List price $99.95/**CE price $79.00**
4 Channels • 2 Bands • Plays off any AC or DC Powered 8 Track Tape Player. *Frequency range: 33-49, 151-165 MHz.*
The *Bearcat* 8 Track Scanner. It converts any 8 track tape player into a live-action scanning radio instantly.

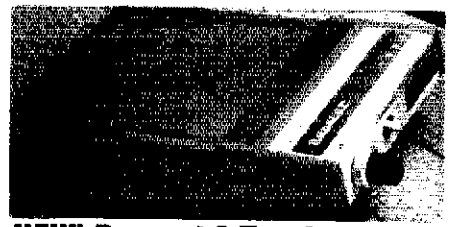
This incredibly compact 4-channel/2-band crystal scanner plugs into the tape player where an 8 track cartridge normally goes. Police, fire, emergency calls—as-it-happens scanning excitement—from an existing home entertainment center, in-car/in-boat system or portable 8 track tape player. The *Bearcat* 8 Track Scanner plugs live-action into any 8 track player. Anywhere. Crystal certificates **# A-135cc** are $4.00 each.

Bearcat® Four-Six

List price $169.95/**CE price $109.00**
The first 4 Band, 6 Channel, Hand-Held Scanner.
Frequency range: 33-47, 152-164, 450-512 MHz.
The *Bearcat* Four-Six offers "hip pocket" access to police, fire, weather and special interest public service broadcasts. Lightweight. Extremely compact. The *Bearcat* Four-Six—with its popular "rubber ducky" antenna and belt clip—provides "go anywhere/hands-off" scanning.

NEW! Aircraft and UHF Bearcat® ThinScan™

List price $149.95/**CE price $99.00**
World's smallest scanner!
The *Bearcat* ThinScan.™ High-performance scanning has never been this portable. There are **now three models** available. The **BC 2-4 L/H** receives 33-44 and 152-164 MHz. The **BC 2-4 H/U** receives 152-164 and 450-508 MHz. The new high-performance Aircraft ThinScan model **BC 2-4 AC** receives 118-136 and 450-470 MHz. Go ahead, size it up. *Bearcat's* ThinScan™ measures 2¾" across. Just 1" deep. And 5⅝" high. Four crystal-controlled channels are scanned every ½ second providing immediate access to police, fire, weather and other special-interest broadcasts.



NEW! Bearcat 8 Track scanner

INCREASED PERFORMANCE ANTENNAS

If you want the utmost in performance from your *Bearcat* scanner, it is essential that you use an external antenna. We have four base and mobile antennas specifically designed for receiving all bands. Order **#A60** is a magnet mount mobile antenna. Order **#A61** is a gutter clip mobile antenna. Order **#A62** is a trunk-lip mobile antenna and **#A70** is an all band base station antenna. All antennas are $25.00 and $3.00 for UPS shipping in the continental United States.

OTHER BEARCAT ACCESSORIES

SP50 AC Adapter	$12.00
SP51 Battery Charger	$12.00
SP55 Carrying Case for Four-Six	$15.00
SP57 Carrying Case for ThinScan	$15.00
SM210 Service manual for *Bearcat* 210	$15.00
SM220 Service manual for *Bearcat* 220	$15.00
SM250 Service manual for *Bearcat* 250	$15.00
B-31 2 V AA Ni-Cad's for Four-Six (Pack of 4)	$15.00
B-41 2 V AAA Ni-Cad's for ThinScan (Pack of 4)	$15.00
B-5 Replacement memory battery for Bearcat 210	$5.00
A-135cc Crystal certificate	$4.00

Add $3.00 shipping for all accessories ordered at the same time.

TEST A BEARCAT SCANNER FREE

Test any *Bearcat* brand scanner from **Communications Electronics™** for 31 days before you decide to keep it. If you do, you'll own the most sophisticated and technologically advanced scanner available. If for any reason you are not completely satisfied, return it in new condition with all accessories in 31 days, for a courteous and prompt refund (less shipping charges).

NATIONAL SERVICE

With your *Bearcat* scanner, we will send all accessories, a complete set of simple operating instructions and a one-year limited warranty. If service is ever required on any *Bearcat* scanner purchased from **Communications Electronics,™** just send your receiver to a CE approved *Bearcat* national service center. Another *Bearcat* service is the frequency information hotline. After you get your scanner from CE, you may call 317-894-1230 and get up to the second information on active frequencies in your area. If you ever need engineering assistance, feel free to call the factory during the day at 317-894-1440.

BUY WITH CONFIDENCE

All *Bearcat* scanners are extraordinary scanning instruments. They provide virtually any scanning function that the most professional monitor could require. To ***get the fastest delivery*** of any *Bearcat* scanner, send or phone your order directly to our Scanner Distribution Center.™ Be sure to calculate your price using the CE prices in this ad. Michigan residents please add 4% sales tax. Written purchase orders are accepted from approved government agencies and well rated firms at a 10% surcharge for net 30 billing. All sales are subject to availability. Prices and specifications are subject to change without notice. Out of stock items will be placed on backorder automatically unless CE is instructed differently. International orders are invited with a $10.00 surcharge for special handling in addition to shipping charges. All shipments are F.O.B. Ann Arbor, Michigan. No COD's please. Cashier's checks will be processed immediately and receive an order priority number. Personal checks require three weeks bank clearance. Mail orders to: **Communications Electronics,™** Box 1002, Ann Arbor, Michigan 48106 U.S.A. Add $5.00 per scanner for U.P.S. *ground* shipping, $9.00 for faster U.P.S. *air* shipping or $30.00 for *overnight delivery* to most major U.S. cities via Airborne Air Freight. If you have a Master Charge or Visa card, you may call anytime and place a credit card order. **Order toll free** 800-521-4414. If you are outside the U.S. or in Michigan, dial 313-994-4444. **Dealer inquiries invited.** All order lines at **Communications Electronics™** are staffed 24 hours.

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30-DAY GUARANTEE ■ 90-DAY FULL CREDIT TRADE-IN ■ FREE SHIPPING VIA UPS ONLY

Limited quantities. First come, first served. *(if weight or size exceeds UPS max., we will ship freight collect)*

Allied
AX-190 Receiver	$159

Ameco
PV-50	$ 9
CN-50	29
CN-144	39
TX-62	79
621 VFO	45

B&W Waters
Nuvertor 2 + 6 Conv.	$ 75
6100 SSB Xmitter	395
670 SSB Adaptor	39
Co-Dax Keyer.	95

Central Electronics
100V Transmitter	325
MM-2 Scope	69
20-A SSB Adaptor	79

Clegg
22'er FM	$129
66'er 6M Xcvr	115
99'er 6M Xcvr	59
Interceptor BRCUR	275
Ant Pre Amp	22
All Bander	69
HT-146	125
2 Vess	259
FM-27-B Xcvr	325

Collins
75 A4 Receiver	$395
75S3B Receiver	695
75S1 Receiver	349
KWM-2 Xcvr	595
32S1 Xmitter	349
PM-2 AC Supply	95
516 F2 AC Supply	139
312B5 Console	425
361D2 Mount	29

Drake
2A Receiver	$149
2B Receiver	189
2AQ SPKR QMULT	29
R4 Receiver	289
R4-B Receiver	349
R4-C Receiver	399
MS-4 Speaker	19
2NT Transmitter	125
2NT Transitter	99
TR-4	695
TR-22 2 Meter	140
T-4X Transmitter	339
TR-22 2 Meter FM	225
AC-4 AC Supply	95
TR-4-C Transceiver	449
CC-1 Console	
CPS-1 Supply	
SC-2 Conv	
SC-6 Conv	
SC-1 Calibrator	
The above all assembled complete pkg.	Only $200

Dycomm
10-0 2 M Ampl	$125
35-0 401N 110 Out	130
470-25 450 MC	120
P-1416 16 Amp Supply	95

Eico
720 Transmitter	$ 49
722 VFO	39
730 Modulator	39

Elmac
AF-67 Transmitter	$ 45
PMR-8 Receiver	79

Genave
GTX22M FM	$165
GTX-200 2M FM	149

Globe/Galaxy
VHF 6+2 Transm	$ 39
Chief Transmitter	39
Galaxy III Xcvr	159
Galaxy V Xcvr	189
Galaxy V Mk II	239
GT-550 Xcvr	279
GT-500A Xcvr	329
AC 400 Supply	79
FM-210 2M FM	95

Gonset
Com II 2M	$ 75
Com II 6M	69
Com IV 2M	129
GC-105 2M	115
G-28 Xcvr	149
G-50 Xcvr	149

Hallicrafters
S-108 Receiver	$ 99
SX-101 Receiver	159
HT-32 Transmitter	179
HT-32B Transmitter	269
SX-99 Receiver	79
SX-115 Receiver	349
HT-37 Transmitter	159
HT-40 Transmitter	49
SX-99 Receiver	99
SX-117 Receiver	189
SR-150 Xcvr	259
SR-160 Xcvr	159
SX-146 Receiver	175
HT-44 Transmitter	159
SX-111 Receiver	149
SX-122 Receiver	249
S-36 UHF Receiver	125

Hammarlund
HQ-110 A VHF Receiver	$189
HQ-110C Receiver	119
HQ-110AC Receiver	149
HQ-145X Receiver	169
HQ-170C Receiver	159
HQ-180 Receiver	329
HQ-215 Receiver	259
SP-600 Receiver	179
HX-50 Transmitter	169

Heathkit
SB-300 Receiver	$199
SB-301 Receiver	229
HR-10-B Receiver	69
SB-303 Receiver	269
SB-220 Linear Amp	449
SB-102 Trivcvr	379
DX-60B Transmitter	69
HW-32 Transmitter	85
HW-100 Transceiver	249
SB-100 Transceiver	299
SB-401 Transmitter	249
SB-101 Transceiver	349
SB-650 Digital Freq. Display	149
HW-30 Twoer	29
Also Sixer	29
H-10 Monitor	69
VHF-1 Seneca	79
HW-12 Transmitter	75
HP-23 AC Supply	49
HP-23B AC Supply	59
HW-202 2M FM Xcvr	159
SB-620 Spectrum Analyz	120
SB-102 Xcvr	369
SB-610 Scope	95
HA-20 6m Linear	125
SB-634 Console	175
SB-604 Spkr	29.50
SB-644 VFO	129.50
SB-230 Linear	359
SB-104 Transceiver	625

ICOM
IC-21 2M FM Xcvr	$299
IC-230 Demo	369
IC-22A 2M FM Xcvr	185
IC-30A 432 MCFM	269

Johnson
1-KW Matchbox/SWR	$195
Courier Linear	139
Ranger I Transmitter	85
Ranger II Transmitter	139
Valiant I Transmitter	129
Invader 2000 Xmitt	495

Kenwood
T-599 Transmitter	$289
R-599 Receiver	289
TS-520 Tranc	625
QR-666	259
QR-666 Receiver	239
TV 502 Transvertor	179

Knight
T-60 Transmitter	$ 39
r-100 Receiver	59
TR-108 Trancur 2M	79

Lafayette
HA-800 Receiver	$ 89
HP-350 Receiver	149
HE-45 Transceiver	49

Midland
509 H.T.	$149

Millen
92200 Transmatch	$149
90651-A Grid Dipper	95

National
NC-270 Receiver	$119
NC-300 Receiver	129
NCX-5 Transceiver	279
NCX-5MKII Transcvr	299
NC-303 Receiver	199
AC-500 AC Supply	69
NCX-500 Transceiver	199
NCX-3 Transceiver	169
NC-190 Receiver	149
NC-105 Receiver	69

Regency
HR-2B 2M FM	$169
HR-220 FM 220 MC	185
AR-2 2M Amplifier	85
HR-25 2M FM	225
HR-6 Meter FM	189

SBE
SB-34 Transceiver	$249
SB-33 Transceiver	189
SB-144 2M FM	175
SBZ-LP Linear	179

Standard
SRC-146 HT	$149
826 M Trnscvr	195
SRC-144	395
SRC-851T	250

Swan
700-CX Xcvr	$459
260 Cygnet	289
270 Cygnet	329
500 Xcvr	
500 CX Xcvr	389
117-XC AC Supply	95
14X DC Module	39
MK II Linear	475
KK VI 6 Meter	550
250 C 6M Xcvr	349
FM 2X2M Xcvr	169
FM-1210A 2M	249
350 Transceiver	269
350C Xcvr	299
600R Receiver	339
600T Transmitter	399
410 VFO	79

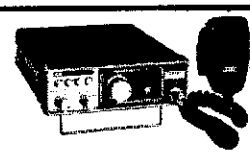
Tempo
Tempo one Xcvr	$299
AC One Supply	79
FMH 2M H.T.	149
CL-220 Trncur 220 MC	179
FMH 2M w/Talkie	149

Ten Tec
PM-3 Trnsur	$ 49
KR-40 Keyer	79
RX-10 Receiver	49
S-30 Signalizer	29
Triton II	479

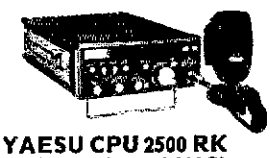
Yaesu
FT-401 Xcvr	$499
FRDX 400SD Rec	325
FT 2 Auto 2M FM	249
FT-101B Xcvr	549
FL-2100B Linear	295
FV-101 VFO	79
101E Xcvr Demo	695

Test Equipment Bargains
Boonton "Q" Meter	$295
Tektronix 5140	249
Tektronix 545A	950
5 3/54A Plug-in wide band preamp	75
Hickok 695 Generator	69
Bendix BC221 Freq Meter	39
Polarad Spectrum Analyzers A84T	1695
Hewlett Packard 400C	75
Precision E-400 Signal Generator	125
Electro Impulse Spectrum Analyzer	395
Dyna/Sciences Model 330 Digital Multimeter	195
Hewlett Packard 4905A Ultra Sonic Detector	550
Hewlett Packard 120A Scope	250
TS-323/UR Frequency Meter	175
Hewlett Packard 4910B Open Fault Locator	650
General Radio 650A	150
Measurements Mod 80	195
Nems Clark 1400	495
Ballantine 300H	175
PACO Scope Mod-S-50	75
Singer FM-10C	3495
Sirhpson 260 V.O.M.	49.50

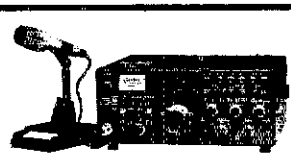
The inventory quantities of the items shown in this list vary. There may be one or several of any item. Some items may be sold by the time you read this ad. It is also likely that we have items in stock that are not listed, as a result of the many trades we make each day. We reserve the right to sell accessories and power supplies with matching transceivers and transmitters. Please allow up to 10 working days to ship your order so that we may check and service the gear you purchase.



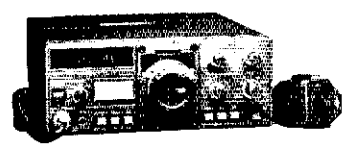
YAESU FT227RA
Regular $399.00
Cash (no trades) $339.15



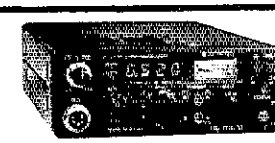
YAESU CPU 2500 RK
(With Keyboard MIC)
Reg. $585.00
CASH (No Trades) $497.25



KENWOOD TS 180S
Retail $1,149.95
w/D.F.C.



KENWOOD TS 120S
Retail $699.00



KENWOOD TR7625
Regular $425.00
Cash (No Trades) $375.00

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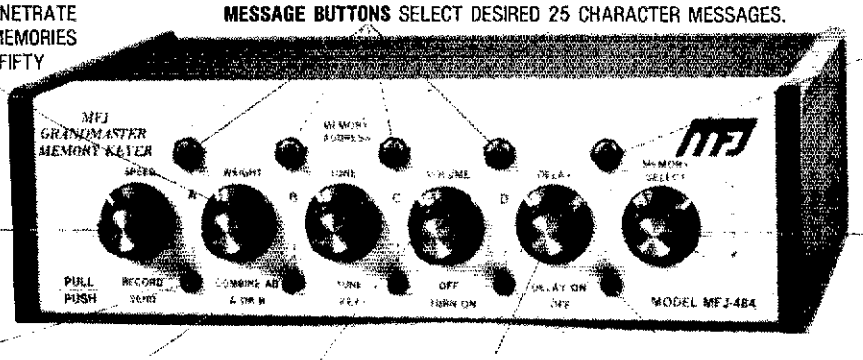
NEW! MFJ INTRODUCES THE GRANDMASTER MEMORY KEYERS

At $139.95 this MFJ-484 GRANDMASTER

memory keyer gives you more features per dollar than any other memory keyer available — and Here's Why . . .

WEIGHT CONTROL TO PENETRATE QRM. **PULL** TO COMBINE MEMORIES A AND B FOR 1, 2, OR 3 FIFTY CHARACTER MESSAGES.

MESSAGE BUTTONS SELECT DESIRED 25 CHARACTER MESSAGES.



RESETS MEMORY IN USE TO BEGINNING.

SPEED CONTROL, 8 TO 50 WPM. **PULL** TO RECORD.

MEMORY SELECT: POSITIONS 1, 2, 3 ARE EACH SPLIT INTO MEMORY SECTIONS A, B, C, D (UP TO TWELVE 25 CHARACTER MESSAGES). SWITCH COMBINES A AND B. **POSITION** K GIVES YOU 100, 75, 50, OR 25 CHARACTERS BY PRESSING BUTTONS A, B, C, OR D.

LEDs (4) SHOW WHICH MEMORY IS IN USE AND WHEN IT ENDS.

TONE CONTROL. PULL TO TUNE.

VOLUME CONTROL. POWER ON-OFF.

DELAY REPEAT CONTROL (0 TO 2 MINUTES). **PULL** FOR AUTO REPEAT.

LED INDICATES DELAY REPEAT MODE.

NOW YOU CAN CALL CQ, SEND YOUR QTH, NAME, ETC., ALL AUTOMATICALLY.

And only MFJ offers you the MFJ-484 Grandmaster memory keyer with this much flexability at this price.

Up to twelve 25 character messages plus a 100, 75, 50, or 25 character message (4096 bits total).

A switch combines 25 character messages for up to three 50 character messages.

To record, pull out the speed control, touch a message button and send. **To playback,** push in the speed control, select your message and touch the button. That's all there is to it!

You can repeat any message continuously and even leave a pause between repeats (up to 2 minutes). **Example:** Call CQ. Pause. Listen. If no answer, it repeats CQ again. To answer simply start sending. LED indicates Delay Repeat Mode.

Instantly insert or make changes in any playing message by simply sending. Continue by touching another button.

Memory resets to beginning with button, or by tapping paddle when playing. Touching message button restarts message.

LEDs show which 25 character memory is in use and when it ends.

Built-in memory saver. Uses 9 volt battery, no drain when power is on. Saves messages in memory when power loss occurs or when transporting keyer. Ultra compact, 8x2x6 inches.

PLUS A MFJ DELUXE FULL FEATURE KEYER.

Iambic operation with squeeze key. Dot-dash insertion.

Dot-dash memories, self-completing dots and dashes, jamproof spacing, instant start (except when recording).

All controls are on front panel: speed, weight, tone, volume. Smooth linear speed control, 8 to 50 WPM.

Weight control lets you adjust dot-dash-space ratio; makes your signal distinctive to penetrate QRM.

Tone control. Room filling volume. Built-in speaker.

Tune function keys transmitter for tuning.

Ultra reliable solid state keying: grid block, cathode, solid state transmitters (−300 V, 10 ma. max., +300 V, 100 ma. max.). CMOS ICs, MOS memories. Use 110 VAC or 12 to 15 VDC. Automatically switches to external batteries when AC power is lost.

OPTIONAL SQUEEZE KEY for all memory keyers. Dot and dash paddles have fully adjustable tension and spacing for the exact "feel" you like. Heavy base with non-slip rubber feet eliminates "walking". $29.95 plus $2.00 for shipping and handling.

THIS MFJ-482 FEATURES FOUR 25 OR A 50 AND TWO 25 CHARACTER MESSAGES.

- **Speed, volume, weight, tone controls**
- **Combine memory switch**
- **Repeat, tune functions**
- **Built-in memory saver**

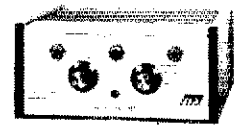
$99.95

Similar to MFJ-484 but with 1024 bits of memory, less delay repeat, single memory operating LED. Weight and tone controls adjustable from rear panel. 6x2x6 inches. 110 VAC or 12 to 15 VDC.

THIS MFJ-481 GIVES YOU TWO 50 CHARACTER MESSAGES.

- **Repeat function**
- **Tune function**
- **Built-in memory saver**

$79.95



Similar to MFJ-482 but with two 50 character messages, less weight controls. Internal tone control. Volume control is adjustable from rear panel. 5x2x6 inches. 110 VAC or 12 to 15 VDC.

For Orders Call toll-free 800-647-1800

Order any product from MFJ and try it. If not delighted, return within 30 days for a prompt refund (less shipping).

Order today. Money back if not delighted. One year unconditional guarantee. Add $2.00 shipping/handling.

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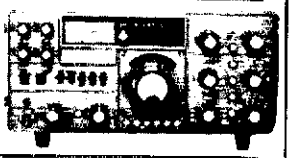
Call for yours today!



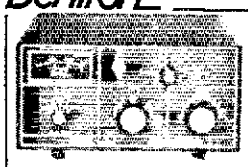
NEW! YAESU FT207R

Synthesized Handi-Talkie. 2 Watts

CALL NOW FOR OUR PRICE!

We stock the complete YAESU line!

Dentron



Dentron GLA 1000

1 KW DC INPUT! 1200 W. PEP! LOW PRICES!

CLIPPERTON L

1 KW DC INPUT! 2 KW P.E.P. In Stock – Low Prices!

We have the New Dentron AF-1A Audio Processor, Dentron Antenna Tuners, Antennas and SWR Meters.

MLA 2500 B – DTR 2000L

CHECK OUR LOW PRICES!

MIRAGE MP1 HF & MP2 VHF SWR MTR. – B108 2M AMP. & B1016 160 WATT. 2M AMP. In Stock, call or write!

B&W ANTENNA SWITCHES in stock!

DAIWA

J. W. Miller

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TUNERS – FILTERS – We've got 'em! CHECK US FIRST!

SEND S.A.S.E. FOR OUR PINK SHEET SPECIALS!

USED AND CLEARANCE GEAR!

USED EQUIPMENT? OUR STOCK TURNS FAST. WRITE OR CALL YOUR SPECIFIC NEEDS.

KENWOOD

NEW! TS 520 SE

A new version of the FAMOUS STANDARD!

Call or write for our price!

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All Solid State with Digital Frequency Control. 200W P.E.P. Memory.

Best Price Anywhere!

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ALL SOLID STATE HF TRANSCEIVER PLUS A FULL LINE OF ACCESSORIES!

TR 7600/7625 TS 700SP

HOLIDAY SALE! Special low prices! TR 7600/7625 and RM 76 Micro Processor, and TS 700SP—Call or write for these special lowest prices yet!

NEW! Ask us about the NEW TR 2400 2M HANDI TALKIE!

NEW! KENWOOD OWNERS! We have the new Kenwood Phone Patch!

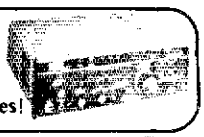
We stock the full KENWOOD line and provide warranty and after-warranty service. BUY WITH CONFIDENCE!

DRAKE

TR/DR-7

Now in stock!

Full 7 line of accessories!



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$105.00 including Shipping in U.S.A.

HD-73 with 100 feet rotor cable $120.00

HD73 with 100 feet rotor cable and 100 feet RG8U $150.00

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CDE ROTOR SPECIALS

The NEW HAM IV Rotor

Shipping included

HAM IV Rotor $147.00

HAM IV Rotor with 100 ft rotor cable $162.00

HAM IV Rotor plus 100 ft each - rotor cable and first grade RG8U $185.00

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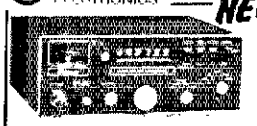

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HF SSB Transceiver featuring "VRS"

Fully Synthesized 235 Watts PEP & CW.

See the Swan ads and Call us or write for BEST PRICES ANYWHERE!

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Dual PTO's SYNTHESIZED 1.8–30 MHZ 235 Watts PEP

SWAN 100 MX P.S. and ANT. TUNER.

Call or write for quote, ideal for home QTH or mobile!

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701, 211, 215, 280, 30A—All in stock!

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SSTV – ROBOT

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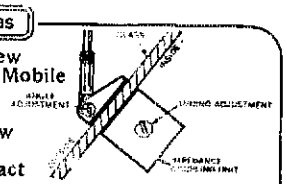
avanti antennas

The fantastic new Avanti 2 meter Mobile Antenna—mounts on your car window glass! Neat and compact installation!



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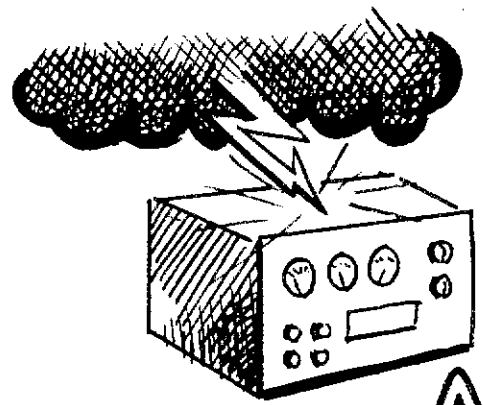

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Antennas

Towers

Flood

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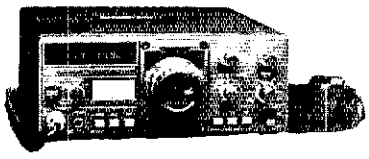
KENWOOD Transceivers/Accessories

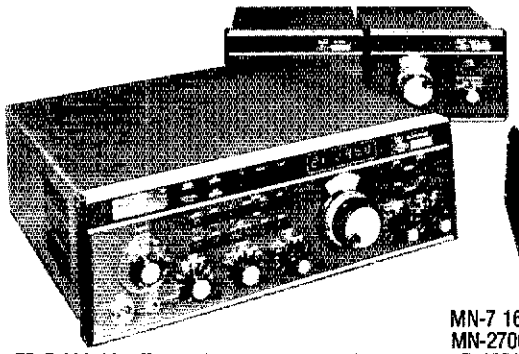


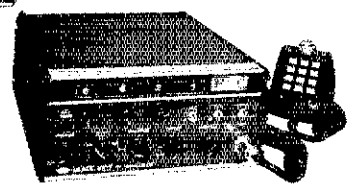
TS-120S Xcvr	$ 699.95
VFO-120 remote VFO	159.95
ST-120, ext. speaker	39.00
AT-120 ant. tuner/SWR Mtr	99.95
TS-30 AC power supply, 13.8VDC, 20A	139.00
MB-100 mobile mt. bracket	29.00
YK-88CW 500 Hz CW filter	59.95

TS-180S Xcvr w. D.F.C.	1149.95
TS-180S w/o D.F.C.	984.95
TS-30 AC power supply, 13.8VDC, 20A	139.00
ST-180 ext. speaker w. selectable audio filters	69.95
DF-180 Dig.Freq.Control module	164.95

YK-88SSB IF Xtal SSB filter for dual filter system	59.95
YK-88CW 500 Hz CW filter	59.95
VFO-180 Remote VFO	179.95
AT-180 Ant. Tuner/SWR-RF Pwr Mtr/Ant. Sw	179.95

DRAKE® Transceivers/Accessories





TR-7 160-10m Transceiver	1200.00
DR-7 Digital/gen cov board	195.00
TR-7/DR-7 Xcvr w/dig. gen coverage	1395.00
PS-7 120/240V ac supply	249.00
MS-7 Speaker	36.00
RV-7 Remote VFO	195.00
FA-7 Fan for TR-7 or PS-7	25.00
NB-7 Noise blanker	90.00
SL-300 300 Hz crystal filter	52.00
SL-500 500 Hz crystal filter	52.00
SL-1800 1.8 KHz crystal filter	52.00
SL-6000 6 KHz crystal filter	52.00
MMK-7 Mobile mounting kit	49.95

MN-7 160-10m 250w matcher	165.00
MN-2700 160-10m 1Kw matcher	279.00
B-1000 4:1 balun	24.95
WH-7 160-6m wattmeter	89.00
7073 Hand microphone	19.00
7077 Desk microphone	45.00
Aux-7 Range program board	45.00
385-0004 TR-7 service manual	30.00
R-7 160-10m receiver	1100.00
DR-7 Digital readout/gen cov board	195.00
R-7/DR-7 Rcvr w/dig, gen coverage	1295.00
MS-7 Speaker	36.00
NB-7A Noise blanker	90.00
SL-300 300 Hz crystal filter	52.00
SL-500 500 Hz crystal filter	52.00

SL-1800 1.8 KHz crystal filter	52.00
SL-4000 4 KHz crystal filter	52.00
SL-6000 6 KHz crystal filter	52.00
Aux-7 Range program board	45.00
DL-300 300 w dry dummy load	19.95
DL-1000 1kw dry dummy load	39.95
DSR-2 10 KHz-30 MHz dig. receiver	3200.00
L-7 2Kw PEP 160-15m linear	1099.00
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Fixed frequency crystals each	9.50
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TV-5200-LP 1Kw (100w/6m) low-pass	26.60
TV-3300-LP 1Kw 80-10m low-pass	26.60
TV-75-HP 75 ohm high-pass filter	13.25
TV-300-HP 300 ohm high-pass filter	10.60
1340 UV-3 2m FM Xcvr	595.00
1343 UV-3 2m/220 MHz FM Xcvr	795.00
1344 UV-3 2m/450 MHz FM Xcvr	795.00
1346 UV-3 2m/220/450 MHz FM	995.00
220 MHz add-on, factory installed	200.00
450 MHz add-on, factory installed	200.00
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1330 UMK-3 Remote trunk kit	69.95
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385-0002 UV-3 service manual	25.00
1525EM Microphone w/touch tone	49.95

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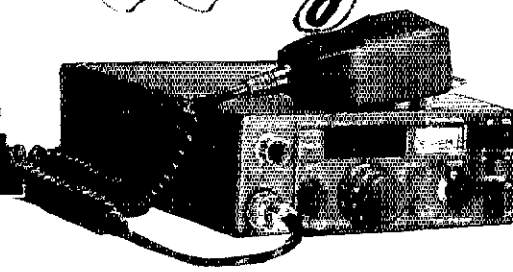

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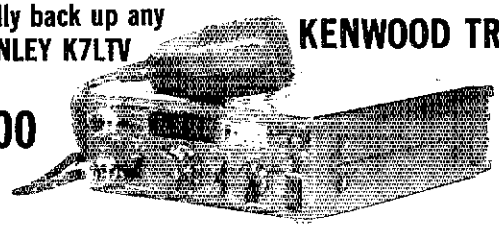

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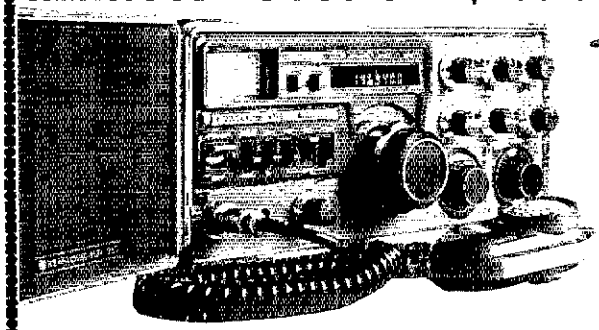

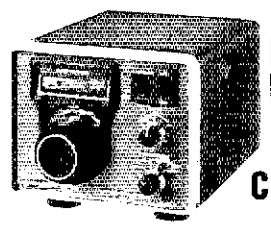

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Write or Call For Our Used Equipment List. Over 100 Pieces of Used Ge
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Ham-Ads

(1) Advertising must pertain to products and services which are related to Amateur Radio.

(2) The Ham-Ad rate is 70 cents per word. A special rate of 25 cents per word applies to hamfest and convention announcements, to individuals seeking to dispose of or acquire personal equipment, and to other advertising which, in our opinion, obviously qualifies for the individual rate.

(3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" × 11" sheet of paper.

(4) Closing date for Ham-Ads is the 20th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received August 21 through September 20 will appear in November *QST*.

(5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permited in *QST* advertising.

(6) New "commercial" advertisers must submit a production sample of their product (which will be returned) and furnish a statement in writing that they will respond appropriately to customer complaints and will stand by and support all claims and specifications mentioned in their advertising before their ad can appear.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or character of their products and services. Individual advertisers are not subject to scrutiny.

Clubs/Hamfests

QCWA Quarter Century Wireless Association is an international nonprofit organization founded in 1947. Any currently licensed Amateur who was first licensed 25 or more years ago is eligible for membership. Members receive a membership call book and quarterly news. Write Q.C.W.A. Inc. 1409 Cooper Dr., Irving TX 75061.

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.

YAESU Equipment owners — present or prospective — join the eight-year-old, 4000-member, 45-country, International Fox-Tango Club. Members receive valuable monthly newsletter, money-saving purchasing service, technical committee consultation, free ads, FT Net, more. Back issues of newsletter available from 1972. To join, send $6 for calendar year (includes only 1979 issues of newsletter) or $1 creditable towards dues, for complete information and sample newsletter. N4ML, Box 15944 W. Palm Beach FL 33406.

CERTIFICATE for proven two-way radio contacts with amateurs in all ten USA areas. Award suitable to frame and proven achievements added on request. S.a.s.e. brings TAD data sheet from W6LS, 2814 Empire, Burbank, CA 91504.

ICOM-701 International User's Club is now operational. S.a.s.e. for details: N8RT, Rob Pohorence, 9600 Kickapoo Pass, Streetsboro, OH 44240.

MASSACHUSETTS: 1200 Radio Club, W1DC, Annual Auction, November 17, 1979, 10:00 AM — 4:00 PM, at Honeywell Facility, 300 Concord Road, Billerica, MA 01821, Route 3 at Exit 27, between Routes 495 and 128. Talk-in 147.72-12. Proceeds support Billerica and Waltham repeaters.

FT WAYNE HAMFEST. November 18, 8 A.M.-4:30 P.M. Allen County Memorial coliseum, Ft. Wayne, Indiana. Tables $4, admission $3,, $2.50 advance. 100 prizes including TS120 w/ps and FT207R. Forums, Saturday night activities. Talk-in 28.88. For more, write Ft. Wayne Hamfest, P. O. Box 342, Ft. Wayne, IN 46801.

QSL Cards/Rubber Stamps/Engraving

TRAVEL-PAK QSL Kit — Converts Post Cards, Photos to QSLs. Stamp brings circular. Samco, Box 203, Wynantskill NY 12198.

DELUXE QSLs, Samples 25c. Petty, W2HAZ, P. O. Box 5237, Trenton NJ 08638.

DON'T buy QSL cards until you see my free samples — or draw your own design. I specialize in custom cards. Send black and white sketch: will give quote. Little Print Shop, Box 9848, Austin TX 78766.

$2.70 per 100 (1000 order). 30 original two-color styles. 125 cards minimum. We ship 2-weeks after your check clears or you may have your money back! Satisfaction guaranteed. Send 30c stamps for catalog. VP5QED Press: Box 1523-Boca Raton, FL 33432.

DISPLAY and protect your QSLs with 20 frame plastic holders. Seven for $3.00 prepaid. TEPABCO, Box 198T, Gallatin TN 37066.

FREE Samples — Stamp appreciated. Samcards, 48 Monte Carlo Dr., Pittsburgh, PA 15239.

CUSTOM printed and photo QSLs, very economical, free samples. Stamps appreciated. Stu, K2RPZ, Box 412, Rocky Point, NY 11778. 516-744-6260.

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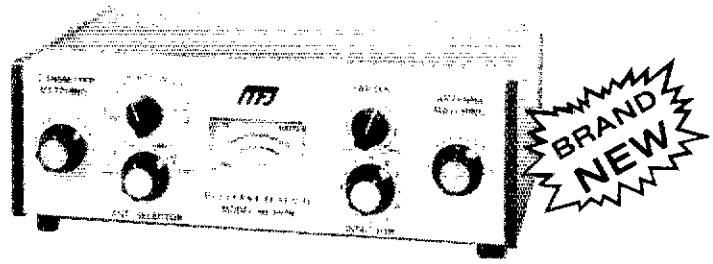
$119.95 buys you one of the world's finest 300 watt antenna tuners with features that only MFJ offers, like . . . dummy load, SWR, forward, reflected power meter, antenna switch, balun. Matches everything from 1.8 thru 30 MHz: coax, random wires, balanced lines.



MFJ's Best Versa Tuner II . . .
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$119.95

This is MFJ's best Versa Tuner II. And one of the world's finest 300 watt (RF output) tuners.

The MFJ-949 *Deluxe* Versa Tuner II gives you a combination of quality, performance, and features that others can't touch at this price . . . or any price.

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FEATURES: A 200 watt 50 ohm dummy load lets you tune up for maximum performance.

A sensitive meter lets you read SWR with only 5 watts and both forward and reflected power in two ranges (300 and 30 watts).

A flexible antenna switch lets you select 2 coax lines direct or thru tuner, random wire or balanced line and dummy load.

A large efficient airwound inductor 3 inches in diameter gives you plenty of matching range and less losses for more watts out.

1:4 balun. 1000 volt capacitors. SO-239 coax connectors. Binding post for balanced line, random wire, ground. 10x3x7 inches.

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The MFJ-949 carries a full one year unconditional guarantee.

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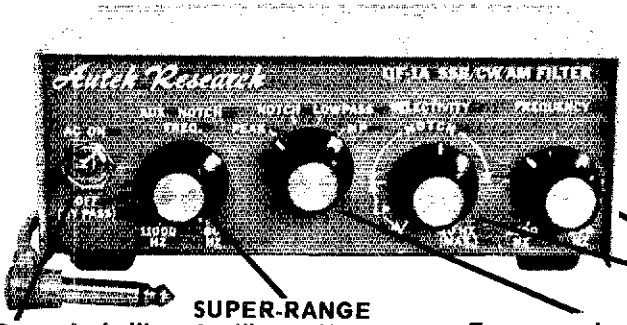

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AUTEK pioneered the **ACTIVE AUDIO FILTER** way back in 1972. Today, we're still maintaining that engineering leadership. Our **QF-1A** evolved from suggestions from thousands of owners, and years of dedication to making the "ultimate" filter. No gimmicks — just something that really "works" like the ad says. You're in for a treat!

Autek filters gained their reputation by using a costly **INFINITELY VARIABLE** design. Yet, mass-production (we sell only **ONE MODEL** — the best) makes it a tremendous bargain. You're not limited by a few fixed positions. You vary selectivity 100:1, and vary frequency over the entire usable audio range. **PEAK CW** (or voice) with an incredible **20 HZ BANDWIDTH**, but also variable all the way to "flat." Imagine what the **NARROWEST CW FILTER MADE** will do to **QRM!** Reject whistles with the most flexible **NOTCH** you've heard. Wide or narrow. Depth to 70 dB. **LOWPASS** helps you cope with **SSB** hiss and splatter. Skirts exceed 80 dB. Most above features were in the popular QF-1 (See excellent review in March, 1977 **QST**.) The new "A" model is more selective, adds a **HIGHPASS** mode for **SSB**, and a great **AUXILIARY NOTCH** (35 to 60 dB) to give **TWO NOTCHES, NOTCH/PEAK, NOTCH/LOWPASS,** or **NOTCH/HIGHPASS!** If this doesn't convince you, please **ASK ON THE AIR.** Owners are our best salesmen!

Due to cost and panel-space limitations, even the latest rigs only include a fraction of the **QF-1A** features. We recommend you buy the best rig you can afford, spend $3,000 or more, then add a **QF-1A** and listen to the improvement! **WORKS WITH** Yaesu, Kenwood, Drake, Swan, Atlas, Tempo, Collins, Heath, S/1, etc., **ANY RIG!**

Hooks up in minutes. Plug into your rigs phone jack, or attach to speaker wires. Plug speaker or phones into **QF-1A** rear-panel jack. That's it! Filter supplies 1 watt to fill a room. No batteries rqd. (+12 VDC hookup possible.) 6½x5x2½". Handsome light/dark grey styling. Get yours today.!

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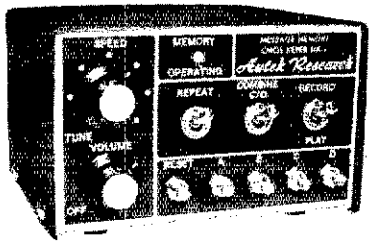

Calls CQ while you relax.

Also remembers name, QTH, contest exchanges.

Record anything you want in seconds!

Model MK-1 $99.50 ppd. U.S.A.

Our classic **MK-1** should make you wonder why anyone would buy an ordinary keyer, when memory costs so little! Records 4 messages. Just select "record," tap the A, B, C, or D message, and start sending at any speed! Record over old messages as easily. Playback by tapping the same button. Each message holds about 25 characters (letters, numbers). Total 100 characters. Handy repeat switch repeats message forever until reset. Very useful for **CQ's. YOU SIT BACK AND WAIT FOR A CALL!** Another switch combines two messages for 50 characters. "Memory-saver" feature standard.

This "state-of-the-art" keyer pleases beginners and CW "pros" alike. **DOT AND DASH MEMORIES. TRIGGERED CLOCK. IAMBIC. SELF-COMPLETING. JAM PROOF. 5 to 50+ WPM. LATEST CMOS FOR LOW CURRENT.** Built-in monitor, speaker. Widely adjustable tone, volume. Perfect weighting at all times. No fiddling with an adjustment that varies with speed. **NEW: DUAL TRANSMITTER OUTPUTS** key **ANY** modern (post 1963) ham rig directly without a battery or relay, including difficult-to-key solid-state rigs. **115VAC** supply built in, or connect **9-14 VDC** to rear panel. Use with **ANY** paddle. 6x3½x5". Burned-in and tested. Sockets for **IC's.** Full instructions.

NOW AVAILABLE. 4096 BIT MEMORY EXPANDER (ME-1) allows 16 messages, 400 chars. & "combine" for longer messages. Plugs into memory socket of **ANY MK-1** ever made. Installs in 10 to 30 mins. Full instructions. Buy your **MK-1** now and easily add memory later if you wish!

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General

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WANTED: Manual or schematic for Lavoie Labs spectrum analyzer, Model LA 17. Tony Sheppard, VE3DIR, 2 Brooklawn Ave., Scarborough Ontario, Canada.

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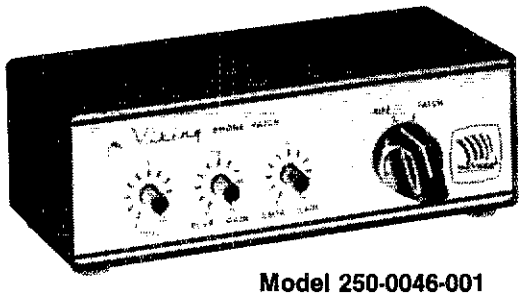

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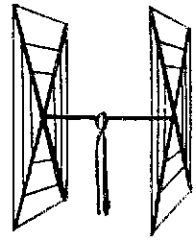

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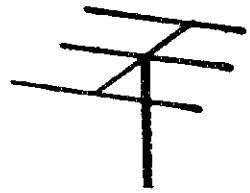

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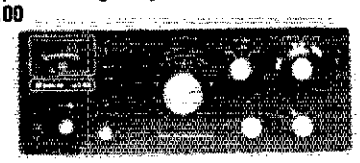

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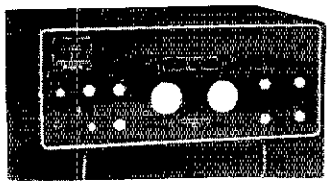

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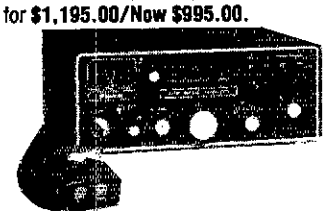

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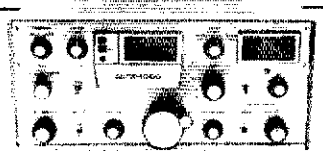

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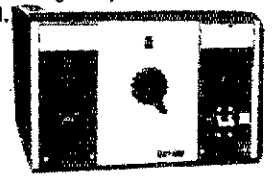

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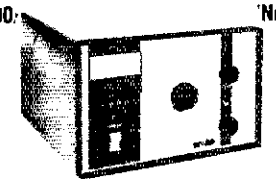

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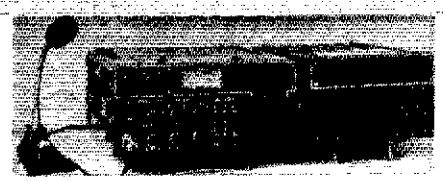

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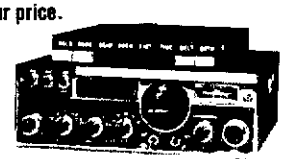

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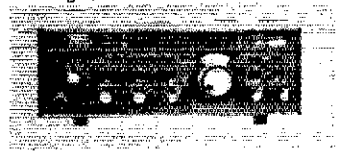

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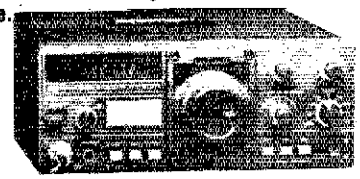

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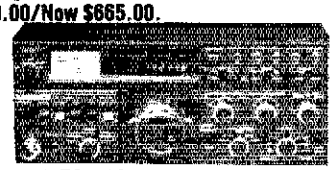

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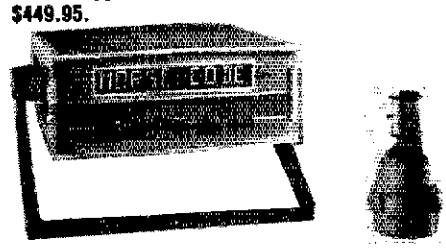

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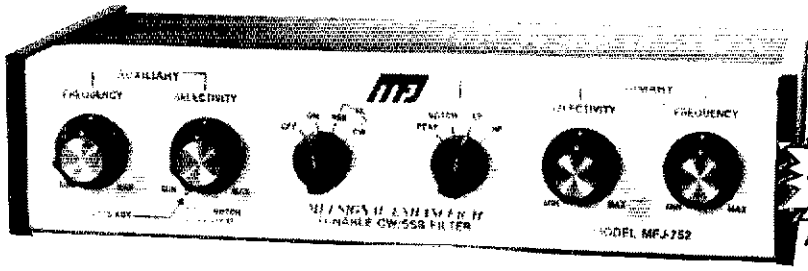

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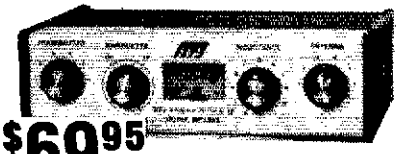

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Up to 300 watts RF OUTPUT. SWR, dual range wattmeter (300 and 30 watts full scale).

Six position antenna switch on rear. Select 2 coax lines direct or thru tuner, random wire, and tuner bypass for dummy load.

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Optional mobile mounting bracket, add $3.00.

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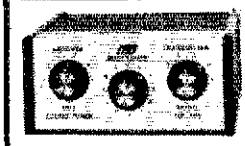

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MFJ-901 Versa Tuner available. Same as MFJ-900 but has 4:1 balun for balanced lines, $49.95.

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For example, a new efficient airwound inductor gives you less losses than a tapped toroid for more watts out and plenty of inductance for full band coverage 1.8 to 30 MHz.

$29.95

MFJ-16010 RANDOM WIRE TUNER lets you operate 1.8 to 30 MHz with random wire. Up to 200 watts RF OUTPUT. Small enough to carry in your hip pocket. Ultra compact 2x3x4 inches.

Match low and high impedances by interchanging input and output. SO-239 coax connectors.

One year unconditional guarantee.

Order from MFJ and try it. If not delighted, return within 30 days for refund (less shipping).

Order yours today. Call toll free 800-647-1800. Charge VISA, MC. Or mail check, money order. Add $3.00 each for shipping.

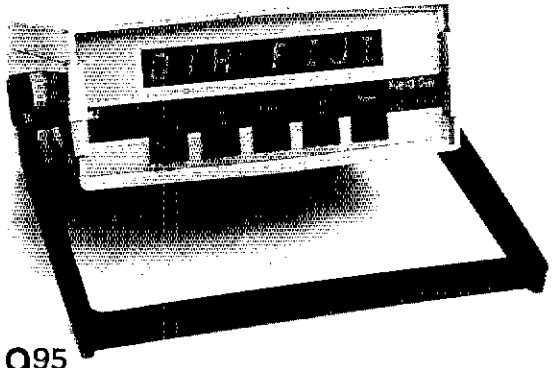
CALL TOLL FREE . . . 800-647-1800

For technical information, order/repair status, in Miss., outside continental USA, call 601-323-5869.

MFJ ENTERPRISES, INC.
BOX 494, MISSISSIPPI STATE, MS 39762

Field Day™ is ready to go

The best code / radioteletype reader and speed-display package available!



$449.95
Plus shipping

We've designed a special **Field Day,** model "B," that is in stock and ready to ship. Right now. Some of the parts designed into the original **Field Day** just couldn't meet your ordering demand.

The **Field Day-B** has a special, high-reliability, 8 character display that costs us about $40 more than the original displays! But we've still held the original price. We've added a "tuning eye" to make tuning easier and faster. Slow-arrival parts have been designed out, and an improved demodulator circuit has been designed in.

But the best part is they're ready to go now. Get 'um while they're hot.

Alabama - Long's; **California** - Electronics Emporium, Fontana; **Colorado** - H-E-P Enterprises; **Delaware** - Amateur & Advanced Communications; **Florida** - Amateur Electronic Supply, Amateur Radio Center, N & G Distributors, Ray's Amateur Radio; **Georgia** - ZZZ; **Idaho** - Ross Distributing; **Illinois** - Spectronics; **Indiana** - Ham Shack; **Kansas** - Associated Radio; **Kentucky** - Cohoon; **Massachusetts** - Tufts; **Michigan** - Omar; **Minneapolis** - PAL; **Missouri** - Burstein-Applebee, MidCom; **North Carolina** - Bob's Amateur Center; **Nebraska** - Heinrich's Communication; **New Hampshire** - Metz Communication; **New York** - Amerisil Overseas, Barry, Communications Technology, Ham Shack, Hirsch, Kelper, Radio World; **Ohio** - Queen City; **Oklahoma** - Brodie; **South Dakota** - Burghardt; **Texas** - Kennedy Associates, Madison, Tracy; **Virginia** - Tuned Circuit; **Washington** - Northwest Radio; **Wisconsin** - Amateur Electronic Supply; **Ontario** - Metro Ham Shack; **West Germany** - Richter & Company

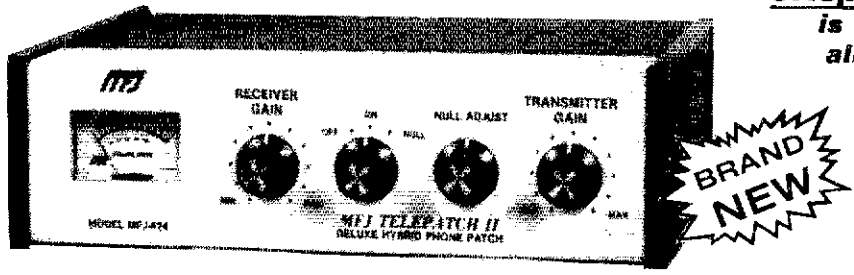
Kantronics
A commitment to excellence.

1202 E. 23rd Street (913) 842-7745
Lawrence, Kansas 66044
Visa, Master Charge accepted

NEW MFJ-624 Deluxe Hybrid Phone Patch

Feature Packed: VU meter for line level and null. Has receiver gain, transmitter gain, null controls, bypass switch. Beautiful hum-free audio. RF filtered. VOX or push-to-talk. Works with any rig. Simple patch-in-patch-out installation.

Crisp, clear hum-free audio is what phone patching is all about and MFJ has it.



$59.95

This new MFJ-624 Telepatch II hybrid phone patch gives you a combination of performance, features, and quality that you won't find in other phone patches.

PERFORMANCE: Gives you crisp clear, hum-free audio which is what phone patching is all about. Use automatic VOX or push-to-talk. RF pi-filters and PC board construction eliminates RF feedback. Works with any rig.

FEATURES: VU meter monitors telephone line level to prevent crosstalk between telephone channels. Also lets you adjust null depth for maximum isolation between receiver and transmitter.

Separate transmitter and receiver gain controls eliminate readjusting rig's controls after patching.

Null control for maximum isolation.

Function switch: OFF for normal operation. **ON** connects your rig to phone line for patching. **NULL** switches VU meter to let you adjust for maximum null.

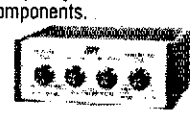
Simple 2 cable installation (plus phone line) when rig has patch-in-patch-out jacks. Connects easily to **any** rig.

Phono jacks for patch-in-patch-out, speaker, microphone. Screw terminals for phone lines.

Eggshell white, walnut sides. 8x2x6 inches.

QUALITY: Every single unit is tested for performance and inspected for quality. Solid American construction, quality components.

MFJ-620 TELEPATCH HYBRID PHONE PATCH. Same as MFJ-624 but less VU meter. 6x2x6 inches. $49.95 plus $3.00 shipping and handling.



One year unconditional guarantee.

Order from MFJ and try it — no obligation. If not delighted, return it within 30 days for refund (less shipping).

Order today. Call toll free 800-647-1800. Charge VISA, MC or mail check, money order for $59.95 plus $3.00 shipping for MFJ-624 and $49.95 plus $3.00 shipping for MFJ-620.

CALL TOLL FREE . . . 800-647-1800

For technical information, order/repair status, in Miss., outside continental USA, call 601-323-5869.

MFJ ENTERPRISES, INC.
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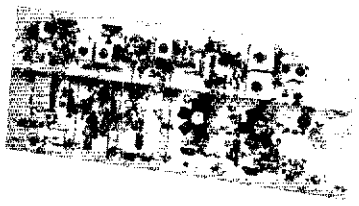
GET ON PHASE THREE FOR MUCH LESS THAN YOU THINK!

These Low Cost SSB TRANSMITTING CONVERTERS

Let you use inexpensive recycled 10M or 2M SSB exciters on UHF & VHF!

- Linear Converters for SSB, CW, FM, etc.
- A fraction of the price of other units; no need to spend $300 – $400!
- Use with any exciter; works with input levels as low as 1 mW.
- Use low power tap on exciter or simple resistor attenuator pad (instructions included).
- Link osc with RX converter for transceive.

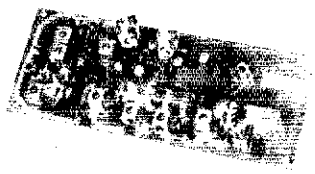


HAMTRONICS DOES IT AGAIN!

NEW XV4 UHF KIT – ONLY $99.95

28-30 MHz in, 435-437 MHz out; 1W p.e.p. on ssb, up to 1½W on CW or FM. Has second oscillator for other ranges. Atten. supplied for 1 to 500 mW input, use external attenuator for higher levels.

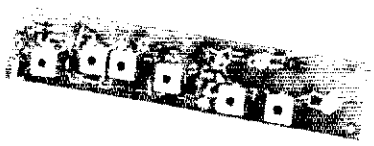
Extra crystal for 432-434 MHz range..... $5.95



XV2 VHF KIT - ONLY $69.95

2W p.e.p. output with as little as 1mW input. Use simple external attenuator. Many freq. ranges available.

MODEL	INPUT (MHz)	OUTPUT (MHz)
XV2-1	28-30	50-52
XV2-2	28-30	220-222
XV2-4	28-30	144-146
XV2-5	28-29 (27-27.4 CB)	145-146 (144-144.4)
XV2-7	144-146	50-52



XV28 2M ADAPTER KIT - $24.95

Converts any 2M exciter to provide the 10M signal required to drive above 220 or 435 MHz units.

Easy to Build FET RECEIVING CONVERTERS

Let you receive OSCAR and other exciting VHF and UHF signals on your present HF or 2M receiver

VHF KIT STILL ONLY $34.95

MODEL	RF RANGE	OUTPUT RANGE
C28	28-32 MHz	144-148 MHz
C50	50-52	28-30
C50-2	50-54	144-148
C144	144-146	28-30
C145	145-147	28-30
or	144-144.4	27-27.4 (CB)
C146	146-148	28-30
C220	220-222	28-30
C220-2	220-224	144-148
C110 (less xtal)	Any 2MHz of Aircraft Band	26-28 or 28-30

UHF KIT ONLY $34.95

MODEL	RF RANGE	OUTPUT RANGE
C432-2	432-434	28-30
C432-5	436-437	28-30
C432-4	432-436	144-148
C432-9	439.25	61.25

Professional Quality VHF/UHF FM/CW EXCITERS

- Fully shielded designs
- Double tuned circuits for spurious suppression
- Easy to align with built-in test aids

T50-50	6-chan, 6M, 2W Kit	$49.95
T50-150	6-chan, 2M, 2W Kit	$49.95
T50-220	6-chan, 220 MHz, 1½W Kit	$49.95
T450	1-chan, 450 MHz, 1W Kit	$49.95

See our Complete Line of VHF & UHF Linear PA's

- Use as linear or class C PA
- For use with SSB Xmtg Converters, FM Exciters, etc.

LPA 2-15 VHF PA, 2W in/15-20W out. Solid-state t/r switching. Kit $59.95

LPA 2-45 VHF PA, 2W in/40-45W out. Can also be used with 8-10W drive. Kit $109.95

LPA 4-10 UHF PA, ½W-1W in/8-10W out. Kit.... $79.95

FAMOUS HAMTRONICS PREAMPS

Let you hear the weak ones too!
Great for OSCAR, SSB, FM, ATV. Over 14,000 in use throughout the world on all types of receivers.

P9 Kit $12.95
P14 Wired $24.95
Specify band when ordering

- Deluxe vhf model for applications where space permits
- 1⅛" x 3"
- Models available to cover any 4MHz band in the 26 to 230 MHz range
- 12 Vdc
- 2 stages
- Ideal for OSCAR
- 20 dB gain

P8 Kit $10.95
Specify band when ordering

- Miniature vhf model for tight spaces–size only ½ x 2⅜
- Models available to cover any 4MHz band in the range 20 to 230 MHz
- 20 dB gain
- 12 Vdc

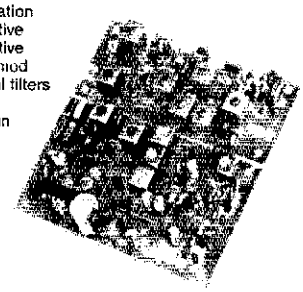
P15 Kit $18.95
P35 Wired $34.95

- Covers any 6 MHz band in UHF range of 380 to 520 MHz
- 20 dB gain
- 2 stages
- 12 Vdc

NEW VHF/UHF FM RCVRS

Offer Unprecedented Range of Selectivity Options

- New generation
- More sensitive
- More selective
- Low cross mod
- Uses crystal filters
- Smaller
- Easy to align



R75A* VHF Kit for monitor or weather sattelite service. Uses wide L-C filter. -60dB at ± 30 kHz..... $69.95

R75B* VHF Kit for normal nbfm service. Equivalent to most transceivers -60dB at ± 17 kHz, -80dB at ± 25 kHz... $74.95

R75C* VHF Kit for repeater service or high rf density area. -60dB at ±14kHz, -80dB ±22kHz, -100dB ±30kHz.... $84.95

R75D* VHF Kit for split channel operation or repeater in high density area. Uses 8-pole crystal filter. -60dB at ±9 kHz, -100dB at ± 15 kHz. The ultimate receiver!... $99.95

* Specify band: 10M, 6M, 2M, or 220 MHz. May also be used for adjacent commercial bands. Use 2M version for 137 MHz WX satellites.

R85( ) UHF FM Receiver Kits, triple conversion, include C432 UHF Front End Module. Add $20 to above prices. (Add selectivity letter to model number.)

A13-45A 6-Channel Adapter for receivers..... $13.95

IT'S EASY TO ORDER!

- Write or phone 716-392-9430 (Electronic answering service evenings & weekends)
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- Add $2.00 shipping & handling per order

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TO OBTAIN THE NEXT UNSERVICED BARGAIN LIST, SEND A SELF ADDRESSED STAMPED ENVELOPE.

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HY-GAIN ANTENNAS

TH5DX	New 5-Element Triband Beam $195
TH6DXX	6-Element Triband beam $225
TH3MK3	3-Element Triband beam $165
TH2MK3	2-Element Triband Beam $109
TH3JR	3-Element Triband Beam $119
205BA	5-Element 20-mtr "Long John" $235
155BA	5-Element 15-mtr "Long John" $145
105BA	5-Element 10-mtr "Long John" $94
203BA	3-Element 20-mtr beam $99
204BA	4-Element 20-mtr beam $175
204MK5	204BA to 205BA kit $79
153BA	3-Element 15-mtr beam $64
103BA	3-Element 10-mtr beam $54
402BA	2-Element 40-mtr beam $175
DB1015A	3-Element 10-/15-mtr beam $115
Hy-Quad	2-Element 10-/15-/20-mtr quad $199
64B	4-Element 6-mtr beam $42
66B	6-Element 6-mtr beam $89
18HT	Hy-Tower 80-10 mtr vertical $255
18V	80-10 mtr vertical $26
18AVT/WB	80-10 mtr trap vertical $75
14AVQ/WB	40-10 mtr trap vertical $55
12AVQ	20-/15-/10-mtr trap vertical $39
RMQ	Roof mount kit for verticals $29
203	3-Element 2-mtr beam $14
205	5-Element 2-mtr beam $18
208	8-Element 2-mtr beam $23
214	14-Element 2-mtr beam $26
2BDQ	80/40 mtr trap dipole $44
5BDQ	80-10 mtr trap dipole $79
GPG2	⅝ Wave 2-mtr ground plane $18
J-Pole	4-Bay 2-mtr stacked J-Pole $59
LA1	Heavy duty Lightning Arrestor $45
LA2	Coax in-line arrestor $7
BN86	kW balun $12

TIMES WIRE COAX

RG-213/u MIL SPEC RG-8/u replacement	$0.25/ft
1/2" 50-ohm polyjacketed hardline	$0.65/ft
Male hardline connector (PL-259)	$8.00
Female hardline connector (SO-239)	$9.00
Male hardline connector (Type N)	$10.00

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A3219	New 19-element 2-mtr 'Boomer' $66
214B	New 14-element 'Jr. Boomer' $53
214FB	New 14-el vertical 'Jr. Boomer' $53
228FB	New Jr. Boomer FM power pack $165
A617B	New 6-element 6-mtr Long Boom $150
A50-5	5-element 6-mtr beam $53
A50-10	10-element 6-mtr beam $90
ATB34	4-Element triband beam $209
20-3CD	New 3-element 20-mtr beam $135
20-4CD	New 4-element 20-mtr beam $225
15-3CD	New 3-element 15-mtr beam $77
15-4CD	New 4-element 15-mtr beam $89
10-3CD	New 3-element 10-mtr beam $55
10-4CD	New 4-element 10-mtr beam $67
ATV4	40-10 mtr vertical $78
ATV5	80-10 mtr vertical $85
ARX2	2-mtr 'Ringo-Ranger' $30
ARX-450	450 MHz 'Ringo Ranger' $30
A147-11	11-Element 147-148 MHz beam $30
A147-22	22-Element 'Power-Pack' $90
A144-10T	10-Element 2-mtr Twist $37
A144-20T	20-Element 2-mtr Twist $53
A220-11	11-element 220-MHz beam $30
A432-11	11-element 432-MHz beam $28
A432-20T	20-element 432-MHz Twist $49
DX120	20-Element 2-mtr EME building block .$44
DXK140	Stacking kit for pair DX120 50

Alliance HD73 Rotor Special $99

CDE ROTORS

CD45 (9 ft² rating)	$110
HAM 4 — (New model - 15 ft² rating)	$139
Tailtwister — (Now rated at 30 ft²)	$189
8-Conductor Rotor Cable	$0.15/ft

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20G/$27.50	25G/$35.50 45G/$61.50 55G/$104.50
HDBX48	Free-standing 48-ft tower (18 ft² ant) .$305
HBX56	Free-standing 56-ft tower (10 ft² ant) .$335
FK2548	48-ft 25G foldover tower $595
FK2558	58-ft 25G foldover tower $660
FK2568	68-ft 25G foldover tower $725
FK4548	48-ft 45G foldover tower $835
FK4558	58-ft 45G foldover tower $920
FK4568	68-ft 45G foldover tower $999

(freight paid on all foldover towers)

100-ft 25G tower (complete)	$649
100-ft 45G tower (complete)	$999

GALVANIZED STEEL TOWER HARDWARE

3/16" EHS (3990 lb rating) ...	$9.50/100 ft $90/1000 ft
1/4" EHS (6000 lb rating)	$12/100 ft $111/1000 ft
5/32" — 7 × 7 Aircraft cable(2700 lb)	$8/100 ft
3/16 CCM cable clamps (3/16" or 5/32" cable) ...	$0.30
1/4 CCM cable clamps(1/4" cable)	$0.40
1/4 TH Thimble (fits all sizes)	$0.25
3/8 EE (3/8" Eye and eye turnbuckle)	$5.50
3/8 EJ (3/8" Eye and jaw turnbuckle)	$6.00
1/2 EE (1/2" Eye and eye turnbuckle)	$7.50
1/2 EJ (1/2" Eye and jaw turnbuckle)	$8.00
3/16" Preformed guy deadend	$1.45
1/4" Preformed guy deadend	$1.65
6"-dia 4-ft long earth screw anchor	$10.50
2"-dia 10-ft long heavy duty mast	$30.00
500D Guy insulator (5/32" or 3/16" cable)	$0.85
502 Guy insulator (1/4" cable)	$1.55

BERKTEK

RG-8X Full braid, low-loss 50-ohm coax (SPECIAL) $0.15/ft

Rohn 20G, 25G, 45G and 55G Prices FOB Peoria, IL. Slightly higher for local shipments. Write or call for quote on $1800 freight paid orders.

Write or call for our SUPER PRICE on Hy-Gain and Towermaster crank-up towers!

HOSS-Trader Ed says "We refuse to be undersold: Big-Sale, the Hoss needs folding money. Shop around for the best price then telephone the Hoss last." New Atlas 210X transceiver $489. New Drake C-Line, T4XC, R4C and AC-4, regular $1548, cash price $1295. New Rohn 50 foot fold over tower, prepaid, $649. Used Mosley TA-33 beam $149. Used Ham-4 rotor $109. New Kenwood transceiver: 120-S, regular $699, cash $609. New Alpha linear $1219. Specials: New DenTron Clipperton-linears $519. New Drake R4C $569. New Drake TR-7 transceiver $1249. New Dentron GLA-1000 linears $295. Used Kenwood 120-S $595. Alliance HD-73 ham rotors, regular $165, cash $89.95. Moory Electronics Company, P. O. Box 506, DeWitt, AR 72042, Tel: 501-946-2820.

WANTED: R390, R-390A radio receivers. New or used. Parts, manuals, etc. Trade for new amateur equipment. Communications Technology Group Inc., 448 Merrick Road, Oceanside, N.Y. 11572. 516-536-5724.

HAM Radio Repair, alignment. New location near Chattanooga for fast service by UPS, or visit our modern mountaintop lab. "Grid" Gridley, W4GJO, Route 2, Box 138-B, Rising Fawn, Georgia 30738. 404-657-7841.

AMATEURS Buy/sell exchange — Quickly buy/sell used amateur radio gear! Send $2., long s.a.s.e. for latest classified flyer. Buy, sell, trade equipment fast! Nationwide advertisers pay only $1 for each item listed. Write: ABSE, Box 374-A, Visalia, CA 93279.

HRO-500 mint $900. 51S1 $900 or trade. AC4R, P. O. Box 570949, Miami, FL 33157.

TR-7, IC-701, Omni, Swan Astro-150, Wilson Mark II/IV, IC-211, UV-3, Clipperton-L, DSI counters, Exidy computers, and on and on. Call toll free Tues. Thru Sat. 1-800-638-4486. Comm.Center, Laurel, MD 20810.

SWAN 500, 117XC P.S. $400. Collins R-388 $200. Genave GTX-800 synthesized 2-M $200. Military Tektronics scope, 545 A with preamp $300. C.L. Henderson, 5546 Kentucky Ave., Indianapolis, IN 46241. 319-858-5558.

RTTY — Bandpass active filter 2125/2295 Hz. kit $11.95, W/T $16.95. NS-1A PLL Demodulator W/T $26.95; kit $19.95; board only $4.95. All postpaid. S.a.s.e. for info. Nat Stinnette Electronics, Tavares, FL 32778.

QST Collector looking for ARRL 1914 and 1915 List of Member Stations and map, QST March — September 1916. Ed Katin, K1RT, 75 Tumblebrook Lane, West Hartford, CT 06117. 203-233-9915.

ETO amps, KLM amps and antennas — Big Discounts! KDK 2016A $330. Bearcat 250 $259. Write for other hot specials! Ben Franklin Electronics, 115-1/2 N. Main, Hillsboro, KS 67063.

WANTED: Heath HA-14 linear, any condition. Jim, WA5ZVB, 611 Woodvale, Lafayette, LA 70503. 318-984-3711.

TEN-TEC, Wilson, Cushcraft, Hy-Gain, Anteco, Weatheralert, KLM, Nye-Viking, Vibroplex, Bencher, MFJ, B&W, DB Products, and many others. Call or write for quote Mon-Sat, 10 AM till 8 PM. 10-5 PM Wed & Sat. Sidewalk Sale last Saturday of each month. J-T Electronics Supply, Inc., 14 Jupiter Place no. 117, Plano, TX 75074. 214-424-0515.

WANTED: Cushman plug in modules for Cushman Service Monitors, also will consider taking over payments on service monitor you cannot pay for, Cushman or IFR only; WB8IJX, Fred Slaughter, 5844 Grisell Rd., Oregon, OH 43618.

SALE: Collins, Late round emblem KWM2A, 312B-5 VFO console, Spectronics digital display DD1C, 516F-2 powr supply, SM-3 desk microphone, dummy load DL1, DX Engineering rf speech processor — with all manuals, like new, excellent condition $2500, or best offer, cash sale only. No trades. Will not separate. Will prepay shipment. WB5RNC, P. O. Box 5566, Corpus Christi, TX 78405. 512-883-8511 days only.

VHF Amplifier kits, SSB-FM, 75 watt, complete kit, see Sept. QST, 1979. $99.95 post paid. Communication Concepts, Inc. 2648 North Aragon Ave., Kettering, OH 45420.

DX? You bet! The DX Bulletin, best weekly DX info in world! Send for free sample copy: K1TN, 306 Vernon Ave., Vernon, CT 06066.

KW Rotary Inductors for amplifiers and antenna tuners. Thompson Electronics, 1555 Bellefontaine, Indianapolis, IN 46202.

WANT To Buy: Technical material BAC-1 and BAC-2 antenna couplers; Eimac 1000T triodes, Rohn crank-up tower mounted on trailer; Telrex or KLM 80 meter beam, Vesto, etc., 100-300 foot tower; Collins 51J4. Sell: Greve Synchrophase Console with built-in horn. $300.; RCA AR-88, $75; BC610E, $175; HQ170AC, speaker $200; HQ120X, $75. F.O.B. K8CCV 216-427-2302 6 to 9 P.M. weeknights.

BATTERIES: New GE 12 V 2.5 A.h. sealed lead-acid rechargable, 3" x 4", $22. WØPOQ, 2755 Rigel Dr., Colorado Springs, CO 80906.

CENTURY 21 $285. Hy-Gain 18-AVT $82. TH6DXX $235. All new. Supina, 525 Ridge, State College, PA 16801.

DRAKE TR-72, all 146 repeater crystals and more; mint; never used mobile — base station only. Make offer over $125. WD4REH, 6206 Fernwood Terrace Apt 202 Riverdale, MD 20840. 301-459-6228.

SELL Drake T4XC, R4C, with 500, 1500, AC4, MS4, ETO Alpha 374, KLM 6 EL. 20 M All mint. $2700. N4UT, 804-853-9330.

WANTED: Copy of QST Nov. 1978 Don LaFAvor 511 E. Belvidere St. Paul MN 55107.

WILSON handhelds at big discount. Bill Gerhardt, 2700 Greenlee, Austin, TX 78703.

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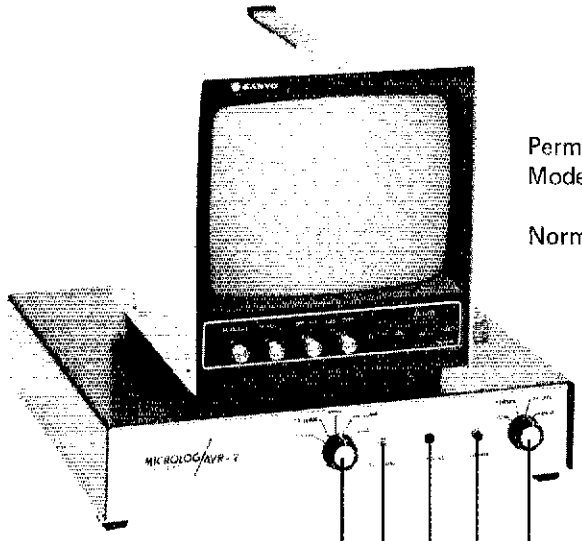
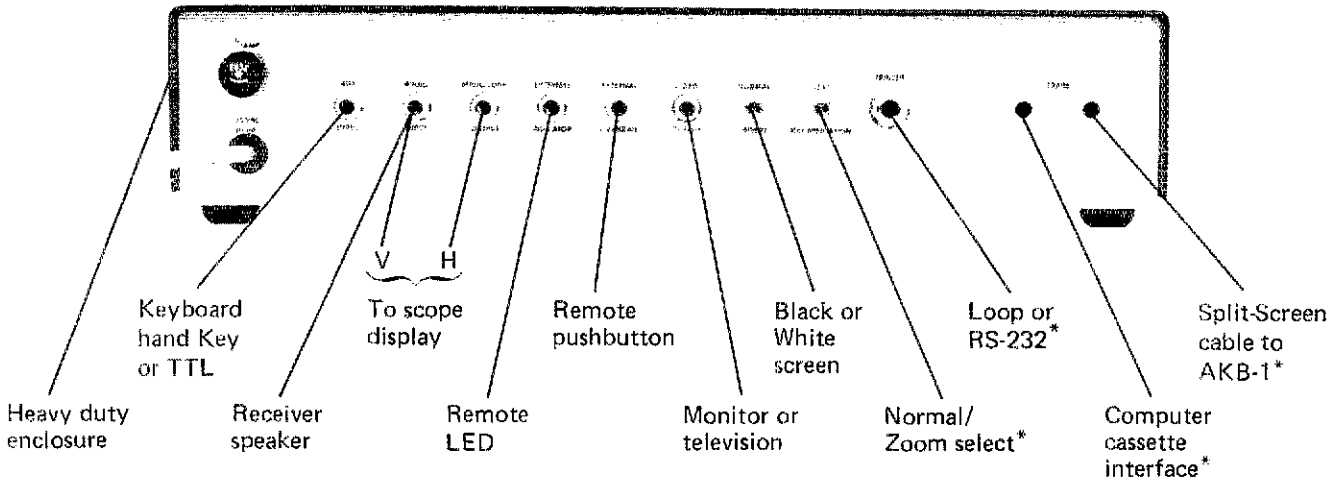


. . . and the Story Behind It



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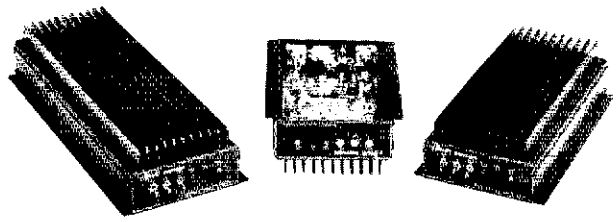

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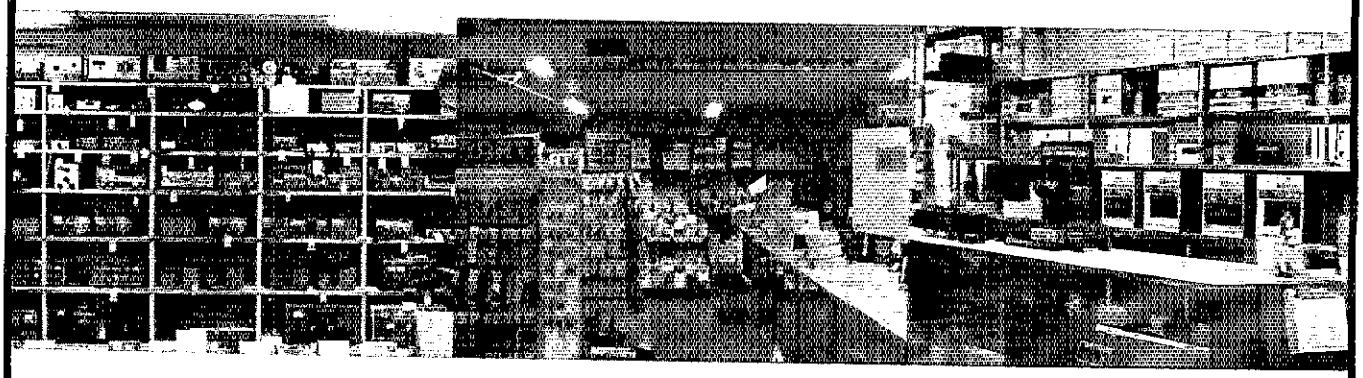

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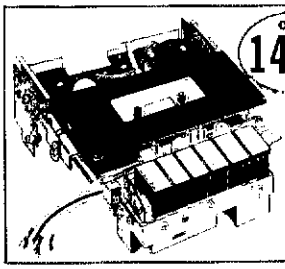

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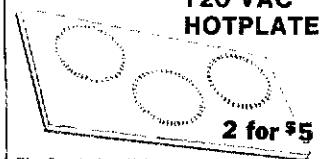

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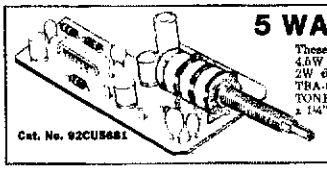

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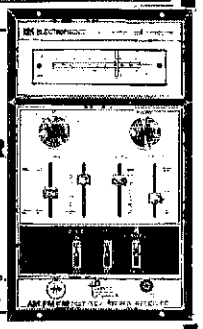

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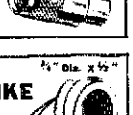

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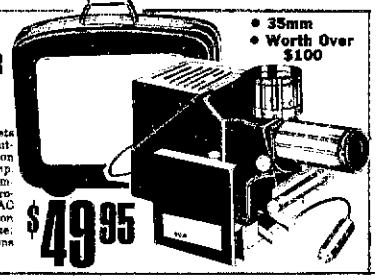

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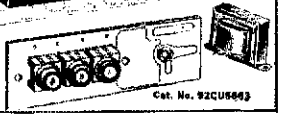

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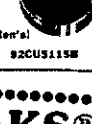

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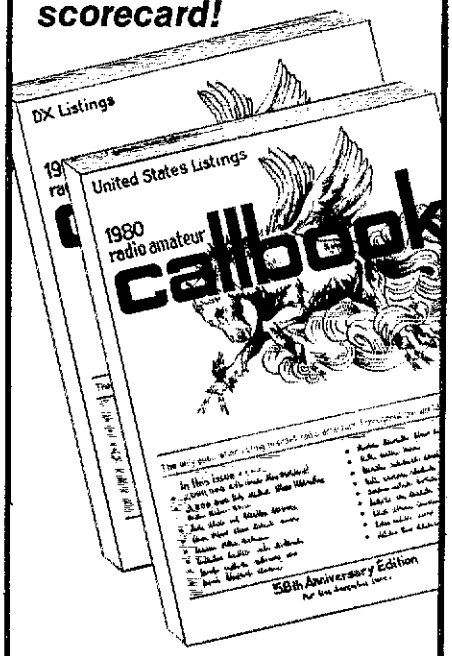

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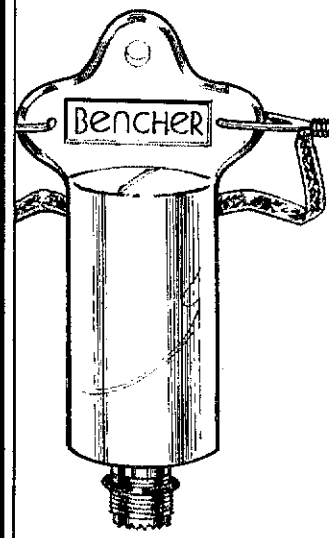

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Below are listed only some of our products. We have chosen for the most part to concentrate on high-efficiency compact antennas designed for limited-space locations, realizing that lack of space for full-sized "farms" is a major problem for many of today's amateurs. All traps, coils, baluns, and center connectors used in our systems are fully assembled, adjusted, and weatherproofed here at our plant, and are rated for full legal power input. Our wire antennas are complete with Z-1 balun (A-1 center connector with 160 meter models), #14 solid insulated copper wire, dielectric insulators, and 100 feet of nylon support rope. We include what we believe are the most comprehensive instructions in the industry with each model, making installation and accurate tuning relatively easy.

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Model	Bands	Height	Price
AV-1	80-10	16'	$89.95
AO-160	160	21'	$28.95

COMPACT TRAPPED DIPOLES

Shorter than usual trapped antennas, they provide effective multiband operation with a single set of elements and a single coax feedline, providing a practical method of compressing a multiband antenna onto a smaller city lot. Our 160 meter models use the only commercially-available traps that will permit full power on 80 meters at this price and overall length.

Model	Bands	Lgth.	Price
TD-1684	160, 80/75, 40	110'	$74.95
TD-16080	160, 80/75	160'	$59.95
TD-8040	80/75, 40	78'	$54.95
TD-4020	40, 20	40'	$49.95

COMPACT SHORTENED DIPOLES

These are standard dipoles shortened to half-size by using loading coils. Good for small lots, attics, and constructing slopers. The SP-40 works very well on 15 meters as well as 40.

Model	Bands	Length	Price
SP-160	160	130'	$42.95
SP-80	80/75	63'	$41.95
SP-40	40, 15	33'	$39.95

MULTIBAND SHORT DIPOLES

These provide absolute maximum performance possible in a minimum space location by combining shortened elements with full-size elements connected to a single coax feedline at the balun.

Model	Bands	Length	Price
MSP-8010	80/75, 40, 20, 15, 10	74'	$69.95
MSP-1	80/75, 40, 15	74'	$59.95

MULTIBAND FULL SIZE DIPOLES

These antennas provide uncompromised multiband operation by connecting separate half wave elements to a single coax feedline at the balun.

Model	Bands	Lgth.	Price
PD-8010	80-10	130'	$54.95
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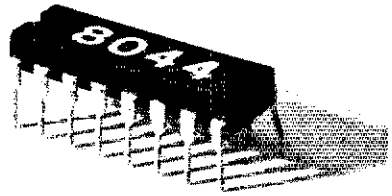

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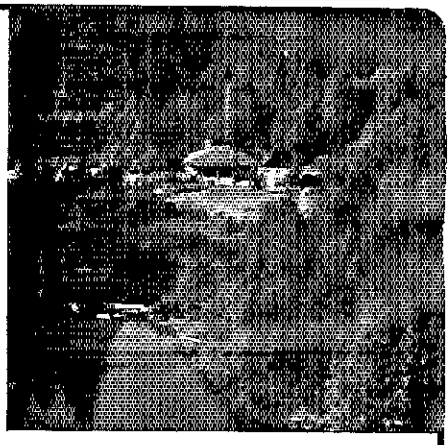

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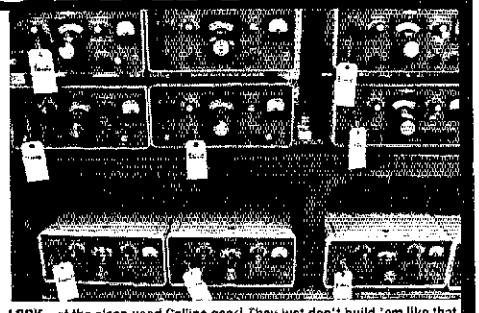

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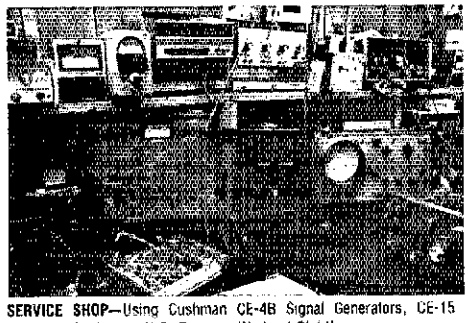

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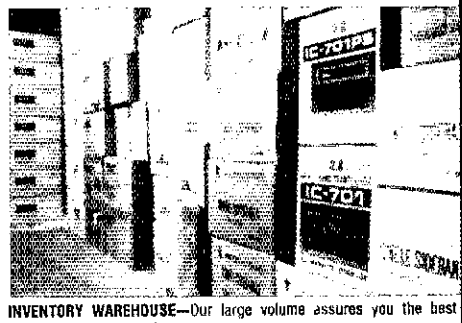

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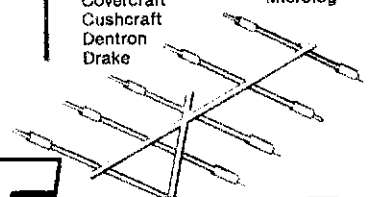

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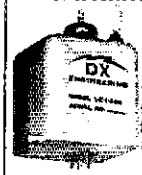

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Drake TR-72	Regency HR-312
Genave	Regency HR-2MS
Heathkit HW-2021 rec. only	Heathkit HW-202
Icom/VHF Eng	Standard 146/826
Ken/Wilson	Tempo FMH
Lafayette HA-146	Trio/Kenwood TR2200
Midland 13-505	Trio/Kenwood TR7200

FREQUENCIES IN STOCK

146.01T	
6.61R	
6.04T	6.52R
6.64R	6.55T
6.07T	6.55R
6.67R	6.58T
6.10T	6.58R
6.70R	6.94T
6.115T	7.60T
6.715R	7.00R
6.13T	7.63T
6.73R	7.03R
6.145T	7.66T
6.745R	7.06R
6.16T	7.69T
6.76R	7.09R
6.175T	7.72T
6.775R	7.12R
6.19T	7.75T
6.79R	7.15R
6.22T	7.78T
6.82R	7.18R
6.25T	7.81T
6.85R	7.21R
6.28T	7.84T
6.88R	7.24R
6.31T	7.87T
6.91R	7.27R
6.34T	7.90T
6.94R	7.30R
6.37T	7.93T
6.97R	7.33R
6.40T	7.96T
6.46T	7.36R
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6.52T	7.39R

Note: If you do not know type of radio, or if your radio is not listed, give fundamental frequency, formula and loading capacitance.

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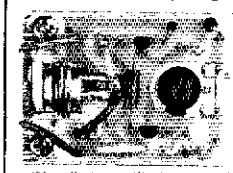

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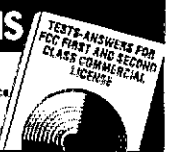

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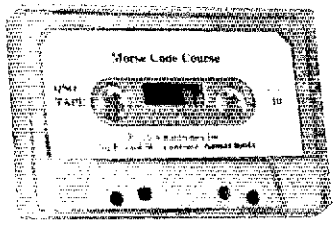

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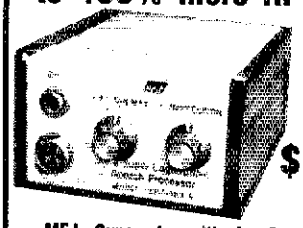

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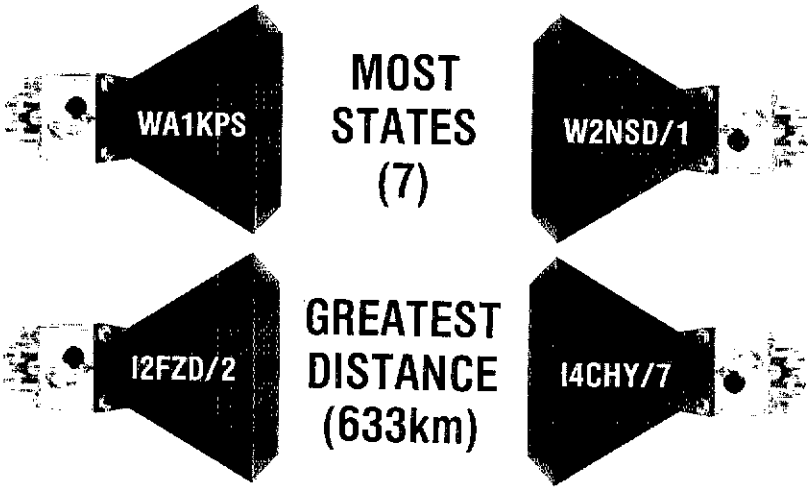

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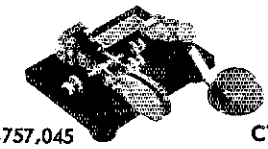

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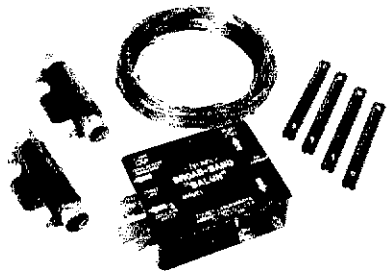

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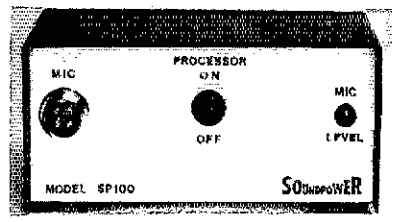

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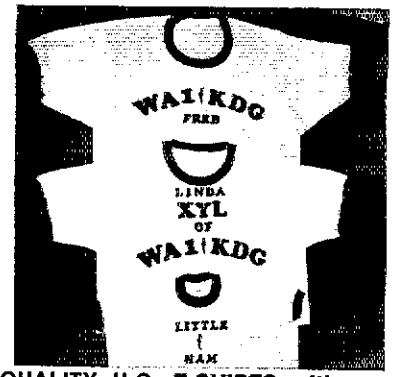

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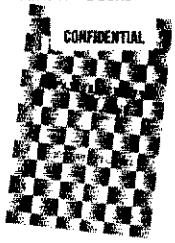

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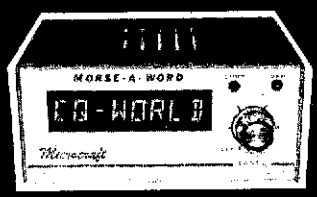

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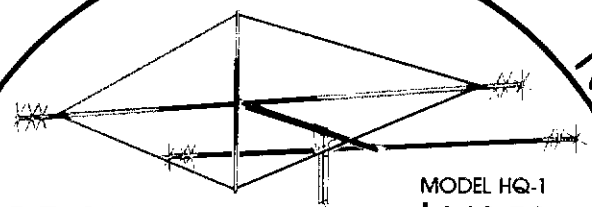

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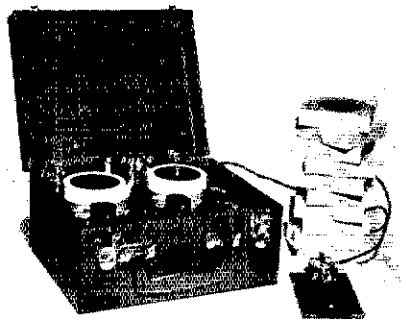

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SELL: HQ-215 $225. RCA VIP 4K, many extras, $225 K9UKX, 51625 Chestnut Road Granger IN, 46530.

DENTRON MT3000A 3kW antenna tuner. Perfect condx with manual, $225. Henry Sprague, 322 Bridge, Chatham, MA 02633.

WORK OSCAR this winter! For sale: KLM Echo 70, A 432 MHz ssb transceiver, Cushcraft 2 meter Twist antenna, Cushcraft 432 MHz Twist antenna and new connecting boom kit. All excellent condition and all for $300., postpaid to 48 states. Write for details. Joe Schwob WD8PUV, 4941 Harwich Ct., Kettering, OH. 45440.

ROSS' Specials: CushCraft Boomer antenna for $66.95. The Kenwood 520SE for $557.69. And the Tempo VHF one plus for $319. Ross Distributing Company, 78 South State, Preston, ID 83263, 208-852-0830. Closed Mondays at 2:00.

COLLINS 75S-3B serial no. 16886, 3 filters, extra set tubesters (solid state plug-ins), $795.00; also matching transmitter with 516F-2 supply (Round) $500., No scratches, both $1200. 75A-4, serial no. 3923, $325. Need Kenwood 820 or 520. W8RH, 513-277-0409.

SALE: Collins, mint, winged — KWM2 w/PM-2 ps and rej. tuning, $725; 75S-1, $325. W4QAW. 703-777-8104 or Rte. 1, Box 69, Ashburn VA, 22011.

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CALL toll-free! Buy wholesale from ABCOMM. Examples: Yaesu FT901DM: $1159; FT101ZD: $739; FT227RB: $349; CPU2500RK: $482; Ten-Tec OMNI D(B series): $925; Dentron GLA: $299; Drake TR7/DR7: $1193; and more! Call or write: ABCOMM, Box 1714, Sun City, AZ 85372, 1-800-528-6050, Ext. 1360.

ICOM 701 with IC-701 ps & mike, $995.00; Yaesu FT-301D (digital) 200 W. PEP, $650.; Drake 2-B, $165., Drake 2-C with Blanker, $180. W8RH. Address-Callbook 513-277-0409.

OLD radio books, list for s.a.s.e. K1LK, 90 Robinwood Rd., Hamden, CT 06517.

DRAKE SPR-4, perfect cond. with manual, MS-4 speaker, noise blanker, calibrator. Outfitted with extra xtal deck, total 45 xtals. Cost over $1100, will accept B.O. Unused Telrex antennas. 2m beam $90, 80m-40m inverted vee $50. WB1AAK, 413-789-1424.

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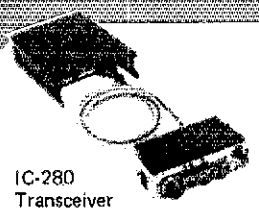

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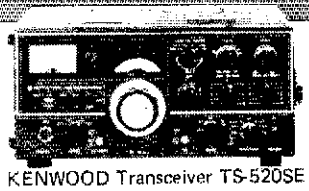

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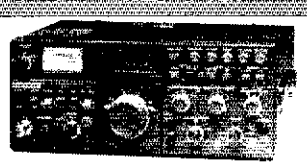

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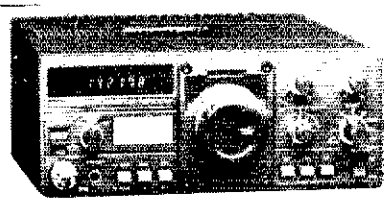

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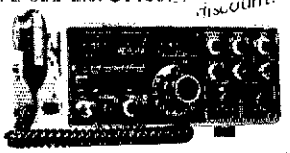

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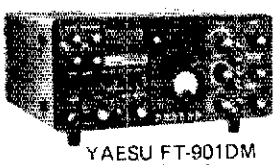

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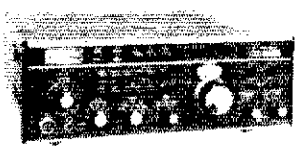

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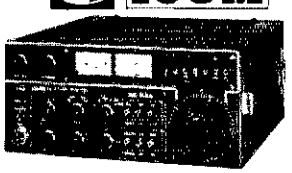

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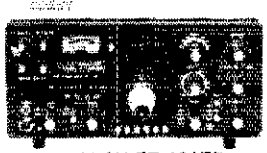

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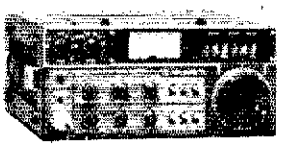

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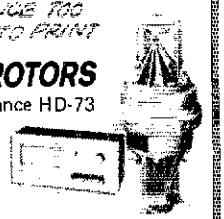

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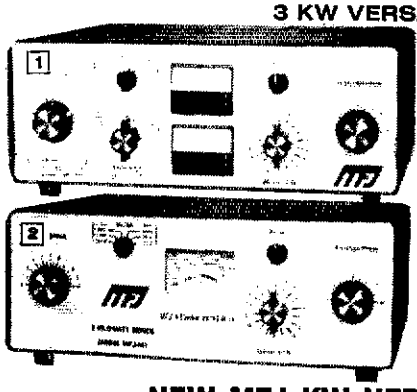

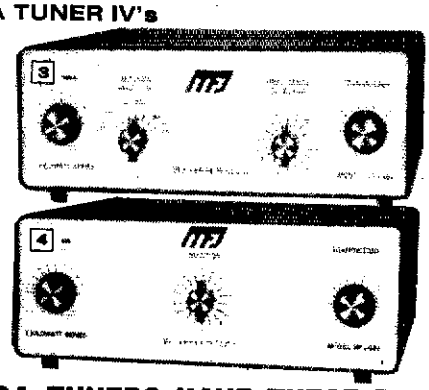

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NEW MFJ KW VERSA TUNERS HAVE THESE FEATURES IN COMMON

These 6 new MFJ KW Versa Tuners let you run up to 3 KW or 1.5 KW PEP (depending on the model) and match any feedline continuously from 1.8 to 30 MHz: coax, balanced line or random wire. Gives maximum power transfer. Harmonic attenuation reduces TVI, out of band emissions.

All metal, low profile cabinet gives RFI protection, rigid construction, sleek styling. Black. Rich anodized aluminum front panel. 5x14x14 inches. Flip down stand tilts tuner for easy viewing.

Efficient, encapsulated 4:1 ferrite balun. 250 pf, 6000 volt capacitors. 18 position dual inductor, 17 amp, 3000 V ceramic rotary switch (3 KW version). 12 position inductor, ceramic rotary switch (1.5 KW version). 2% meters. SO-239 coax connectors, ceramic feedthru for random wire and balanced line. One year limited warranty. Made in U.S.A.

3 KW VERSA TUNER IV's

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$299.95 ***EXCLUSIVE RF AMMETER insures maximum power to antenna at minimum SWR. Built-in dummy load.***

This is MFJ's best 3 KW Versa Tuner IV. The MFJ-984 Deluxe 3 KW Versa Tuner IV gives you a combination of quality, performance, and features that others can't touch at this price.

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Versatile antenna switch lets you select 2 coax lines thru tuner and 1 thru or direct, or random wire, balanced line or dummy load.

A 200 watt 50 ohm dummy load lets you tune your exciter off air for peak performance. Efficient, encapsulated 4:1 ferrite balun.

2 MFJ-981 3 KW VERSA TUNER IV

$199.95 ***Accurate meter gives SWR, forward and reflected power in 2 ranges: 2000 and 200 watts. 4:1 ferrite balun.***

The MFJ-981 3 KW Versa Tuner IV is one of MFJ's most popular Versa Tuners. An accurate meter gives you SWR, forward and reflected power in 2 ranges: 2000 and 200 watts. Encapsulated 4:1 ferrite balun.

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$199.95 ***Antenna switch lets you select 1 coax thru tuner and 2 coax thru tuner or direct, or random wire and balanced line.***

The MFJ-982 3 KW Versa Tuner IV gives you a versatile 7 position antenna switch that lets you select 1 coax thru tuner and 2 coax thru tuner or direct, or random wire and balanced line. Encapsulated 4:1 balun.

If you already have a SWR/wattmeter, the MFJ-982 is for you.

4 MFJ-980 3 KW VERSA TUNER IV

$169.95 ***Heavy duty encapsulated 4:1 ferrite balun for balanced lines.***

The MFJ-980 is MFJ's lowest priced 3 KW Versa Tuner IV but has the same matching capabilities as the other 3 KW Versa Tuner IV's.

Features an efficient, encapsulated 4:1 ferrite balun for balanced lines.

1.5 KW VERSA TUNER III's

5 MFJ-962 1.5 KW VERSA TUNER III

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A versatile six position antenna switch lets you select 2 coax lines thru tuner or direct, or random wire and balanced line. Encapsulated 4:1 balun.

Black front panel has reverse lettering.

6 MFJ-961 1.5 KW Versa Tuner III

$149.95 ***6 position antenna switch lets you select 2 coax lines thru tuner or direct, or random wire and balanced line.***

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The FT-107 has been created as a result of a blending of technologies — computer, solid state and RF design. By careful utilization of these disciplines and the experience gained from our FT-301 series, YAESU has achieved an HF transceiver which offers unique features (e. g. "Digital Memory Shift"), efficient operation and a level of performance that has been previously unattainable.

RECEIVER:

Sensitivity: 0.25 uV for 10dB S/N, CW/SSB, FSK
1.0 uV for 10dB S/N, AM
Image Rejection: 60dB except 10 meters (50dB)
IF Rejection: 70dB
Selectivity: SSB 2.4 kHz at −6dB, 4.0 kHz at −60dB.
CW 0.6 kHz at −6dB, 1.2 kHz at −60dB.
AM 6 kHz at −6dB, 12 kHz at −60dB
Variable IF Bandwidth
20dB RF Attenuator
Peak/Notch Audio Filter
Audio Output: 3 watts (4-16 ohms)
Accessories: FV-107 VFO (standard not synthesized)
FTV-107 VHF (UHF Transverter)
FC-107 Antenna Tuner
SP-107 Matching Speaker
FP-107 AC Power Supply

TRANSMITTER

Power Input: 240 watts DC SSB/CW
80 watts DC AM/FSK
Opposite Sideband Suppression: Better than 50dB
Spurious Radiation: −50dB.
Transmitter Bandwidth 350-2700 hz (−6dB)
Transmitter: 3rd IMD −31dB neg feedback 6dB
Transmitter Stability: 30 hz after 10 min. warmup
less than 100 hz after 30 min.
Antenna Input Impedance: 50 ohms
Microphone Impedance: 500 ohms
Power Required: 13.5V DC at 20 amps
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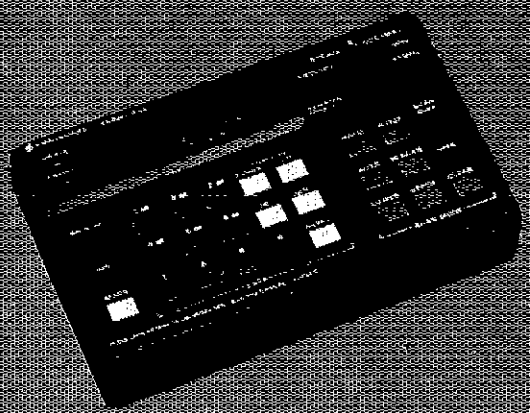
TR-7600 TR-7625

Looks the same as the TR-7625, but offers 10 watts RF output (switchable to 1 watt low power). Also uses RM-76 Microprocessor Control Unit. Offers one built-in memory.

Featuring 25 watts RF output (switchable to 5 watts low power), the TR-7625 is a high-performance 2-meter FM transceiver with built-in memory, and is designed to permit multi-channel (800-channel) operation. Compact and perfect for mobile or ham shack use. When used with optional RM-76 Microprocessor Control Unit, the TR-7625 offers a whole new dimension in channel memory and scanning capability.



RM-76

Optional Microprocessor Control Unit. Combines with either the TR-7600 or TR-7625. Stores frequencies in six memories (simplex/repeater), and it scans.

TS-700SP

Here's an outstanding 2-meter ALL-MODE TRANSCEIVER that provides an extra dimension of versatility over the entire 2-meter band. Feature-packed and equipped for SSB, FM, CW and AM. Complete with built-in digital frequency readout, receiver preamplifier, VOX, sidetone, and microphone.

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